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VOLUME the SECOND.

BRITISH MUSEUM

Encyclopædia Britannica;

OR, A

DICTIONARY

OF

ARTS and SCIENCES,

COMPILED UPON A NEW PLAN.

IN WHICH
The different SCIENCES and ARTS are digeſted into
diſtinct Treatiſes or Syſtems;
AND
The various TECHNICAL TERMS, *&c.* are explained as they occur
in the order of the Alphabet.

ILLUSTRATED WITH ONE HUNDRED AND SIXTY COPPERPLATES.

By a SOCIETY *of* GENTLEMEN *in* SCOTLAND.

IN THREE VOLUMES.

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ARTS and SCIENCES.

CAABA, or Caabah, properly ſignifies a ſquare building; but is particularly applied by the Mahometans to the temple of Mecca, built, as they pretend, by Abraham and Iſmaël his ſon. It is towards this temple they always turn their faces when they pray, in whatever part of the world they happen to be.

This temple enjoys the privilege of an aſylum for all ſorts of criminals; but it is moſt remarkable for the pilgrimages made to it by the devout muſſulmans, who pay ſo great a veneration to it, that they believe a ſingle ſight of its ſacred walls, without any particular act of devotion, is as meritorious, in the ſight of God, as the moſt careful diſcharge of one's duty, for the ſpace of a whole year, in any other temple.

CAB, an Hebrew dry meaſure, being the ſixth part of a ſeah or ſatum, and the eighteenth part of an ephah: A cab contained $2\frac{5}{8}$ pints of our corn meaſure: A quarter-cab was the meaſure of dove's dung, or more properly a ſort of chick-peaſe, called by this name, which was ſold at Samaria, during the ſiege of that city, for five ſhekels.

CABALIST, in French commerce, a factor, or perſon, who is concerned in managing the trade of another.

CABALLARIA, in middle-age writers, lands held by the tenure of furniſhing a horſeman, with ſuitable equipage, in time of war, or when the lord had occaſion for him.

CABALLEROS, or Cavalleros, are Spaniſh wools, of which there is a pretty conſiderable trada at Bayonne, in France.

CABALLINE denotes ſomething belonging to horſes: Thus caballine aloes is ſo called, from its being chiefly uſed for purging horſes; and common brimſtone is called ſulphur caballinum, for a like reaſon.

CABBAGE, in botany. See Brassica.

Cabbage-*tree*, a name ſometimes given to the palm-tree, called by Linnæus, phœnix. See Phoenix.

CABBAGING, among gardeners, a term uſed for the knitting of cabbages into round heads.

CABBALA, according to the Hebrew ſtyle, has a very diſtinct ſignification from that wherein we underſtand it in our language. The Hebrew cabbala ſignifies tradition; and the rabbins, who are called cabbaliſts, ſtudy principally the combination of particular words, letters, and numbers, and by this means pretend to diſcover what is to come, and to ſee clearly into the ſenſe of many difficult paſſages in ſcripture: There are no ſure principles of this knowledge, but it depends upon ſome particular traditions of the ancients; for which reaſon it is termed cabbala.

The cabbaliſts have abundance of names, which they call ſacred: Theſe they make uſe of in invoking of ſpirits, and imagine that they receive great light from them: They tell us, that the ſecrets of the cabbala were diſcovered to Moſes on mount Sinai; and that theſe have been delivered down to them from father to ſon, without interruption, and without any uſe of letters; for to write them down, is what they are by no means permitted to do. This is likewiſe termed the oral law, becauſe it paſſed from father to ſon, in order to diſtinguiſh it from the written laws.

There is another cabbala, called artificial, which conſiſts in ſearching for abſtruſe and myſterious ſignifications of a word in ſcripture, from whence they borrow certain explanations, by combining the letters which compoſe it: this cabbala is divided into three kinds, the gematrie, the notaricon, and the temura or themurah. The firſt whereof conſiſts in taking the letters of a Hebrew word for ciphers or arithmetical numbers, and explaining every word by the arithmetical value of the letters whereof it is compoſed. The ſecond ſort of cabbala, called notaricon, conſiſts in taking every particular letter of a word for an entire diction; and the third, called themurah, *i. e.* change, conſiſts in making different tranſpoſitions or changes of letters, placing one for the other, or one before the other.

Among the Chriſtians likewiſe, a certain ſort of magic is, by miſtake, called cabbala, which conſiſts in uſing improperly certain paſſages of ſcripture for magic operations, or in forming magic characters or figures with ſtars and taliſmans.

Some viſionaries, among the Jews, believe, that Jeſus Chriſt wrought his miracles by virtue of the myſteries of the cabbala.

CABBALISTS, the Jewiſh doctors who profeſs the ſtudy of the cabbala.

In the opinion of theſe men, there is not a word, letter, or accent in the law, without ſome myſtery in it. The Jews are divided into two general ſects; the karaites, who refuſe to receive either tradition or the talmud, or any thing but the pure text of ſcripture; and the rabbiniſts, or talmudiſts, who, beſides this, receive the traditions of the ancients, and follow the talmud.

The latter are again divided into two other ſects; pure rabbiniſts, who explain the ſcripture, in its natural ſenſe, by grammar, hiſtory, and tradition; and cabbaliſts, who, to diſcover hidden myſtical ſenſes, which they ſuppoſe God to have couched therein, make uſe of the cabbala, and the myſtical methods above mentioned.

CABECA, or **Cabesse**, a name given to the fineſt ſilks in the Eaſt Indies, as thoſe from 15 to 20 *per cent.* inferior to them are called barina. The Indian workmen endeavour to paſs them off one with the other; for which reaſon, the more experienced European merchants take care to open the bales, and to examine all the ſkains one after another. The Dutch diſtinguiſh two ſorts of cabecas; namely, the moor cabeca, and the common cabeca. The former is ſold at Amſterdam for about 21¼ ſchellinghen Flemiſh, and the other for about 18¼.

CABENDA, a port-town of Congo, in Africa, and ſubject to the Portugueſe: E. long. 12°, and S. lat. 4°.

CABIDOS, or **Cavidos**, a long meaſure uſed at Goa, and in other places of the Eaſt Indies belonging to the Portugueſe, to meaſure ſtuffs, linens, *&c.* and equal to ¾ of the Paris ell.

CABIN, in the ſea-language, a ſmall room, or apartment, whereof there are a great many in ſeveral parts of a ſhip; particularly on the quarter-deck, and on each ſide of the ſteerage, for the officers of the ſhip to lie in.

The great cabin is the chief of all, and that which properly belongs to the captain or chief commander.

CABINET, or **Cabbinet**, the moſt retired place in the fineſt part of a building, ſet apart for writing, ſtudying, or preſerving any thing that is precious.

A complete apartment conſiſts of a hall, anti-chamber, chamber, and cabinet, with a gallery on one ſide. Hence we ſay, a cabinet of paintings, curioſities, *&c.*

Cabinet alſo denotes a piece of joiner's workmanſhip, being a kind of preſs or cheſt, with ſeveral doors and drawers.

There are common cabinets of oak or of cheſnut, varniſhed cabinets of China and Japan, cabinets of inlaid work, and ſome of ebony, or the like ſcarce and precious woods.

Formerly the Dutch and German cabinets were much eſteemed in France, but are now quite out of date, as well as the cabinets of ebony, which came from Venice.

CABIRI, a term in the theology of the ancient Pagans, ſignifying great and powerful gods; being a name given to the gods of Samothracia. They were alſo worſhipped in other parts of Greece, as Lemnos and Thebes, where the cabiria were celebrated in honour of them: theſe gods are ſaid to be, in number, four, *viz.* Axieros, Axiocerſa, Axiocerſus, and Caſmilus.

CABIRIA, feſtivals in honour of the cabiri, celebrated in Thebes and Lemnos, but eſpecially in Samothracia, an iſland conſecrated to the cabiri. All who were initiated into the myſteries of theſe gods, were thought to be ſecured thereby from ſtorms at ſea, and all other dangers. The ceremony of initiation was performed by placing the candidate, crowned with olive-branches, and girded about the loins with a purple ribband, on a kind of throne, about which the prieſts, and perſons before initiated, danced.

CABLAN, the name of a kingdom and city of India, beyond the Ganges.

CABLE, a thick, large, ſtrong rope, commonly of hemp, which ſerves to keep a ſhip at anchor.

There is no merchant-ſhip, however weak, but has at leaſt three cables; namely, the chief cable, or cable of the ſheet-anchor, a common cable, and a ſmaller one.

Cable is alſo ſaid of ropes, which ſerve to raiſe heavy loads, by the help of cranes, pullies, and other engines. The name of cable is uſually given to ſuch as have, at leaſt, three inches in diameter; thoſe that are leſs are only called ropes of different names, according to their uſe.

Every cable, of what thickneſs ſoever it be, is compoſed of three ſtrands; every ſtrand of three ropes; and every rope of three twiſts: the twiſt is made of more or leſs threads, according as the cable is to be thicker or thinner.

In the manufacture of cables, after the ropes are made, they uſe ſticks, which they paſs firſt between the ropes of which they make the ſtrands, and afterwards between the ſtrands of which they make the cable, to the end that they may all twiſt the better, and be more regularly wound together; and alſo, to prevent them from twining or intangling, they hang, at the end of each ſtrand and of each rope, a weight of lead or of ſtone.

The number of threads each cable is compoſed of is always proportioned to its length and thickneſs; and it is by this number of threads that its weight and value are aſcertained: thus a cable of three inches circumference, or one inch diameter, ought to conſiſt of 48 ordinary threads, and weigh 192 pounds; and on this foundation is calculated the following table, very uſeful for all people engaged in marine commerce, who fit out merchant-men for their own account, or freight them for the account of others.

A table of the number of threads and weight of cables of different circumferences.

Circumf.	Threads.	Weight.
3 inches.	48	192 pounds
4	77	308
5	121	484
6	174	696
7	238	952
8	311	1244
9	393	1572
10	485	1940
11	598	2392
12	699	2796
13	821	3284
14	952	3808
15	1093	4372
16	1244	4976
17	1404	5616
18	1574	6296
19	1754	7016
20	1943	7772

Sheet-anchor CABLE, is the greateſt cable belonging to a ſhip.

Serve or plate the CABLE, is to bind it about with ropes, clouts, *&c.* to keep it from galling in the hawſe.

To ſplice a CABLE, is to make two pieces faſt together, by working the ſeveral threads of the rope, the one into the other.

Pay more CABLE, is to let more out of the ſhip. *Pay cheap the cable*, is to hand it out apace. *Veer more cable*, is to let more out, *&c.*

CABLED, in heraldry, a term applied to a croſs, formed of the two ends of a ſhip's cable; ſometimes alſo to a croſs covered over with rounds of rope, more properly called a croſs-corded.

CABLED-*flute*, in architecture, ſuch flutes as are filled up with pieces, in the form of a cable.

CABO DE ISTRIA, the capital of the province of Iſtria, in the dominion of Venice, ſituated on the gulph of Venice, about twelve miles ſouth of Trieſte: E. long. 14° 20′, and N. lat. 45° 50′.

CABOCHED, in heraldry, is when the heads of beaſts are borne without any part of the neck, full-faced.

CABOLETTO, in commerce, a coin of the republic of Genoa, worth about 3 d. of our money.

CABUL, the capital of a province of the ſame name, on the north-weſt of India. Both the town and province of Cabul were ceded to the Perſians in 1739: E. long. 69°, and N. lat. 35° 30′.

CABURNS, on ſhip-board, are ſmall lines, made of ſpun yarn, to bind cables, ſeize tackles, or the like.

CACACA, a city of Africa, in the kingdom of Fez.

CACAGOGA, among ancient phyſicians, ointments, which, applied to the fundament, procure ſtools. Paulus Ægineta directs to boil alum, mixed with honey, for that purpoſe.

CACALIA, in botany, a genus of the ſyngeneſia polygamia æqualis claſs. The receptacle is naked; the pappus is hairy; and the calix is cylindrical, oblong, and has a kind of ſmall cup at the baſe. There are 12 ſpecies, none of which are natives of Britain.

CACALIANTHEMUM, in botany, a ſynonime of the cacalia. See CACALIA.

CACAO, in botany. See THEOBROMA.

CACERES, a town of Eſtremadura, in Spain, about ſeventeen miles ſouth-eaſt of Alcantara: W. long. 6° 45′, and N. lat. 39° 12′.

CACHAN, a city of Perſia, ſituated in a large plain, about 20 leagues from Iſpahan.

It is remarkable for its manufactures of gold and ſilver ſtuffs, and of fine earthen ware.

CACHAO, or KECHIO, the capital of the kingdom of Tonquin, ſituated on the weſtern ſhore of the river Domea: E. long. 105°, and N. lat. 22° 30′.

CACHECTIC, ſomething partaking of the nature of, or belonging to a cachexy. See CACHEXY.

CACHEMIRE, or KACHEMIRE, a province of Aſia, in the country of the Mogul. The inhabitants are thought to have been originally Jews, becauſe they ſpeak much of Moſes and Solomon, whom they believe to have travelled into their country.

CACHEMIRE is alſo the capital of that province, ſituated in 76° E. long. and 34° 30′ N. lat.

CACHEXY, in medicine, a vitious ſtate of the humours and whole habit. See MEDICINE.

CACHRYS, in botany, a genus of the pentandria digynia claſs. The fruit is oval and a little angled. There are but two ſpecies, *viz.* the libanotis, a native of Sicily; and the ſicula, a native of Sicily and Spain.

CACOETHES, in medicine, an epithet applied, by Hippocrates, to malignant and difficult diſtempers: when applied to ſigns or ſymptoms, it imports what is very bad and threatening; and if given to tumours, ulcers, *&c.* it denotes a great malignancy.

CACTUS, in botany, a genus of the icoſandria monogynia claſs. The calix conſiſts of one leaf, imbricated, and above the fruit. The berry has but one cell, containing many ſeeds. The ſpecies are twenty-three, one of which is the cochineal-plant. See COCHINEAL.

CAD, or CADE. See CADE.

CADARI, or KADARI, a ſect of Mahometans, which attributes the actions of men to men alone, and not to the divine decree determining his will; and denies all abſolute decrees, and predeſtination. Ben Aun calls the cadari, the magi or manichees of the muſſulmans.

CADE, a cag, caſk, or barrel. A cade of herrings is a veſſel containing the quantity of 500 red herrings, or of ſprats 1000.

Cade-lamb, a young lamb, weaned and brought up by hand in a houſe.

Cade-oil, an oil much uſed in France and Germany: it is prepared from the fruit of a ſpecies of cedar, called *oxycedrus*.

Cade-worm, in zoology, the maggot or worm of a fly, called phryganea. See Phryganea.

CADENCE, in reading, is a falling of the voice below the key-note at the cloſe of every period. In reading, whether proſe or verſe, a certain tone is aſſumed which is called the key-note; and in this tone the bulk of the words are ſounded; but this note is generally lowered towards the cloſe of every ſentence.

CADENCE, in muſic, according to the ancients, is a ſeries of a certain number of notes, in a certain interval, which ſtrike the ear agreeably, and eſpecially at the end of the ſong, ſtanza, *&c.* It conſiſts ordinarily of three notes.

Cadence, in the modern muſic, may be defined a certain concluſion of a ſong, or of the parts of a ſong, which divide it, as it were, into ſo many numbers or periods. It is when the parts terminate in a chord or note, the ear ſeeming naturally to expect it; and is much the ſame in a ſong, as the period that cloſes the ſenſe in a paragraph of a diſcourſe.

A cadence is either perfect, conſiſting of two notes ſung after each other, or by degrees conjoined in each of the two parts, and by theſe means ſatisfying the ear; or imperfect, when its laſt meaſure is not in the octave or uniſon, but a ſixth or third. It is called imperfect, becauſe the ear doth not acquieſce in the concluſion, but expects a continuation of the ſong. The cadence is ſaid to be broken, when the baſs, inſtead of falling a fifth, as the ear expects, riſes a ſecond, either major or minor. Every cadence is in two meaſures; ſometimes it is ſuſpended, in which caſe it is called a repoſe, and only conſiſts of one meaſure, as when the two parts ſtop at the fifth, without finiſhing the cadence. With regard to the baſs-viol, Mr Rouſſeau diſtinguiſhes two cadences, one with a reſt, when the finger, that ſhould ſhake the cadence, ſtops a little, before it ſhakes, on the note immediately above that which requires the cadence; and one without a reſt, when the ſtop is omitted.

Cadence, in the menage, an equal meaſure or proportion, obſerved by a horſe in all his motions; ſo that his times have an equal regard to one another, the one does not embrace or take in more ground than the other, and the horſe obſerves his ground regularly.

CADENE, one of the ſorts of carpets which the Europeans import from the Levant. They are the worſt ſort of all, and are ſold by the piece from one to two piaſters per carpet.

CADET, the younger ſon of a family, is a term naturalized in our language from the French. At Paris, among the citizens, the cadets have an equal patrimony with the reſt. At Caux, in Normandy, the cuſtom, as with us, is to leave all to the eldeſt, except a ſmall portion to the cadets. In Spain, it is uſual for one of the cadets in great families to take the mother's name.

Cadet is alſo a military term denoting a young gentleman who chuſes to carry arms in a marching regiment as a private man. His views are, to acquire ſome knowledge in the art of war, and to obtain a commiſſion in the army. Cadet differs from volunteer, as the former takes pay, whereas the latter ſerves without any pay.

CADI, or **Cadhi**, a judge of the civil affairs in the Turkiſh empire.

It is generally taken for the judge of a town; judges of provinces being diſtinguiſhed by the appellation of molla's.

In Biledulgerid in Africa, the cadi decides in ſpiritual affairs.

CADILESCHER, a capital officer of juſtice among the Turks, anſwering to a chief juſtice among us.

It is ſaid, that this authority was originally confined to the ſoldiery; but that, at preſent, it extends itſelf to the determination of all kinds of law-ſuits; yet nevertheleſs ſubject to appeals.

There are but three cadileſchers in all the grand ſignior's territories; the firſt is that of Europe; the ſecond, of Natolia; and the third reſides at Grand Cairo. This laſt is the moſt conſiderable: they have their ſeats in the divan next to the grand vizir.

CADIZ, a city and port-town of Andaluſia in Spain, ſituated on the north-weſt end of the iſland of Leon, or Lyon, oppoſite to Port St Mary on the continent, about ſixty miles ſouth-weſt of Seville, and forty north-weſt of Gibraltar: W. long. 6° 40, N. lat. 36° 30′.

The iſland it ſtands on is in length about eighteen miles; the ſouth-weſt end is about nine broad, but the other end, where the city ſtands, not above two. It has a communication with the continent by means of a bridge; and, with the oppoſite ſhore, forms a bay of twelve miles long and ſix broad. About the middle of this bay, there are two head-lands, or promontories, one on the continent, and the other on the iſland, which advance ſo near together, that the forts upon them, called the Puntal and Matagorda, command the paſſage; and within theſe forts is the harbour, which it is impoſſible for an enemy to enter till he has firſt taken the forts.

CADIZADELITES, a ſect of Mahometans very like the ancient ſtoics. They ſhun feaſts and diverſions, and affect an extraordinary gravity in all their actions; they are continually talking of God, and ſome of them make a jumble of Chriſtianity and Mahometaniſm; they drink wine, even in the faſt of the ramazan; they love and protect the Chriſtians; they believe that Mahomet is the Holy Ghoſt, practiſe circumciſion, and juſtify it by the example of Jeſus Chriſt.

CADMIA, a metallic ſubſtance ſeparated from the ore of zinc by fuſion. See Chemistry, *Of zinc*.

CADORIN, a province of Italy, in the territories of Venice, bounded by the biſhopric of Brixen on the north; by Friuli, on the eaſt; by the Belluneſe, on the ſouth; and by the Trentin, on the weſt.

CADRITES, a ſort of Mahometan friars, who once a-week ſpend [illegible] part of the night in turning round, holding each other's hand, and repeating inceſſantly the word *hai*, which ſignifies living, and is one of the attributes of God; during which one of them plays on a flute. They never cut their hair, nor cover their heads, and always go bare footed; they have liberty to quit their convent when they pleaſe, and to marry.

CADSAND, an iſland on the coaſt of Dutch Flanders, ſituated at the mouth of the Scheld, whereby the Dutch command the navigation of that river.

CADUCEUS, in antiquity, Mercury's rod, or ſceptre, being a wand entwiſted by two ſerpents, borne by that deity, as the enſign of his quality and office, given him, according to the fable, by Apollo, for his ſeven-ſtringed harp.

Wonderful properties are aſcribed to this rod by the poets, as laying men aſleep, raiſing the dead, *&c.* It is uſed alſo as a ſymbol of peace. The caduceus, as found on ſome medals, is a common ſymbol, ſignifying good conduct, peace, and proſperity.

CADUS, in antiquity, a wine-veſſel of a certain capacity, containing eighty amphoræ, or firkins, each of which, according to the beſt accounts, held nine gallons.

CÆCILIA, in zoology, a genus of ſerpents belonging to the amphibia claſs. The cæcilia has no ſcales; it is ſmooth, and moves by means of lateral rugæ or prickles. The upper lip is prominent, and furniſhed with two tentacula. It has no tail. There are but two ſpecies of this ſerpent, viz. 1. The tentaculata, has 135 rugæ. It is about a foot long and an inch in circumference, preſerving an uniform cylindrical ſhape from the one end to the other. The teeth are very ſmall. It has ſuch a reſemblance to an eel, that it may eaſily be miſtaken for one; but as it has neither fins nor gills, it cannot be claſſed with the fiſhes. It is a native of America, and its bite is not poiſonous. 2. The glutinoſa has 340 rugæ or prickles above and ten below the anus. It is of a browniſh colour, with a white line on the ſide, and is a native of the Indies.

CÆCUM, or Coecum, in anatomy, the blind-gut. See p. 260. col. 2.

CÆMENT, in a general ſenſe, any glutinous ſubſtance, capable of uniting and keeping things together in cloſe coheſion: in this ſenſe, under cæment, are comprehended mortar, ſolder, glue, *&c.* but, ſtrictly ſpeaking, the term cæment only denotes a glutinous compoſition, uſed in cæmenting broken glaſſes, china-ware, or earthen-ware.

One of the fineſt, and at the ſame time ſtrongeſt cæment for this purpoſe, is the juice of garlic ſtamped in a ſtone mortar: this, if the operation is done with care, leaves little or no mark. Another cæment is made by beating the white of an egg very clear, and mixing with it fine powdered quick-lime: or iſing-glaſs, powdered chalk, and a little lime may be mixed together, and diſſolved in fair water. With theſe, the glaſſes, *&c.* are to be cæmented, and then ſet in the ſhade to dry; a caution which ſhould always be obſerved, whichever of the above cæments is uſed.

A cæment for cracked chemical-glaſſes, that will ſtand the fire, may be thus prepared: take wheat-flour, fine powdered Venice glaſs, and pulverized chalk, of each an equal quantity; of fine brick-duſt, one half of the ſaid quantity; and a little ſcraped lint: mix them all together with the whites of eggs; then, ſpreading this mixture upon a linen cloth, apply it to the cracks of the glaſſes, which muſt be well dried before they are uſed. Old varniſh is another cæment that will anſwer the ſame purpoſe.

Cæment, among builders, a ſtrong ſort of mortar, uſed to bind bricks or ſtones together for ſome kind of mouldings; or in cæmenting a block of bricks for the carving of capitals, ſcrolls, or the like. There are two ſorts, 1. Hot cæment, which is the moſt common, made of reſin, bees-wax, brick-duſt, and chalk, boiled together. The bricks to be cæmented with this kind, muſt be made hot with the fire, and rubbed to and fro after the cæment is ſpread, in the ſame manner as joiners do when they glue two boards together. 2. Cold cæment, made of Cheſhire-cheeſe, milk, quick-lime, and whites of eggs. This cæment is leſs uſed than the former, and is accounted a ſecret known but to few bricklayers.

Cæment, among engravers, jewellers, *&c.* a compoſition of fine brick-duſt well ſifted, reſin, and bees-wax, in uſe among theſe artificers to keep the metals to be engraven or wrought on firm to the block; and alſo to fill up what is to be cheſſeled.

Cæment, in chemiſtry, a kind of menſtruum compounded of ſalts, ſulphurs, and brick, reduced to dry powders, and ſtrewed betwixt plates of metal, in order to raiſe their colour, or ſeparate one metal from another. See Chemistry.

Cæment-pots, or thoſe uſed in the cæmentation of metals, are made of fine potter's clay, and that either pure, or mixed with ſand in different proportions.

CÆMENTATION, in a general ſenſe, the corroding of metals in a dry form, by means of the fumes of acid ſalts. See Chemistry, Part II.

CAEN, the capital of a county of the ſame name in Normandy, ſituated on the river Orne, about ſeventy-five miles weſt of Rouen, and thirty ſouth-weſt of Havre de Grace: W. long. 25′, N. lat. 49° 20′.

It has an univerſity, firſt founded by king Henry VI. of England, in 1431.

CAERFILLY, a town of Glamorganſhire, about five miles north of Landaff: W. long. 3° 15′, and N. lat. 51° 35′.

CÆRITES, or Cæritum tabulæ, in Roman antiquity, tables or regiſters in which the names of the Cærites were regiſtered. The people of Cære were accounted citizens of Rome, but had no privilege of voting; hence when a Roman citizen was degraded, if a ſenator, he was expelled the ſenate; if a knight, he loſt the public horſe; and if a plebeian, his name was inſerted in the regiſter of the Cærites; that is, he was ſubject to all taxes, but incapable of voting or enjoying any public office.

CAERLEON, a market-town of Monmouthſhire, ſituated on the river Uſke, about ſixteen miles ſouth-weſt of Monmouth: W. long. 3°, N. lat. 51° 40′.

CAERMARTHEN, the capital of Caermarthenſhire in Wales, ſituated upon the river Tivy, about five miles from the ſea.

CAERNARVAN, the chief town of Caernarvanſhire in Wales, ſituated upon the river Menay.

CAERWIS, a market town in Flintſhire, in north Wales, about five miles eaſt of St Aſaph, and four weſt of Flint: W. long. 3° 25′, N. lat. 53° 20′.

CÆSALPINIA, in botany, a genus of the decandria monogynia claſs. The calix has five ſegments, the loweſt of which is largeſt; the corolla conſiſts of five petals; the capſule is of the pod kind. There are four ſpecies, all natives of the Indies.

CÆSALPINOIDES, in botany, a ſynonime of the gleditſia. See GLEDITSIA.

CÆSAR, in Roman antiquity, a title borne by all the emperors, from Julius Cæſar, to the deſtruction of the empire. It was alſo uſed as a title of diſtinction, for the intended or preſumptive heir of the empire, as King of the Romans is now uſed for that of the German empire.

This title took its riſe from the ſurname of the firſt emperor, C. Julius Cæſar, which, by a decree of the ſenate, all the ſucceeding emperors were to bear. Under his ſucceſſor, the appellation of Auguſtus being appropriated to the emperors, in compliment to that prince, the title Cæſar was given to the ſecond perſon in the empire, though ſtill it continued to be given to the firſt; and hence the difference betwixt Cæſar uſed ſimply, and Cæſar with the addition of Imperator Auguſtus.

The dignity of Cæſar remained the ſecond of the empire, till Alexius Comnenus having elected Nicephorus Meliſſenus Cæſar, by contract; and it being neceſſary to confer ſome higher dignity on his own brother Iſaacius, he created him Sebaſtocrator, with the precedency over Meliſſenus; ordering, that in all acclamations, *&c.* Iſaacius Sebaſtocrator ſhould be named the ſecond, and Meliſſenus Cæſar, the third.

CÆSARIAN operation, in midwifery. See MIDWIFERY.

CÆSARIANS, *cæſarienſes*, in Roman antiquity, were officers or miniſters of the Roman emperors: They kept the account of the revenues of the emperors, and took poſſeſſion, in their name, of ſuch things as devolved, or were confiſcated to them.

CÆSTUS, in antiquity, a large gantlet made of raw hide, which the wreſtlers made uſe of when they fought at the public games.

This was a kind of leathern ſtrap, ſtrengthened with lead, or plates of iron, which encompaſſed the hand, the wriſt, and a part of the arm, as well to defend theſe parts, as to enforce their blows.

CÆSTUS, or CÆSTUM, was alſo a kind of girdle, made of wool, which the huſband untied for his ſpouſe the firſt day of marriage, before they went to bed. This relates to Venus's girdle, which Juno borrowed of her, to entice Jupiter to love her. See CESTUS.

CÆSURA, in the ancient poetry, is when, in the ſcanning of a verſe, a word is divided ſo, as one part ſeems cut off, and goes to a different foot from the reſt; as,

Menti|ri no|li, nun|quam men|dacia| proſunt.

where the ſyllables *ri*, *li*, *quam*, and *men*, are cæſuras.

CÆSURE, in the modern poetry, denotes a reſt, or pauſe, towards the middle of an Alexandrian verſe, by which the voice and pronunciation are aided, and the verſe, as it were, divided into two hemiſtichs. See PAUSE.

CAFFA, in commerce, painted cotton-cloths manufactured in the E. Indies, and ſold at Bengal.

CAFFA, or KAFFA, a city and port-town of Crim Tartary, ſituated on the ſouth-eaſt part of that peninſula: E. long. 37°, N. lat 44° 55′.

It is the moſt conſiderable town in the country, and gives name to the ſtraits of Caffa, which run from the Euxine or Black ſea, to the Palus Meotis, or ſea of Azoph.

CAFFILA, a company of merchants or travellers, who join together in order to go with more ſecurity thro' the dominions of the Grand Mogul, and through other countries on the continent of the E. Indies.

The Caffila differs from a caravan, at leaſt in Perſia; for the caffila belongs properly to ſome ſovereign, or to ſome powerful company in Europe; whereas a caravan is a company of particular merchants, each trading upon his own account. The Engliſh and Dutch have each of them their caffila at Gambron.

CAFFILA on the coaſt of Guzerat or Cambaya, ſignifies a ſmall fleet of merchant-ſhips.

CAFFRARIA, the country of the Caffers, or Hottentots, in the moſt ſoutherly part of Africa, lying in the form of a creſcent about the inland country of Monomotapa, between 35° S. lat. and the tropic of Capricorn; and bounded on the eaſt, ſouth, and weſt, by the Indian and Atlantic oceans.

Moſt of the ſea-coaſts of this country are ſubject to the Dutch, who have built a fort near the moſt ſouthern promontory, called the Cape of Good-Hope.

CAG, or KEG, a barrel or veſſel, that contains from four to five gallons.

CAGE, an incloſure made of wire, wicker, or the like, interwoven lattice-wiſe, for the confinement of birds, or wild beaſts.

The cage, in the Roman amphitheatres, was a place wherein ſavage animals were confined. It was incloſed with iron rails, and open at top, ſo as to be ſeen to the bottom by the ſpectators.

CAGLI, a town of the province of Urbino, in the pope's territories, about twenty-five miles ſouth of the city of Urbino: E. long 14°, N. lat. 43° 15′.

CAGLIARI, the capital of the iſland of Sardinia, ſituated on a bay of the ſea in the ſouthern part of that iſland: E. long. 9° 12′, N. lat. 39°.

CAGUI, in zoology, a ſynonime of two ſpecies of monkey, *viz.* the jacchus and œdipus. See SIMIA.

CAHERAH, or AL-CAHERAH, the capital of Egypt, which we call Grand Cairo. See CAIRO.

CAHLO, the name by which ſome call the lupus piſcis or wolf-fiſh.

CAHORS, the capital of the territory of Querci, in the province of Guienne in France, ſituated about forty-five miles north of Tholouſe: E. long. 1°, N. lat. 44° 25′.

It is the ſee of a biſhop, and has an univerſity.

CAHYS, a dry meaſure for corn, uſed in ſome parts of Spain, particularly at Seville and at Cadiz. It is near a buſhel of our meaſure.

CAJANABURG, the capital of the province of Cajania, or eaſt Bothnia in Sweden, ſituated on the north-eaſt part of the lake Cajania, about three hundred miles north-eaſt of Abo: E. long. 27°, N. lat. 63° 50′.

CAJAZZO, a town of the province of Lavoro in the kingdom of Naples, ſituated about ſixteen miles north-eaſt of the city of Naples: E. long. 15°, N. lat. 41° 15′.

CAJEPUT, an oil brought from the E. Indies, which reſembles that of cardamoms.

CAIFUM, a city of China, ſituated in the province of Honan, on the river Crocceus, three hundred and fifty miles north-weſt of Nanking: E. long. 113° 30′, and N. lat. 35°.

CAIMACAN, or CAIMACAM, in the Turkiſh affairs, a dignity in the Ottoman empire, anſwering to lieutenant, or rather deputy, among us.

There are uſually two caimacans, one reſiding at Conſtantinople, as governor thereof; the other attending the grand vizir, in quality of his lieutenant, ſecretary of ſtate, and firſt miniſter of his council; and gives audience to ambaſſadors. Sometimes there is a third caimacan, who attends the ſultan; whom he acquaints with any public diſturbances, and receives his orders concerning them.

CAIMAN, or CAIMAN-ISLANDS, certain American iſlands lying ſouth of Cuba, and north-weſt of Jamaica, between 81° and 86° of W. long. and in 21° of N. lat.

They are moſt remarkable on account of the fiſhery of tortoiſe, which the people of Jamaica catch here, and carry home alive, keeping them in pens for food, and killing them as they want them.

CAINIANS, or CAINITES, in church-hiſtory, Chriſtian heretics, that ſprung up about the year 130, and took their name from Cain, whom they looked upon as their head and father: They ſaid, that he was formed by a celeſtial and almighty power, and that Abel was made but by a weak one.

This ſect adopted all that was impure in the hereſy of the gnoſtics, and other heretics of thoſe times: They acknowledged a power ſuperior to that of the Creator; the former they called *Wiſdom*, the latter, *Inferior Virtue*: They had a particular veneration for Korah, Abiram, Eſau, Lot, the Sodomites, and eſpecially Judas, becauſe his treachery occaſioned the death of Jeſus Chriſt: They even made uſe of a goſpel, which bore that falſe apoſtle's name.

CAINITO, in botany. See CHRYSOPHYLLUM.

CAIRO, or GRAND CAIRO, the capital of Egypt, ſituated in a plain at the foot of a mountain, about two miles eaſt of the Nile, and 100 miles ſouth of the mouth of that river: E. long. 32°, N. lat. 30°.

The town is ten miles in circumference, and full of inhabitants. The caſtle ſtands on the ſummit of a hill, at the ſouth end of the town, and is three miles round. The Britiſh and other European ſtates have their conſuls and factors here, for the protection of trade.

CAIROAN, a town of the kingdom of Tunis in Africa, ſituated on the river Magrida, about eighty miles ſouth of Tunis: E. long. 9°, N. lat. 36°.

CAINS, a name given to the Greeks in the iſle of Crete, who revolt from the Turks to the Venetians.

CAISSON, in the military art, a wooden cheſt, into which ſeveral bombs are put, and ſometimes only filled with gun-powder: This is buried under ſome work whereof the enemy intends to poſſeſs themſelves, and, when they are maſters of it, is fired, in order to blow them up.

CAISSON is alſo uſed for a wooden frame or cheſt, uſed in laying the foundations of the piers of a bridge.

CAITHNESS. See CATHNESS.

CAKILE, in botany. See BUNIAS.

CALABA, in botany. See CALOPHYLLUM.

CALABASH-*tree*, in botany. See CRESCENTIA.

CALABRIA, the moſt ſoutherly part of the kingdom of Naples, ſituated over againſt Sicily.

There are two provinces of Calabria called the Hither and Farther Calabria, with reſpect to the city of Naples; Coſenza being the capital of the former, and Rheggio of the latter.

CALADE, in the menage, the deſcent or ſloping declivity of a riſing menage ground, being a ſmall eminence upon which we ride down a horſe ſeveral times, putting him to a ſhort gallop, with his fore-hams in the air, to make him learn to ply or bend his haunches, and form his ſtop upon the aids of the calves of the legs, the ſtay of the bridle, and the caveſon ſeaſonably given.

CALAHORRA, a city of Old Caſtile in Spain, ſituated on the river Ebro, near the confines of Navarre, about ſixty miles north-weſt of Saragoſſa: W. long. 2°, N. lat. 42° 20′.

CALAIS, a port-town of Picardy in France, ſituated on the Engliſh channel, about twenty-two miles ſouth-eaſt of Dover: E. long. 2°, N. lat. 51°.

CALAMANCO, a ſort of woolen ſtuff manufactured in England and in Brabant. It has a fine gloſs, and is chequered in the warp, whence the checks appear only on the right ſide. Some calamancos are quite plain, others have broad ſtripes adorned with flowers; ſome with plain broad ſtripes, ſome with narrow ſtripes, and others watered.

CALAMINARIS, or LAPIS CALAMINARIS, in natural hiſtory, a kind of foſſil, the general ore of zinc, of a ſpungy ſubſtance and a lax and cavernous texture, yet conſiderably heavy.

It is of no determinate ſhape or ſize, but is found in maſſes of a very various and irregular figure. It is, when moſt pure and perfect, of a pale browniſh grey. It is found in Germany, Saxony, Bohemia, and England. See CHEMISTRY, *Of zinc.*

After roaſting the calamine, in order to purge it of ſulphureous or arſenical matter, it is uſed by phyſicians in collyria againſt defluxions of thin acrid humours upon the eyes, for drying up moiſt running ulcers, and healing excoriations.

CALAMINT, in botany. See MELISSA, and MENTHA.

CALAMITA, in natural hiſtory, a name given to ſtyrax. See STYRAX.

CALAMITA is ſometimes alſo uſed for the magnet or load-ſtone.

CALAMITES. See OSTEOCOLLA.

CALAMUS, in botany, a genus of the hexandria monogynia claſs. The calix has ſix leaves; it has no corolla; the berry is imbricated, and contains but one ſeed. There is but one ſpecies, *viz.* the rotang, a native of India.

CALAMUS *aromaticus*, or ſweet-ſcented flag, in the materia medica, a ſpecies of flag called acorus by Linnæus. See ACORUS. The root is generally looked upon as a carminative and ſtomachic medicine, and as ſuch is ſometimes uſed in practice.

CALAMUS *ſcriptorius*, in antiquity, a reed or ruſh to write with.

The ancients made uſe of ſtyles to write on tables covered with wax; and of reed, or ruſh, to write on parchment, or Egyptian paper.

CALANGAY, in ornithology. See PSITTACUS.

CALASH, or CALESH, a light and very low kind of chariot, uſed chiefly for taking the air in parks and gardens.

CALASIRIS, in antiquity, a linen tunic fringed at the bottom, and worn by the Egyptians under a white woolen garment; but this laſt they were obliged to pull off when they entered the temples, being only allowed to appear then in linen habits.

CALATAJUD, a city of Aragon, in Spain, ſituated on the river Xalo, about fifty miles weſt of Saragoſſa: W. long. 2° 5′, N. lat. 41° 15′.

CALATHUS, in antiquity, a baſket, hamper, or pannier of oſiers, reeds, or twigs, for women to put their work in, or to gather flowers in.

CALATHUS was alſo a veſſel, or pan, for cheeſe-curds and milk; alſo the name of a cup for wine, uſed in ſacrifices.

CALATOR, in antiquity, was a public ſervant, and a freeman, ſuch as a bailiff or crier, a ſumner, to ſummon courts, ſynods, and other public aſſemblies.

CALATRAVA, a city of new Caſtile, in Spain, ſituated on the river Guadiana, forty-five miles ſouth of Toledo: W. long. 4° 20′, N. lat. 39°.

Knights of CALATRAVA, a military order in Spain, inſtituted under Sancho III. king of Caſtile, upon the following occaſion. When that prince took the ſtrong fort of Calatrava from the moors of Andaluſia, he gave it to the templars, who, wanting courage to defend it, returned it him again. Then Don Reymond, of the order of the Ciſtercians, accompanied with ſeveral perſons of quality, made an offer to defend the place, which the king thereupon delivered up to them, and inſtituted that order. It increaſed ſo much under the reign of Alphonſus, that the knights deſired they might have a grand maſter, which was granted. Ferdinand and Iſabella afterwards, with the conſent of pope Innocent VIII. reunited the grand maſterſhip of Calatrava to the Spaniſh crown; ſo that the kings of Spain are now become perpetual adminiſtrators thereof.

The knights of Calatrava bear a croſs gules, fluerdeliſed with green, *&c.* their rule and habit was originally that of the Ciſtercians.

CALCADA, or St DOMINGO DE CALCADA, a city of Old Caſtile, in Spain, forty-eight miles eaſt of Burgos: W. long. 3°, N. lat. 42° 36′.

CALCANEUM, or OS CALCIS, in anatomy. See p. 186. col. 1.

CALCAR, in zoology, the trivial name of a ſpecies of nautilus. See NAUTILUS.

CALCAR, in glaſs-making, a ſort of oven, or reverberatory furnace, in which, being well heated, the cryſtal frit, or bollito, is made.

CALCAR, in geography, a town of the duchy of Cleves, and circle of Weſtphalia, in Germany: E. long. 5° 50′, and N. lat. 51° 45′.

CALCARIOUS, in general, denotes ſomething belonging to, or partaking of the nature of calx. See CALX.

CALCARIUS *lapis*, in natural hiſtory, the ſame with lime-ſtone. See LIME.

CALCEARIUM, in antiquity, a term uſed to denote the allowance made the ſoldiers to buy their ſhoes.

CALÇEOLUS, in botany. See CYPRIPEDIUM.

CALCINATION, in chemiſtry, the reducing of ſubſtances to a calx by fire. See CHEMISTRY.

CALCITRAPA, and CALCITRAPOIDES, in botany. See CENTAUREA.

CALCULUS, in natural hiſtory, properly denotes a little ſtone or pebble. See PEBBLE.

CALCULUS, or CALCULUS HUMANUS, in medicine, the ſtone in the bladder or kidneys. See MEDICINE, and SURGERY.

CALCULUS alſo denotes a method of computation, ſo called from the calculi, or counters, anciently uſed for this purpoſe. Hence,

CALCULUS SPECIALIS, OR LITERALIS, is the ſame with algebra. See ALGEBRA.

CALCULUS *differentialis* is a method of differencing quantities, that is, of finding an infinitely ſmall quantity, which being taken an infinite number of times, ſhall be equal to a given quantity. See FLUXIONS.

CALCULUS *exponentialis*, among mathematicians, a method of differencing exponential quantities, and ſumming up the differentials of exponential quantities. See FLUXIONS.

CALCULUS INTEGRALIS, OR SUMMATORIUS, is a method of ſumming up differential quanties; that is, from a differential quantity given, to find the quantity from whoſe differencing the given differential reſults. See FLUXIONS.

CALDARIUM, in the ancient baths, a certain vault, or room, made ſo as to collect the vapours, and produce ſweating: whence it ſignifies a hot-houſe, bagnio, ſtove, or ſweating-room.

CALEFACTION, the production of heat in a body from the action of fire, or that impulſe impreſſed by a hot body upon other bodies about it. This word is uſed in pharmacy, by way of diſtinction from coction, which implies boiling; whereas calefaction is only heating a thing.

CALENBURG-CASTLE, the capital of a duchy of the ſame name, in Lower Saxony, in Germany, ſituated upon the river Leine, about fifteen miles ſouth of Hanover: E. long. 9° 40′, and N. lat. 52° 20′.

CALENDAR, a diſtribution of time, accommodated to the various uſes of life, but more eſpecially ſuch as regard civil and eccleſiaſtical polity. See ASTRONOMY, *Of the diviſion of time.*

Julian Chriſtian CALENDAR. See ASTRONOMY, *Of the diviſion of time.*

Gregorian CALENDAR. See ASTRONOMY, *Of the diviſion of time.*

CALENDER, a machine uſed in manufactories, to preſs certain woollen and ſilken ſtuffs, and linens, to make them ſmooth, even, and gloſſy, or to give them waves, or water them, as may be ſeen in mohairs and tabbies. This inſtrument is compoſed of two thick cylinders, or rollers, of very hard and poliſhed wood, round which the ſtuffs to be calendered are wound: theſe rollers are placed croſs-ways between two very thick boards, the lower ſerving as a fixed baſe, and the upper moveable, by means of a thick ſcrew, with a rope faſtened to a ſpindle, which makes its axis: the uppermoſt board is loaded with large ſtones weighing 20000 ℔. or more. It is this weight that gives the poliſh and makes the waves on the ſtuffs about the rollers, by means of a ſhallow indenture or engraving cut in it.

CALENDS, in Roman antiquity, the firſt day of each month, ſo called from the Greek [*kalein*], to proclaim: it being cuſtomary, on thoſe days, to proclaim the number of holy-days in each month.

The Roman method of reckoning the days of their months has ſomething extremely ſingular in it: inſtead of computing forwards, in the natural order of the numbers 1, 2, 3, *&c.* they reckoned backwards, in the manner expreſſed in the following verſes:

> *Prima dies menſis cujuſque eſt dicta* calendæ:
> *Sex Maius*, nonas, *Julius*, *October*, *&* *Mars*;
> *Quatuor at reliqui: habet* idus *quilibet octo*;
> *Inde dies reliquos omnes dic eſſe* calendas;
> *Quas retro numerans, dices a menſe ſequente.*

Hence to find the day of our month anſwering to that of the calends, to the number of days in the preceding month add two, and from this ſum ſubtracting the number of calends given, the remainder will be the day of our month: thus the fourth of the calends of June is found to anſwer to the twenty-ninth of May; and ſo in other caſes.

CALENDULA, or MARYGOLD, in botany, a genus of the ſyngeneſia polygamia neceſſaria claſs. The receptacle is naked; it has no pappus; the calix conſiſts of many equal leaves; the ſeeds of the diſk are membranaceous. There are eight ſpecies, none of them natives of Europe. The flowers of the calendula officinalis, or garden marygold, are ſaid to be aperient and attenuating, as alſo cordiac, alexipharmic, and ſudorific. They are principally celebrated in uterine obſtructions, and for throwing out the ſmall pox.

CALF, in zoology, the young of the ox-kind. See BOS.

Among ſportſmen, the term calf is uſed for a hart or hind of the firſt year: the ſame term is alſo uſed for the young of the whale.

Sea CALF. See PHOCA.

CALF'S-*ſnout*, in botany. See ANTIRRHINUM.

CALIACA, a town of Bulgaria, ſituated upon the Black-ſea, belonging to the Turks.

CALIBER, or CALIPER, properly denotes the diameter of any body: thus we ſay, two columns of the ſame caliber, the caliber of the bore of a gun, the caliber of a bullet, *&c.*

CALIBER-*compaſſes*, the name of an inſtrument, made either of wood, iron, ſteel, or braſs: that uſed for meaſuring bullets conſiſts of two branches, bending inwards, with a tongue fixed to one of them, and the other graduated in ſuch a manner, that if the bullet be compreſſed by the ends of the two branches, and the tongue be applied to the graduated branch, it will ſhew the weight of the bullet.

CALIBER alſo ſignifies an inſtrument uſed by carpenters, joiners, and bricklayers, to ſee whether their work be well ſquared.

CALICUT, a town ſituated on the Malabar coaſt, in the hither peninſula of India, ſubject to its own prince: E. long. 75°, and N. lat. 11° 20′.

This was the firſt port the Portugueſe made in India, after ſailing round the Cape of Good Hope.

CALIDUCT, in antiquity, a kind of pipes, or canals, diſpoſed along the walls of houſes and apartments, uſed, by the ancients, for conveying heat to ſeveral remote parts of the houſe, from one common furnace.

CALIFORNIA. See CALLIFORNIA.

CALIMUS. See CALLIMUS.

CALIN, a compound metal, whereof the Chineſe make tea-caniſters, and the like. The ingredients ſeem to be lead and tin.

CALIPH, the ſupreme eccleſiaſtical dignity among the Saracens; or, as it is otherwiſe defined, a ſovereign dignity among the Mahometans, veſted with abſolute authority in all matters relating both to religion and policy.

It ſignifies in the Arabic, ſucceſſor or vicar: the Saracen princes aſſumed this title as deſcendants from Mahomet; the caliphs bearing the ſame relation to Mahomet, that the popes pretend they do to Jeſus Chriſt or St Peter. It is at this day one of the grand ſignior's titles, as ſucceſſor of Mahomet; and of the ſophi of Perſia, as ſucceſſor of Ali.

CALIPPIC PERIOD, an improvement of the cycle of Meton, of nineteen years, which Calippus, a famous Grecian aſtronomer, finding in reality to contain nineteen

teen of Nabonaſſar's years, four days, and $\frac{331}{459}$, he, to avoid fractions, quadrupled the golden number, and by that means made a new cycle of ſeventy-ſix years; which time being expired, he ſuppoſed the lunation, or changes of the moon, would happen on the ſame day of the month, and hour of the day, that they were on ſeventy-ſix years before.

CALIX. See Calyx.

CALIXTINS, in church-hiſtory, a ſect of Chriſtians, in Bohemia and Moravia: the principal point in which they differed from the church, was the uſe of the chalice, or communicating in both kinds.

Calixtins, is alſo a name given to thoſe, among the Lutherans, who follow the ſentiments of George Calixtus, a celebrated divine, who oppoſed the opinion of St Auguſtine, on predeſtination, grace, and free-will.

CALKA, a kingdom of Tartary, in Aſia, to the eaſt of Siberia.

CALKING. See Caulking.

CALKINS, the prominent parts at the extremities of a horſe-ſhoe, bent downwards, and forged to a ſort of point.

Calkins are apt to make horſes trip; they alſo occaſion blymes, and ruin the back ſinews. If faſhioned in form of a hare's ear, and the horn of a horſe's heel be pared a little low, they do little damage; whereas the great ſquare calkins quite ſpoil the foot.

Calkins are either ſingle or double, that is, at one end of the ſhoe, or at both: theſe laſt are deemed leſs hurtful, as the horſe can tread more even.

CALL, among hunters, a leſſon blown upon the horn, to comfort the hounds.

CALLS, *natural and artificial*, among fowlers, a ſport much practiſed during the wooing ſeaſon of partridges, eſpecially for taking cock-partridges; for which they put a hen into a cadge, to call and bring them near. The hen-partridge ſhould be ſet near a hedge, in a thin, open, wire-cage, ſo that ſhe may be ſeen at a good diſtance: then the net, called hallier, ſhould be placed quite round the cage, each part about the diſtance of twenty feet: the fowler ſhould retire behind the hedge.

Artificial Calls are beſt made of box, walnut-tree, or the like: they are formed of the bigneſs of an hen's egg, bored through from end to end; about the middle there muſt be a hole hollowed within, to the bottom; then have a pipe of a ſwan's quill, and the bone of a cat's foot, opened at one end, which muſt be conveyed into the hole at the end, and ſo thruſt into the hole at the middle; take afterwards a gooſe-quill, opened at both ends, and put it in at the other end of the call; blow into the quill, and it will make the like noiſe as the partridge-cock does.

CALLA, in botany, a genus of the gynandria polyandria claſs. The ſpatha is plain; the ſpadix is covered with floſcules; it has no corolla; the berry contains many ſeeds. There are three ſpecies, none of them natives of Britain.

CALLABAS, a town of Indoſtan in Aſia, upon the road from Surat to Agra.

CALLAO, a port-town in a little iſland on the coaſt of Peru, in South America, oppoſite to Lima: W. long. 76°, and S. lat. 12°.

CALLEN, a town of Ireland, in the county of Kilkenny, and province of Leinſter, about ten miles ſouth-weſt of Kilkenny: W. long. 7° 22′, and N. lat. 52° 25′.

CALLICHTYS, in ichthyology, the trivial name of a ſpecies of ſilurus. See Silurus.

CALLICO, in commerce, a kind of linen manufacture, made of cotton, chiefly in the Eaſt Indies, ſome of which are painted with various flowers of different colours; and others that are never dyed, having a ſtripe of gold and ſilver quite through the piece; and at each end they fix a tiſſue of gold, ſilver, and ſilk, intermixed with flowers. This manufacture is brought hither by the Eaſt-India company, and is re-exported by merchants to other parts of Europe. The general wear of ſtained or printed India calicoes in this nation having become a general grievance, and occaſioning unſpeakable diſtreſs upon our own manufacturers, they were prohibited by ſtat. 7 Geo. I. cap. vii.

CALLIDRYS, in ornithology, the trivial name of a ſpecies of motacilla. See Motacilla.

CALLIFORNIA, a large country of the Weſt Indies, lying between 116° and 138° W. long. and between 23° and 46° N. lat. It is uncertain whether it be a peninſula or an iſland.

CALLIGONUM, in botany, a genus of the polyandria digynia claſs. The calix has five leaves; the petals are four; it has two ſtyli; and the capſule is divided into two partitions, each containing two ſeeds. There is but one ſpecies, *viz.* the polygonoides, a native of mount Ararat.

CALLIGRAPHUS, in antiquity, a copiſt or ſcriviner, who tranſcribed, in a fair hand, what the notaries had taken down in notes, or minutes, being generally in a kind of cypher or ſhort-hand, which, as they were in that hand, being underſtood by few, were copied over fair and at length by perſons who had a good hand, for ſale, *&c.*

CALLING *the houſe*, in the Britiſh parliament, is the calling over the members names, every one anſwering to his own, and going out of the houſe, in the order in which he is called: this they do, in order to diſcover whether there be any perſons there not returned by the clerk of the crown; or if any member be abſent without leave of the houſe.

CALLIONYMUS, in ichthyology, a genus of fiſhes belonging to the order of jugulares. The upper lip is doubled up; the eyes are very near each other; the membrane of the gills has ſix radii; the operculum is ſhut; the body is naked; and the belly-fins are at a great diſtance from each other. There are three ſpecies of callionymus, *viz.* 1. The lyra, with the firſt bone of the back-fin as long as the body of the animal, and a cirrhus at the anus. It is of the Atlantic. 2. The dracunculus, with the firſt bone of the back-fin ſhorter than its body; which is of a ſpotted yellow colour. It frequents the ſhores of Genoa and Rome. 3. The indicus, has a ſmooth head with longitudinal wrinkles; the lower jaw is a little longer than the upper

per one; the tongue is obtuſe and emarginated; the apertures of the gills are large: it is of a livid colour, and the anus is in the middle of the body. It is a native of Aſia.

CALLISTEA, in Grecian antiquity, a Leſbian feſtival, wherein the women preſented themſelves in Juno's temple, and the prize was aſſigned to the faireſt. There was another of theſe contentions at the feſtival of Ceres Eleuſinia, among the Parrhaſians, and another among the Eleans, where the moſt beautiful man was preſented with a complete ſuit of armour, which he conſecrated to Minerva, to whoſe temple he walked in proceſſion, being accompanied with his friends, who adorned him with ribbands, and crowned him with a garland of myrtle.

CALLOSUM *corpus*, in anatomy. See p. 285. c. 2.

CALLUS, or Calloſity, in a general ſenſe, any cutaneous, corneous, or oſſeous hardneſs, whether natural or preternatural: but moſt frequently it means the callus generated about the edges of a fracture, provided by nature to preſerve the fractured bones, or divided parts, in the ſituation in which they are replaced by the ſurgeon.

CALM, in the ſea language, is when there is no wind ſtirring.

That tract of ſea, to the northward of the equator, between 4° and 10° of latitude, lying between the meridians of Cape Verde, and of the eaſtermoſt iſland of that name, ſeems to be a place condemned to perpetual calms: the little winds that are being only ſome ſudden uncertain guſts of very ſmall continuance, and leſs extent. The Atlantic ocean, near the equator, is very much ſubject, nay, always attended with theſe calms.

CALMAR, the capital of the province of Gothland, in Sweden, ſituated on the coaſt of the Baltic ſea, about forty miles north of Carelſcroon: E. long. 16°, and N. lat. 56° 40′.

CALMUCKS, certain wandering tribes or hords of Tartars, inhabiting the country north of the Caſpian ſea, under the protection of Ruſſia.

CALNE, a borough-town of Wiltſhire, about twenty miles north of Saliſbury, which ſends two members to parliament: W. long. 2°, and N. lat. 51° 30′.

CALOGERI, in church-hiſtory, monks of the Greek church, divided into three degrees, the novices, called archari; the ordinary profeſſed, called michrochemi; and the more perfect, called megalochemi: they are likewiſe divided into cœnobites, anchorets, and recluſes. The cœnobites are employed in reciting their office from midnight to ſun-ſet; they are obliged to make three genuflexions at the door of the choir, and returning, to bow to the right and to the left, to their brethren. The anchorets retire from the converſation of the world, and live in hermitages, in the neighbourhood of the monaſteries; they cultivate a little ſpot of ground, and never go out but on Sundays and holy-days, to perform their devotions at the next monaſtery. As for the recluſe, they ſhut themſelves up in grottos and caverns, on the tops of mountains, which they never go out of, abandoning themſelves entirely to Providence: They live on the alms ſent them by the neighbouring monaſteries.

CALOMEL, or dulcified ſublimate of mercury, is prepared in the following manner. Take of corroſive ſublimate, one pound; purified quick ſilver, nine ounces. Having powdered the ſublimate, add to it the quick-ſilver, and digeſt them together in a matraſs, with a gentle ſand heat, until they unite; then increaſing the heat, let the mixture be ſublimed. The ſublimed matter, freed from the acrimonious part at top and ſuch mercurial globules as happen to appear diſtinct in it, is to be reduced into powder, and ſublimed again; and this ſublimation muſt be repeated ſix times. This dulcified mercury, or calomel, is one of the beſt preparations for general uſe. The doſe, for raiſing a ſalivation, is ten or fifteen grains, taken in the form of a bolus, or pills, every night or oftener, till the ptyaliſm begins. As an alterant and diaphoretic, it is given in doſes of five or ſix grains, a purgative being occaſionally interpoſed, to prevent its affecting the mouth. It anſwers however much better when given in ſmaller quantities, as one, two, or three grains every morning and evening, in conjunction with ſuch ſubſtances as determine its action to the ſkin, as the extract or reſin of guaicum; the patient at the ſame time keeping warm, and drinking freely of warm diluting liquors. By this method of managing it, obſtinate, cutaneous, and veneral diſtempers have been ſucceſsfully cured, without any remarkable increaſe of the ſenſible evacuations.

CALOPHYLLUM, in botany, a genus of the polyandria monogynia claſs. The corolla conſiſts of five petals; the calix has five teeth; and the drupa is globular. There are but two ſpecies, viz. the inophyllum, and calaba, both natives of India.

CALOTTE, a cap or coif of hair, ſatin, or other ſtuff: an eccleſiaſtical ornament in moſt popiſh countries. See Cap.

Calotte, in architecture, a round cavity or depreſſure, in form of a cap or cup, lathed and plaſtered, uſed to diminiſh the riſe or elevation of a moderate chapel, cabinet, alcove, *&c.* which, without ſuch an expedient, would be too high for other pieces of the apartment.

CALPE, the mountain, at the foot of which, towards the ſea, Gibraltar ſtands. It is half a league in height towards the land, and ſo ſteep, that there is no approaching it on that ſide.

CALQUING, or Calking, a term uſed in painting, *&c.* where the backſide of any deſign is covered with a black or red colour, and the ſtrokes, or lines, traced through, on a waxed plate, wall, or other matter, by paſſing lightly over each ſtroke of the deſign with a point, which leaves an impreſſion of the colour on the plate or wall.

CALTHA, in botany, a genus of the polyandria polygynia claſs. It has no calix; there are five petals; and the capſules are many, containing a great number of ſeeds. There is but one ſpecies, viz. the paluſtris, or marſh-marygold, a native of Britain.

Caltrop, in botany, the Engliſh name of the tribulus. See Tribulus.

CALVARIA, in anatomy, the hairy ſcalp. See p. 151.

Calvary, in heraldry, a croſs ſo called, becauſe it reſembles the croſs on which our Saviour ſuffered. It is always ſet upon ſteps.

CALVI, a town of the province of Lavoro, in the kingdom of Naples, ſituated near the ſea, about fifteen miles north of the city of Naples: E. long. 14° 45′, and N. lat. 41° 15′.

Calvi is alſo the name of a ſea-port in the iſland of Corſica, ſituated on a bay, on the weſt ſide of the iſland, about forty miles ſouth-weſt of Baſtia: E. long. 9° 5′, and N. lat. 42° 16.

CALVINISTS, in church-hiſtory, thoſe who follow the opinions of John Calvin, one of the principal reformers of the church, in the XVIth century, a perſon of great parts and induſtry, and of conſiderable learning; whoſe doctrine ſtill ſubſiſts in its greateſt purity at Geneva, where it was firſt broached, and from whence it was propagated. This is the prevailing religion of the United Provinces. In England, it is confined among the diſſenters; and, in Scotland, it is the only orthodox faith.

The Calviniſts are great advocates for the abſoluteneſs of God's decrees, and hold that election and reprobation depend on the mere will of God, without any regard to the merit or demerit of mankind; that he affords to the elect an irreſiſtible grace, a faith that they cannot loſe, which takes away the freedom of will, and neceſſitates all their actions to virtue.

The Calviniſts believe that God foreknew a determinate number, whom he pitched upon to be perſons, in whom he would manifeſt his glory; and that having thus foreknown them, he predeſtinated them to be holy, in order to which he gives them an irreſiſtible grace, which makes it impoſſible for them to be otherwiſe.

CALVITIES, or Calvitium, in medicine, baldneſs, or a want of hair, particularly on the ſinciput, occaſioned by the moiſture of the head, which ſhould feed it, being dried up, by ſome diſeaſe, old age, or the immoderate uſe of powder, *&c.* See Alopecia.

CALUMET, a ſymbol of peace among the Indians, in the north of America; It is made of a red ſtone, like our marble; the head reſembles our tobacco-pipes, but larger; and is fixed on a hollow reed, to hold it for ſmoking: They adorn it with fine wings of ſeveral colours, and is the calumet of the ſun, to whom they preſent it, eſpecially if they want fair weather, or rain. This pipe is a paſs and ſafe conduct amongſt all the allies of the nation who has it given: in all embaſſies the embaſſador carries it as an emblem of peace, and it always meets with a profound regard; for the ſavages are generally perſuaded, that a great misforfortune would befal them, if they violated the public faith of the calumet.

CALX, properly ſignifies lime, but is alſo uſed by chemiſts and phyſicians for a fine powder remaining after the calcination or corroſion of metals and other mineral ſubſtances. See Chemistry.

Calx *antimonii*. See Chemistry, *Of antimony*.

Calx *nativa*, in natural hiſtory, a kind of marly earth, of a dead whitiſh colour, which, if thrown into water, makes a conſiderable bubbling and hiſſing noiſe, and has, without previous burning, the quality of making a cæment like lime, or plaſter of Paris.

Calx *viva*, or quick-lime, that whereon no water has been caſt, in contradiſtinction to lime which has been ſlaked by pouring water on it. See Chemistry, *Of lime*.

Calx, in anatomy. See Calcaneum.

CALYCISTÆ, an appellation given by Linnæus to thoſe botaniſts who have claſſed plants according to the different ſtructure of the calyx, or cup of the flower; ſuch was Magnolius.

CALYPTRA, among botaniſts, a thin membranaceous involucrum, uſually of a conic figure, which covers the parts of fructification. The capſules of moſt of the moſſes have calyptræ. See Botany.

CALYX, among botaniſts, a general term expreſſing the cup of a flower, or that part of a plant which ſurrounds and ſupports the other parts of the flower.

The cups of flowers are very various in their ſtructure, and on that account diſtinguiſhed by ſeveral names, as perianthium, involucrum, ſpatha, gluma, *&c.* See Botany.

CAM, a river, anciently called Grant, which, ariſing in Hertfordſhire, runs north-eaſt by Cambridge, and afterwards continues its courſe northwards, to the iſle of Ely, where it falls into the river Ouſe.

CAMÆA, in natural hiſtory, a genus of the ſemipellucid gems, approaching to the onyx ſtructure, being compoſed of zones, and formed on a cryſtalline baſis; but having their zones very broad and thick, and laid alternately on one another, with no common matter between; uſually leſs tranſparent, and more debaſed with earth, than the onyxes.

1. One ſpecies of the camæa is the dull-looking onyx, with broad black and white zones; and is the camæa of the moderns, and the Arabian onyx: This ſpecies is found in Egypt, Arabia, Perſia, and the Eaſt Indies. 2. Another ſpecies of the camæa is the dull, broad-zoned, green and white camæa, or the jaſpi-cameo of the Italians: It is found in the Eaſt Indies, and in ſome parts of America. 3. The third is the hard camæa, with broad white and cheſnut-coloured veins. 4. The hard camæa, with bluiſh, white, and fleſh-coloured broad veins, being the ſardonyx of Pliny's time, only brought from the Eaſt Indies.

CAMAIEU, a term in painting, when there is only one colour, the lights and ſhades being of gold, or on a golden and azure ground. It is chiefly uſed to repreſent baſſo-relievos.

CAMALDULIANS, a religious order founded by St Romauld, in a little plain, on the mount Apennine, called Camaldalia, ſituated in the ſtate of Florence.

The manner of life firſt enjoined this order was, that they dwelt in ſeparate cells, and met together only at the time of prayer: Some of them, during the two lents of the year, obſerved an inviolable ſilence; and others, for the ſpace of an hundred days. On Sundays and Thurſdays they fed on herbs, and the reſt of

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Plate LIX.

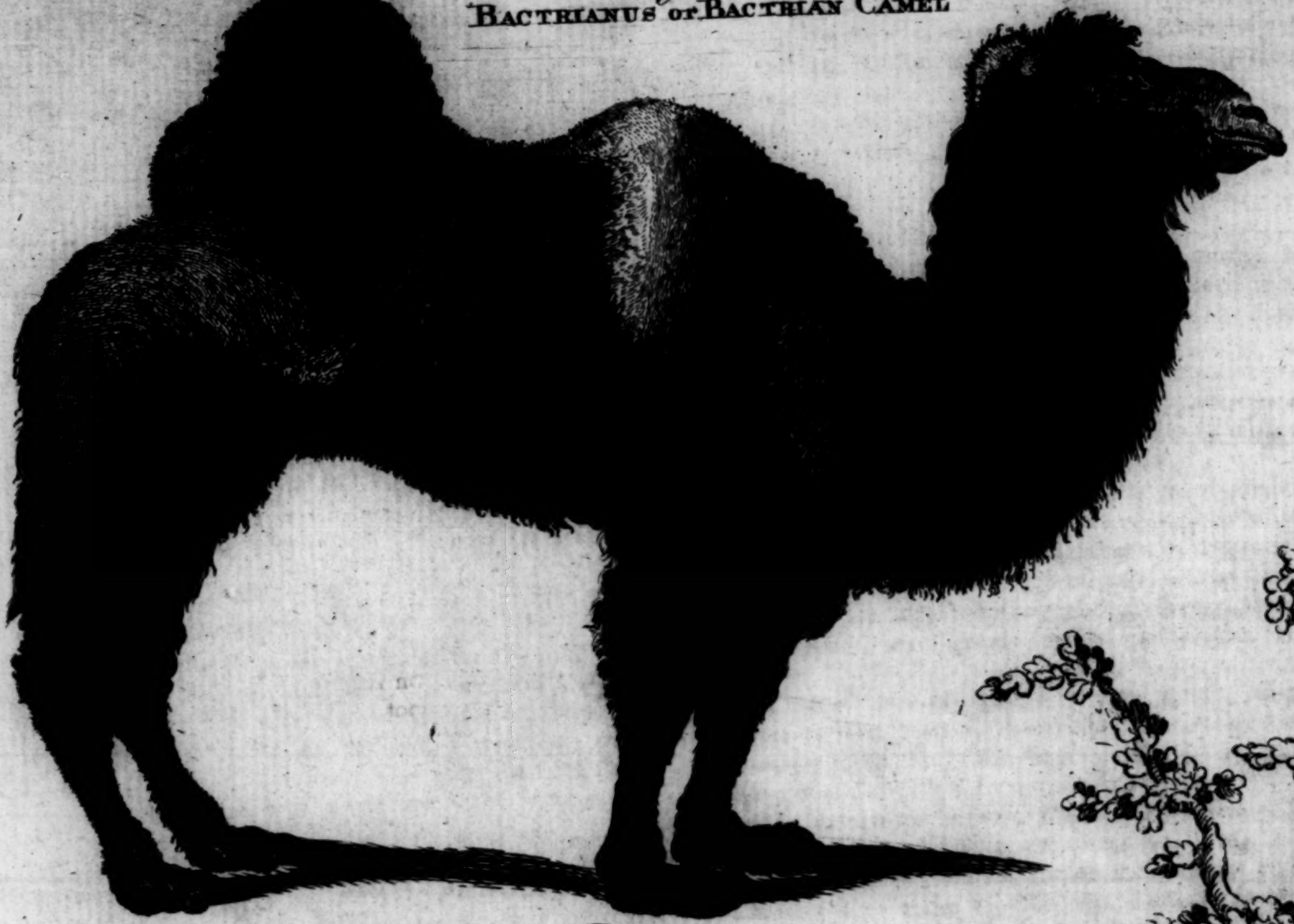


Fig. 3.

BACTRIANUS or BACTRIAN CAMEL

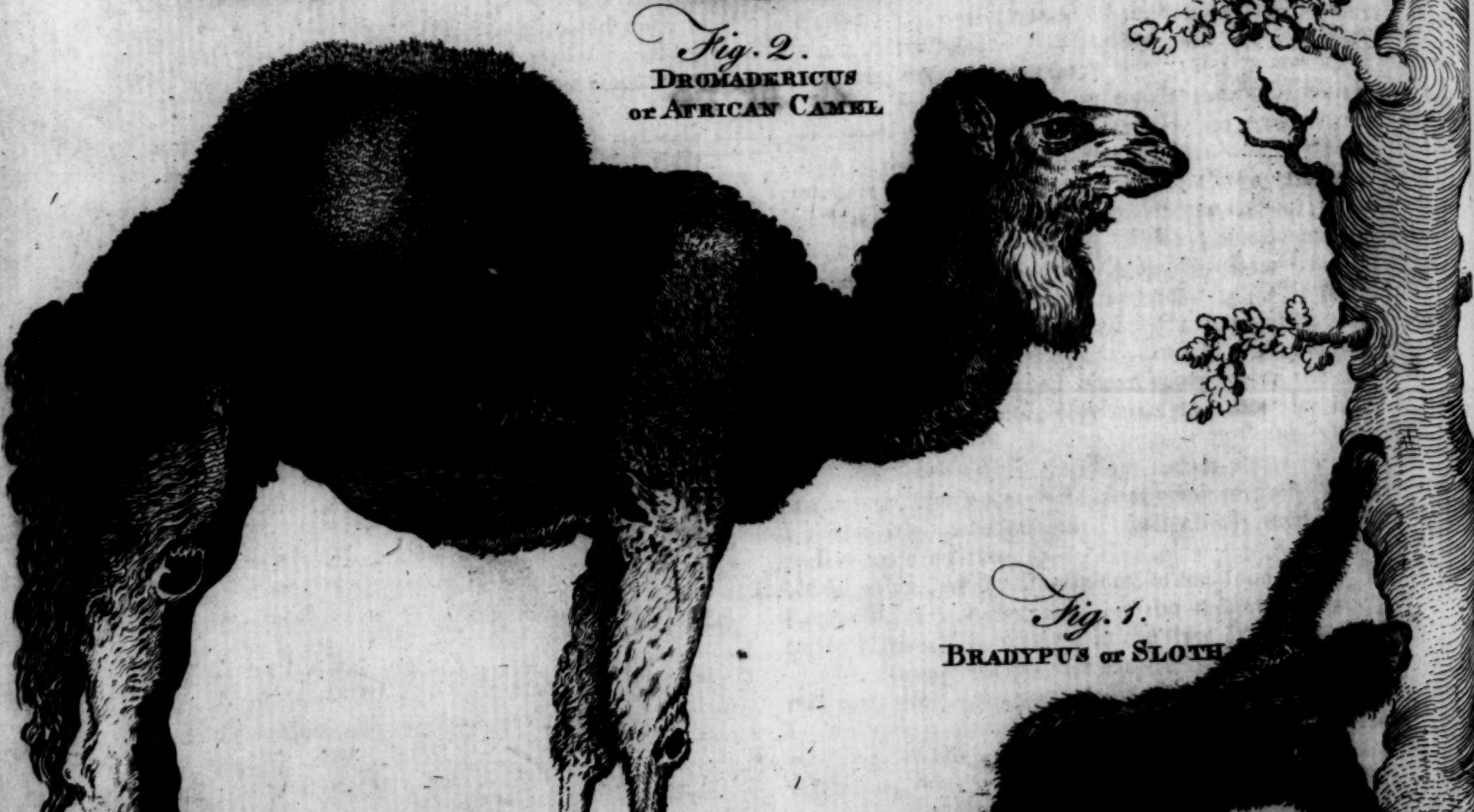


Fig. 2.

DROMADERICUS or AFRICAN CAMEL

Fig. 1.

BRADYPUS or SLOTH

A. Bell Sculpt.

the week only on bread and water. Theſe conſtitutions were, however, a little moderated ſome time afterwards. This hermitage is now accounted very rich.

CAMARA, in botany. See Lantana.

CAMARANA, an iſland of Arabia in the Red ſea, ſituated in 15° N. lat.

CAMBAIA, a city of the province of Cambaia, or Guzarat, in the higher peninſula of India; it is a very large city, and had once a great trade, now removed to Surat: E. long. 72°, and N. lat. 23° 30′.

CAMAYES, in commerce, cotton linens made at Bengal, at Madraſs, and ſome other places on the coaſt of Coromandel.

CAMBER-*beam*, among builders, a piece of timber in an edifice, cut archwiſe, or with an obtuſe angle in the middle, commonly uſed in platforms, as church-leads, and on other occaſions where long and ſtrong beams are required.

CAMBLET, or Camlet, a plain ſtuff, compoſed of a warp and woof, which is manufactured on a loom, with two treddles, as linens and flannels are.

There are camblets of ſeveral ſorts, ſome of goat's hair, both in the warp and woof; others, in which the warp is of hair, and the woof half hair and half ſilk; others again, in which both the warp and the woof are of wool; and laſtly, ſome of which the warp is of wool and the woof of thread. Some are dyed in thread, others are dyed in the piece, others are marked or mixed; ſome are ſtripped, ſome weaved or watered, and ſome figured.

Camblets are proper for ſeveral uſes, according to their different kinds and qualities; ſome ſerve to make garments both for men and women; ſome for bed-curtains; others for houſehold-furniture, *&c.*

CAMBODIA, the capital of a kingdom of the ſame name in India, beyond the Ganges: E. long. 104°, N. lat 12° 30′.

The kingdom of Cambodia extends from 9° to 15° of N. lat. being bounded by the kingdom of Laos on the north, Cochin-china on the eaſt, the Indian ocean on the ſouth, and by the bay of Siam on the weſt.

CAMBRAY, a city in the French Netherlands, ſituated on the river Schelde, near its ſource: E. long. 3° 15′, and N. lat. 50° 15′.

It is a large and well-built city, conſiderable for its linen manufacture, eſpecially cambricks, which took their name from hence.

CAMBRICKS, a ſpecies of very fine white linen, made of flax at Cambray.

CAMBRIDGE, the capital of Cambridgeſhire, ſituated upon the river Cam, about fifty-five miles north of London, and ſixty north-eaſt of Oxford.

Cambridge is moſt remarkable on account of its univerſity, which conſiſts of ſixteen colleges, wherein are educated about fifteen hundred ſtudents. There are fourteen pariſhes in the town, which is ſaid to contain about ſix thouſand inhabitants.

New Cambridge, a town of New England, about three miles weſt of Boſton; likewiſe remarkable for an univerſity, conſiſting of three colleges: W. long. 70° 4′, and N. lat. 42°.

CAMEL, in zoology. See Camelus.

CAMELFORD, a borough-town of Cornwall, about twenty miles weſt of Launceſton: W. long. 5°, and N. lat. 50° 40′.

It ſends two members to parliament.

CAMELIA, in botany, a genus of the monodelphia polyandria claſs. The calix is imbricated, and conſiſts of many leaves, the anterior of which are longeſt. There is but one ſpecies, *viz.* the japonica, a native of China and Japan.

CAMELOPARDALIS, in zoology, the trivial name of a ſpecies of cervus. See Cervus.

CAMELUS, or Camel, in zoology, a genus of quadrupeds belonging to the order of pecora. The characters of the camel are theſe: It has no horns, it has ſix foreteeth in the under-jaw; the laniarii are wide ſet, three in the upper, and two in the lower jaw; and there is a fiſſure in the upper lip, reſembling the cleft in the lip of a hare. The ſpecies are four, *viz.* 1. The dromedarius, or African camel, (Plate LIX. fig. 2.) with one bunch or protuberance on the back. It has four callous protuberances on the fore-legs, and two on the hind ones. The hoof, or rather callous ſkin of their feet, which is ſofter than the hoofs of other animals, enables the camel to walk along the ſandy paths of warm climates with greater eaſe; by yielding to the preſſure, it is not ſo ſubject to be injured by friction. The ſtructure and conſtitution of the camel is admirably adapted to the climate which produces them. In Africa and Arabia, where this animal is moſt frequent, and is employed in carrying all kinds of burdens, there is great ſcarcity of water. The camel has often been obſerved to travel longer than any other creature without drink. This it is enabled to do, from a ſingular conſtruction in its ſtomachs. It is one of the ruminating animals, and has four ſtomachs. At the top of the ſecond ſtomach, there are ſeveral ſquare holes, which are the orifices of about twenty cavities or ſacks, placed between the two membranes which compoſe the ſubſtance of this ſtomach. Theſe ſacks are ſo many reſervoirs which they fill over and above what ſatisfies their preſent thirſt, and ſerve for ſupplying them with water in long journeys through the dry and ſandy deſarts, where wells or rivers are ſeldom to be met with. Travellers, when much oppreſſed with drought, are ſometimes obliged to kill their camels, in order to have a ſupply of drink from theſe reſervoirs. The camel carries very heavy burdens, and travels long, but with a ſlow pace. They have ſometimes been known to travel ſeveral days without a freſh ſupply of water. When fatigued, they lie on their breaſt. 2. The Bactrianus, or Bactrian camel (fig. 3.), has two bunches on the back, the hindmoſt of which is by much the largeſt. It is a native of Africa, and is more rarely to be met with than the dromedary. It is alſo much ſwifter in its motion. 3. The glama, or South-American camel-ſheep, has a ſmooth ſkin, and very ſhort hair; it has a bunch or protuberance on the breaſt, which ſecretes

cretes a liquor. They are very impatient of cold; are eaſily tamed, and carry burdens of about fifty or ſixty pounds weight. When reſtive, they are puſhed on by ſqueezing their teſticles. When enraged by their driver, they throw out from their mouth a liquor which corrodes and makes the ſkin riſe into bliſters. 4. The pacos, or ſheep of Chili, has no bunch on the back. It is covered with a fine valuable wool, which is of a blood-red colour on the back of the animal, and white on the belly. It is unfit for carrying burdens, and is kept principally for the ſake of the wool, and the fleſh, which is exceedingly well-taſted.

CAMERA *obſcura*, in optics, a machine repreſenting an artificial eye, wherein the images of external objects are exhibited diſtinctly, in their native colours, either inverted or erect. See Optics.

CAMERARIA, in botany, a genus of the pentandria monogynia claſs. The flower of which is a petal of a funnel-form, with a cylindrical long tube, ventricoſe both at the baſe and top, and a plane limb divided into five lanceolated ſegments: The fruit is compoſed of two oblong follicles, bent horizontally, obtuſe at both ends, and ſending out a lobe on each ſide, near the baſe; they have one cell, with one valve, containing numerous, oval, and imbricated ſeeds, inſerted in a large oval membrane at the baſe. There are two ſpecies, *viz.* the latifolia, and anguſtifolia, both natives of America.

CAMERATED, among builders, the ſame with vaulted or arched.

CAMERET-BAY, in the province of Britany in France, forms the harbour of Breſt. See Brest.

CAMERINO, a town of the eccleſiaſtical ſtate in Italy.

CAMERLINGO, according to Ducange, ſignified formerly the pope's or emperor's treaſurer: At preſent, camerlingo is nowhere uſed, but at Rome, where it notes the cardinal who governs the eccleſiaſtical ſtate, and adminiſters juſtice. It is the moſt eminent office at the court of Rome, becauſe he is at the head of the treaſury. During a vacation of the papal chair, the cardinal camerlingo publiſhes edicts, coins money, and exerts every other prerogative of a ſovereign prince; he has under him a treaſurer-general, auditor-general, and twelve prelates called clerks of the chamber.

CAMERONIANS, a party of preſbyterians, which ſprung up in Scotland in the reign of king Charles II. They affirmed that the king had forfeited his right to the crown, by breaking the ſolemn league and covenant, which were the terms on which he received it. They pretended both to dethrone and excommunicate him; and broke out into an open rebellion. Upon the revolution, they were reconciled to the kirk, and their preachers ſubmitted to the general aſſembly of the church of Scotland, in 1690. That ſect is now greatly declined. They are few in number, and ſplit into many parties.

CAMERY, or Frounce, in horſes. See Frounce.

CAMILLI, and Camillæ, in Roman antiquity, a certain number of boys and girls, who aſſiſted in the ſacrifices to the gods, but more eſpecially attended the flamen dialis.

CAMIS, or Kamis, in the Japoneſe affairs, denote the deified ſouls of illuſtrious perſonages, believed to intereſt themſelves in the welfare of their countrymen: In which ſenſe they anſwer to the deified heroes of antiquity. See Hero.

CAMISARDS, a name given by the French to the Calviniſts of the Cevennes, who formed a league, and took up arms in their own defence, in 1688.

CAMLETINE, a ſlight ſtuff, made of hair and coarſe ſilk, in the manner of camblet. It is now out of faſhion.

CAMMIN, a port-town of Brandenburg-Pomerania in Germany, ſituated on the eaſtern mouth of the river Oder, about thirty miles north of Stetin: E. long. 15°, N. lat. 54°.

CAMP, the ground upon which an army pitch their tents. It is marked out by the quarter-maſter general, who appoints every regiment their ground.

The chief advantages to be minded in chuſing a camp for an army, are, to have it near the water, in a country of forage, where the ſoldiers may find wood for dreſſing their victuals; that it have a free communication with garriſons, and with a country from whence it may be ſupplied with proviſions; and, if poſſible, that it be ſituated on a riſing ground, in a dry gravelly ſoil. Beſides, the advantages of the ground ought to be conſidered, as marſhes, woods, rivers, and incloſures; and if the camp be near the enemy, with no river or marſh to cover it, the army ought to be intrenched. An army always encamps fronting the enemy; and generally in two lines, running parallel about five hundred yards diſtance; the horſe and dragoons, on the wings, and the foot in the centre: Sometimes a body of two, three, or four brigades is encamped behind the two lines, and is called the body of reſerve. The artillery and bread-waggons are generally encamped in the rear of the two lines. A battalion of foot is allowed eighty or an hundred paces for its camp; and thirty or forty for an interval betwixt one battalion and another. A ſquadron of horſe is allowed thirty for its camp, and thirty for an interval, and more if the ground will allow it.

The diſpoſition of the Hebrew encampment was at firſt laid out by God himſelf. Their camp was of a quadrangular form, ſurrounded with an incloſure of the height of ten hands-breadth. It made a ſquare of twelve miles in compaſs about the tabernacle; and within this was another, called the Levites camp. The Greeks had alſo their camps, fortified with gates and ditches. The Lacedemonians made their camp of a round figure, looking upon that as the moſt perfect and defenſible of any form: We are not, however, to imagine, that they thought this form ſo eſſential to a camp, as never to be diſpenſed with when the circumſtance of the place required it. Of the reſt of the Grecian camps, it may be obſerved, that the moſt valiant of the ſoldiers were placed at the extremities, the reſt in the middle. Thus we learn from Homer, that Achilles and Ajax were poſted at the ends of the camp before Troy, as bulwarks on each ſide of the reſt of the princes.

The camps of the Romans were generally of an exact ſquare form, or elſe oblong; though this, without doubt, was often accommodated to the ſituation of the place. They were always fortified, and a very exact diſcipline maintained in them, in order to prevent ſurpriſes from the enemy.

Camp is alſo uſed, by the Siameſe, and ſome other nations in the E Indies, as the name of the quarters which they aſſign to the foreigners who come to trade with them.

In theſe camps, every nation forms, as it were, a particular town, where they carry on all their trade, not only keeping all their ware-houſes and ſhops there, but alſo live in theſe camps with their whole families. The Europeans, however, are ſo far indulged, that at Siam, and almoſt every where elſe, they may live either in the cities or ſuburbs, as they ſhall judge moſt convenient.

CAMPAGNA, in geography. See Campania.

CAMPAIGN, in the art of war, denotes the ſpace of time that an army keeps the field, or is incamped, in oppoſition to quarters.

CAMPANIA, a city of the hither principate in the kingdom of Naples, ſituated about thirty-five miles ſouth-eaſt of the city of Naples: E. long. 15° 30′, N. lat. 4° 45′.

Campania, or Campagna di Roma, a province of the pope's territories in Italy, extending from the city of Rome ſouth-eaſt, as far as the frontiers of the kingdom of Naples.

CANPANIFORM, or Campanulated, an appellation given to flowers reſembling a bell.

CAMPANINI, a name given to a marble of Italy, dug out of the mountains of Carrara, becauſe when it is worked it reſounds like a bell.

CAMPANULA, or Bell-flower, in botany, a genus of the pentandria monogynia claſs. The corolla is campaniform or bell-ſhaped, the bottom of which is cloſed with five valvulous nectaria; the ſtigma is trifid; and the capſule is below the flower, and opens at the ſides. There are forty-one ſpecies of campanula, only nine of which are natives of Britain, *viz.* the rotundifolia, or leſſer round-leaved bell flower; the patula, or field bell-flower; the uniflora, or mountain bell-flower; the rapunculus, or rampions; the latifolia, or giant throat-wort; the tracheluna, great throat-wort, or Canterbury bells; and the glomerata, leſſer throat-wort, or Canterbury-bells.

CAMPBELL-TOWN, a parliament town of Argyleſhire in Scotland, ſituated on the eaſtern ſhore of Kintire, about ten miles weſt of the iſland of Arran: W. long. 5° 10′, N. lat. 55° 35′.

CAMPDEN, a market-town in Glouceſterſhire, about eighteen miles north-eaſt of Glouceſter: W. long. 1° 50′, and N. lat. 52°.

CAMPEACHY, or Campechy, a town of the province of Jucatan, on the bay or gulf of Mexico: W. long. 93°, N. lat. 19°.

Campeachy-wood, in botany. See Hæmatoxylum.

CAMPEN, a port-town, in the provine of Overyſſel, in the united Netherlands, near the mouth of the river Iſſel, about forty-two miles north-eaſt of Amſterdam: E. long. 5° 40′, and N. lat. 52° 35′.

CAMPHOR, or Camphire, a ſolid concrete juice extracted from the wood and roots of the laurus camphora, which grows in Japan. The camphor is extracted in the ſame way by which we extract eſſential oils. As it firſt ſublimes from the wood, it appears browniſh, compoſed of ſemipellucid grains mixed with dirt. In this ſtate it is exported by the Dutch, and purified by a ſecond ſublimation; after which it is reduced to loaves, probably by fuſion in cloſe veſſels, and in this form it is ſold to us. Pure camphor is very white, pellucid, ſomewhat unctuous to the touch; of a bitteriſh, aromatic, acrid taſte, yet accompanied with a ſenſe of coolneſs. It has a fragrant ſmell, ſomewhat like that of roſemary, but much ſtronger. It is totally volatile and inflammable; ſoluble in vinous ſpirits, oils, and mineral acids; but not in water, alkaline liquors, or the vegetable acids. Camphor is eſteemed one of the moſt efficacious diaphoretics, and has long been celebrated in fevers, malignant and epidemical diſtempers. In deliria, where opiates fail of procuring ſleep, this medicine frequently ſucceeds.

Artificial **Camphor** is prepared with gum-ſandarach and white vinegar diſtilled, kept twenty days in horſe-dung, and afterwards expoſed a month to the ſun to dry, at the end of which the camphor is found in form of the cruſt of a white loaf. This is alſo called juniper-gum, and maſtic.

Camphor-tree. See Laurus.

CAMPHORATA, in botany. See Polycnemum.

CAMPION, in botany. See Lychnis.

CAMPOIDES, in botany. See Scorpiurus.

CAMPREDON, a town of Catalonia, in Spain, about fifty miles north of Barcelona: E. long. 2°, and N. lat. 42° 20′.

Campus Maii, in ancient cuſtoms, an anniverſary aſſembly of our anceſtors held on May-day, when they confederated together for defence of the kingdom againſt all its enemies.

Campus martius, among the Romans, a field, by the ſide of the Tiber, where the youth exerciſed themſelves in warlike exerciſes. It was ſo called, on account of a temple that ſtood on it, conſecrated to the god Mars. The conſuls Brutus and Collatinus made it the place for holding the comitia or aſſemblies of the people, and in after-times it was adorned with a great quantity of fine ſtatues.

CAMUS, a perſon with a low flat noſe, hollowed in the middle.

The Tartars are great admirers of camus beauties. Rubruquis obſerves, that the wife of the great Jenghis Kan, a celebrated beauty, had only two holes for a noſe.

CAN, in the ſea-language, as can-pump, a veſſel, wherewith ſeamen pour water into the pump to make it go.

Can-buoy, a larger ſize of buoy, uſed to diſcover dangerous rocks and ſhelves, by being placed over them.

CAN-HOOK. See HOOK.

CANADA, or NEW FRANCE, an extenſive tract of North America, bounded by New Britain and the Britiſh colonies on Hudſon's bay, on the north; by the river of St Lawrence, the Iroquois, or five Indian nations, the Huron and Illonois lakes, on the eaſt and ſouth; and by unknown lands, on the weſt. Its chief town is Quebec.

CANAL *of communication*, an artificial cut in the ground, ſupplied with water from rivers, ſprings, *&c.* in order to make a navigable communication betwixt one place and another.

The particular operations neceſſary for making artificial navigations depend upon a number of circumſtances. The ſituation of the ground; the vicinity or connection with rivers; the eaſe or difficulty with which a proper quantity of water can be obtained; theſe and many other circumſtances neceſſarily produce great variety in the ſtructure of artificial navigations, and augment or diminiſh the labour and expence of executing them. When the ground is naturally level, and unconnnected with rivers, the execution is eaſy, and the navigation is not liable to be diſturbed by floods; but, when the ground riſes and falls, and cannot be reduced to a level, artificial methods of raiſing and lowering veſſels muſt be employed; which likewiſe vary according to circumſtances.

A kind of temporary ſluices are ſometimes employed for raiſing boats over falls or ſhoals in rivers by a very ſimple operation. Two poſts or pillars of maſon-work, with grooves, are fixed, one on each bank of the river, at ſome diſtance below the ſhoal. The boat having paſſed theſe poſts, planks are let down acroſs the river by pullies into the grooves, by which the water is dammed up to a proper height for allowing the boat to paſs up the river over the ſhoal.

The Dutch and Fleemings at this day, ſometimes when obſtructed by caſcades, form an inclined plane or rolling-bridge upon dry land, alongſt which their veſſels are drawn from the river below the caſcade into the river above it. This, it is ſaid, was the only method employed by the ancients, and is ſtill uſed by the Chineſe, who are ſaid to be entirely ignorant of the nature and utility of locks. Theſe rolling-bridges conſiſt of a number of cylindrical rollers which turn eaſily on pivots, and a mill is commonly built near by, ſo that the ſame machinery may ſerve the double purpoſe of working the mill and drawing up veſſels.

A LOCK is a baſon placed lengthwiſe in a river or canal, lined with walls of maſonry on each ſide, and terminated by two gates, placed where there is a caſcade or natural fall of the country; and ſo conſtructed, that the baſon being filled with water by an upper ſluice to the level of the waters above, a veſſel may aſcend through the upper gate; or the water in the lock being reduced to the level of the water at the bottom of the caſcade, the veſſel may deſcend through the lower gate; for when the waters are brought to a level on either ſide, the gate on that ſide may be eaſily opened. But as the lower gate is ſtrained in proportion to the depth of water it ſupports, when the perpendicular height of the water exceeds 12 or 13 feet, more locks than one become neceſſary. Thus, if the fall be 17 feet, two locks are required, each having 8½ feet fall; and if the fall be 26 feet, three locks are neceſſary, each having 8 feet 8 inches fall. The ſide-walls of a lock ought to be very ſtrong. Where the natural foundation is bad, they ſhould be founded on piles and platforms of wood: They ſhould likewiſe ſlop outwards, in order to reſiſt the preſſure of the earth from behind.

Plate LX. fig. 1. A perſpective view of part of a canal: the veſſel L, within the lock A C.—Fig. 2. Section of an open lock: the veſſel L about to enter.—Fig. 3. Section of a lock full of water: the veſſel L raiſed to a level with the water in the ſuperior canal.—Fig. 4. Ground ſection of a lock. L, a veſſel in the inferior canal. C, the under gate. A, the upper gate. G H, a ſubterraneous paſſage for letting water from the ſuperior canal run into the lock. K F, a ſubterraneous paſſage for water from the lock, to the inferior canal.

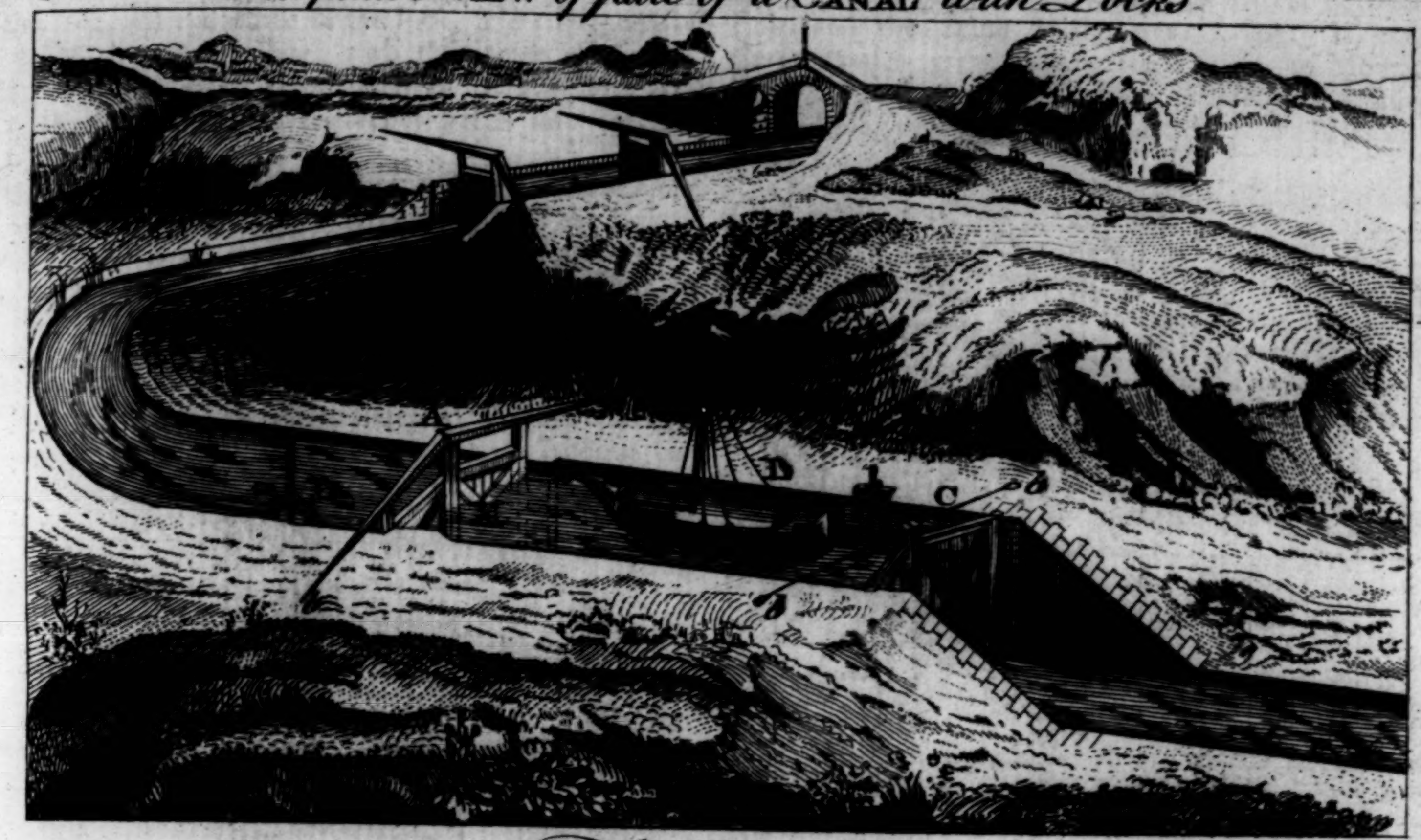
X and Y (fig. 1.) are the two flood-gates, each of which conſiſts of two leaves, reſting upon one another, ſo as to form an obtuſe angle, in order the better to reſiſt the preſſure of the water. The firſt (X) prevents the water of the ſuperior canal from falling into the lock; and the ſecond (Y) dams up and ſuſtains the water in the lock. Theſe flood-gates ought to be very ſtrong, and to turn freely upon their hinges. In order to make them open and ſhut with eaſe, each leaf is furniſhed with a long lever A *b*, A *b*; C *b*, C *b*. They ſhould be made very tight and cloſe, that as little water as poſſible may be loſt.

By the ſubterraneous paſſage G H (fig. 2, 3, & 4) which deſcends obliquely, by opening the ſluice G, the water is let down from the ſuperior canal D, into the lock, where it is ſtopt and retained by the gate C when ſhut, till the water in the lock comes to be on a level with the water in the ſuperior canal D; as repreſented, fig 3. When, on the other hand, the water contained by the lock is to be let out, the paſſage G H muſt be ſhut by letting down the ſluice G, the gate A muſt be alſo ſhut, and the paſſage K F opened by raiſing the ſluice K: A free paſſage being thus given to the water, it deſcends through K F, into the inferior canal, until the water in the lock is on a level with the water in the inferior canal B; as repreſented, fig. 2.

Now, let it be required to raiſe the veſſel L (fig. 2.) from the inferior canal B, to the ſuperior one D; if the lock happens to be full of water, the ſluice G muſt be ſhut, and alſo the gate A, and the ſluice K opened, ſo that the water in the lock may run out till it is on a level with the water in the inferior canal B. When the water in the lock comes to be on a level with the water at B, the leaves of the gate C are opened by the levers C *b*, which is eaſily performed, the water on each ſide of the gate being in equilibrio; the veſſel then ſails into the lock. After this the gate C, and the

ſluice

Fig. 1.
Perspective VIEW of part of a CANAL with Locks



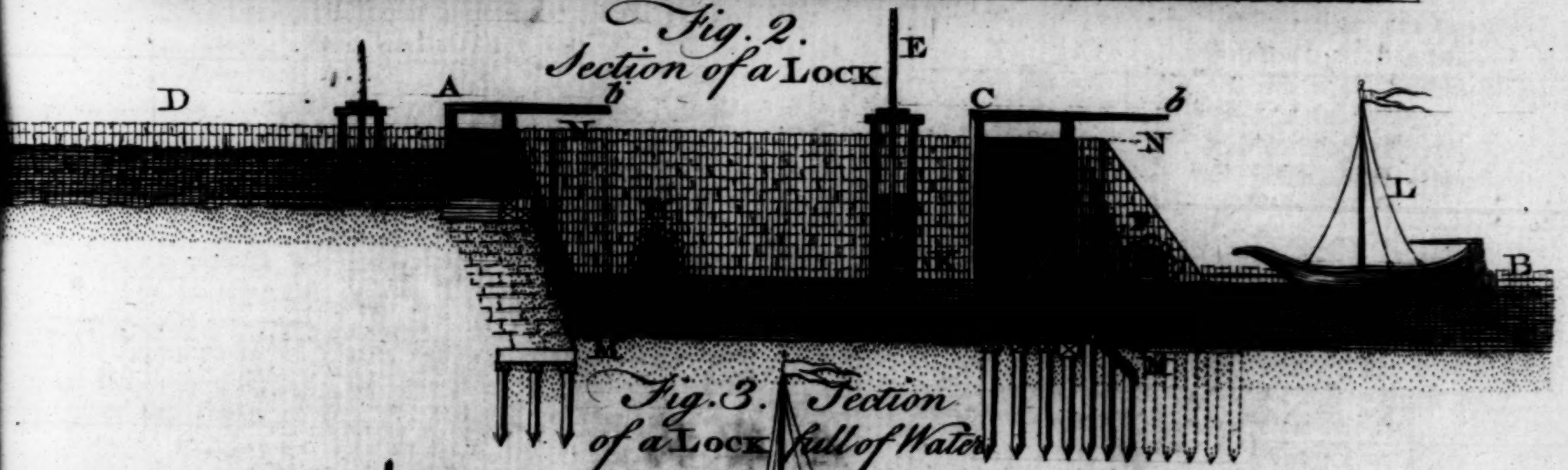


Fig. 2.
Section of a LOCK
D
A
b
N
E
C
b
N
L
B
M
M

Fig. 3. Section of a LOCK full of Water

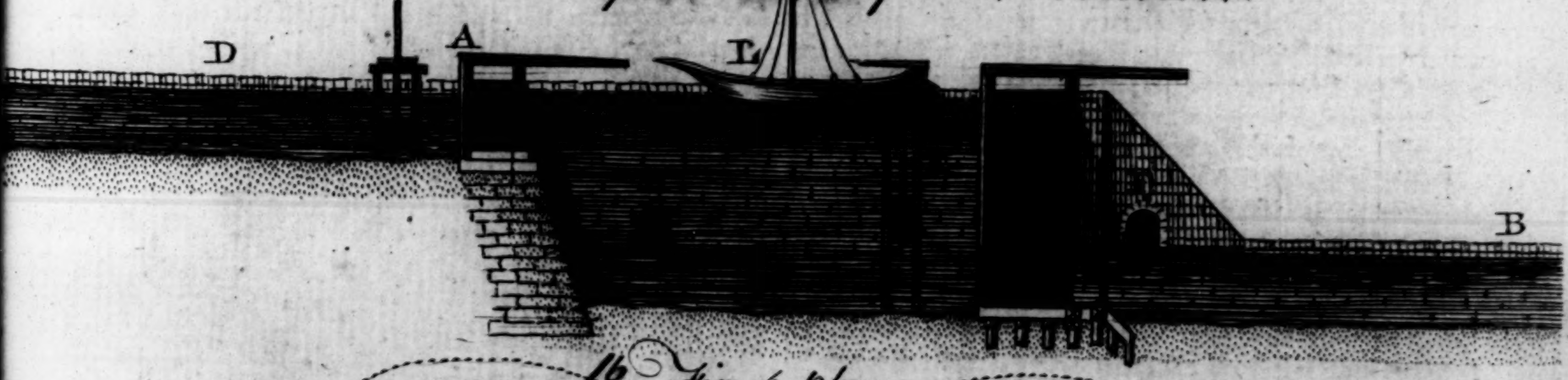
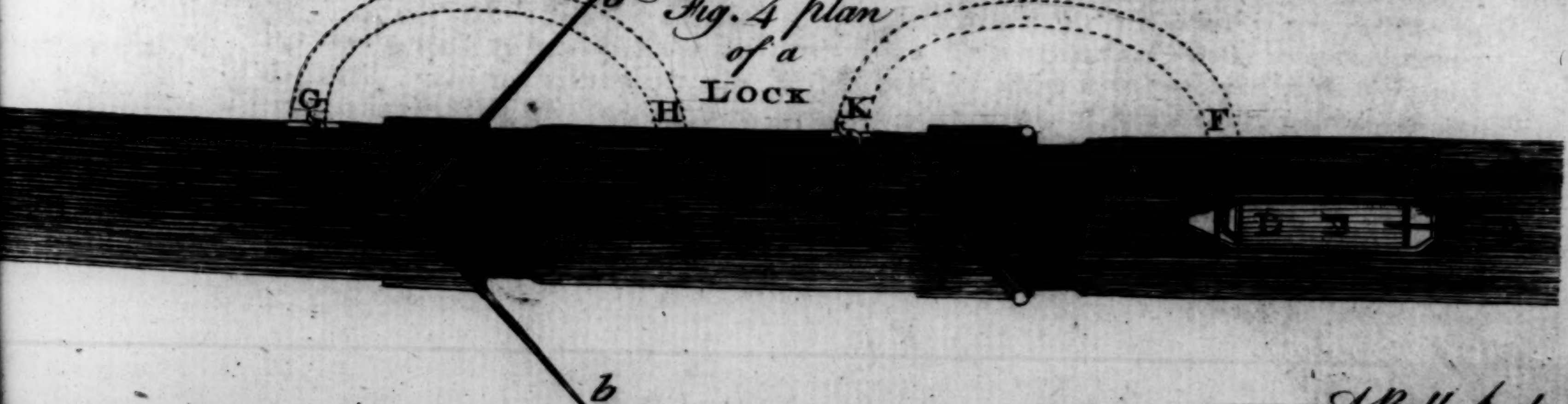


Fig. 4 plan of a LOCK



A. Bell Sculpt.

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ſluice K are ſhut, and the ſluice G opened, in order to fill the lock, till the water in the lock, and conſequently the veſſel, be upon a level with the water in the ſuperior canal D; as is repreſented in fig. 3. The gate A is then opened, and the veſſel paſſes into the canal D.

Again, let it be required to make a veſſel deſcend from the canal D, into the inferior canal B. If the lock is empty, as in fig. 2. the gate C and ſluice K muſt be ſhut, and the upper ſluice G opened, ſo that the water in the lock may riſe to a level with the water in the upper canal D. Then open the gate A, and let the veſſel paſs through into the lock. Shut the gate A and the ſluice G: then open the ſluice K, till the water in the lock be on a level with the water in the inferior canal; then the gate C is opened, and the veſſel paſſes along into the canal B, as was required.

It is almoſt needleſs to ſpend time in enumerating the many advantages which neceſſarily reſult from artificial navigations. Their utility is now ſo apparent, that moſt nations in Europe give the higheſt encouragement to undertakings of this kind where-ever they are practicable. The advantages of navigable canals did not eſcape the obſervation of the ancients. From the moſt early accounts of ſociety we read of attempts to cut through large iſthmuſes, in order to make a communication by water, either betwixt different nations, or diſtant parts of the ſame nation, where land-carriage was long and expenſive. Herodotus relates, that the Cnidians, a people of Caria in Aſia Minor, deſigned to cut the Iſthmus which joins that Peninſula to the continent; but were ſuperſtitious enough to give up the undertaking, becauſe they were interdicted by an oracle. Several Kings of Egypt attempted to join the Red-ſea to the Mediterranean. Cleopatra was exceedingly fond of this project. Soliman II. emperor of the Turks, employed 50,000 men in this great work. This canal was compleated under the caliphate of Omar, but was afterwards allowed to fall into diſrepair; ſo that it is now difficult to diſcover any traces of it. Both the Greeks and Romans intended to make a canal acroſs the Iſthmus of Corinth, which joins the Morea and Achaia, in order to make a navigable paſſage by the Ionian ſea into the Archipelago. Demetrius, Julius Cæſar, Caligula, and Nero, made ſeveral unſucceſsful efforts to open this paſſage. But, as the ancients were intirely ignorant of the uſe of water-locks, their whole attention was employed in making level cuts, which is probably the principal reaſon why they ſo often failed in their attempts. Charlemagne formed a deſign of joining the Rhine and the Danube, in order to make a communication between the ocean and the Black-ſea, by a canal from the river Almutz which diſcharges itſelf into the Danube, to the Reditz, which falls into the Maine, and this laſt falls into the Rhine near Mayence: For this purpoſe he employed a prodigious number of workmen; but he met with ſo many obſtacles from different quarters, that he was obliged to give up the attempt.

The French at preſent have many fine canals: That of Briare was begun under Henry IV. and finiſhed under the direction of cardinal Richelieu in the reign of Lewis XIII. This canal makes a communication betwixt the Loire and the Seine by the river Loing. It extends eleven French great leagues from Briare to Montargis. It enters the Loire a little above Briare, and terminates in the Loing at Cepoi. There are forty-two locks on this canal.

The canal of Orleans, for making another communication between the Seine and the Loire, was begun in 1675, and finiſhed by Philip of Orleans, regent of France, during the minority of Lewis XV. and is furniſhed with twenty locks. It goes by the name of the canal of Orleans; but it begins at the village of Combleux, which is a ſmall French league from the town of Orleans.

But the greateſt and moſt uſeful work of this kind is the junction of the ocean with the Mediterranean by the canal of Languedoc. It was propoſed in the reigns of Francis I. Henry IV. and was undertaken and finiſhed under Lewis XIV. It begins with a large reſervoir 4000 paces in circumference, and 24 feet deep, which receives many ſprings from the mountain Noire. This canal is about 64 leagues in length, is ſupplied by a number of rivulets, and is furniſhed with 104 locks, of about eight feet riſe each. In ſome places it paſſes over bridges of vaſt height; and in others it cuts through ſolid rocks for 1000 paces. At one end it joins the river Garonne near Tholouſe, and terminates at the other in the lake Tau, which extends to the port of Cette. It was planned by Francis Riquet in the 1666, and finiſhed before his death, which happened in the 1680.

In the Dutch, Auſtrian, and French Netherlands, there is a very great number of canals; that from Bruges to Oſtend carries veſſels of 200 tons.

The Chineſe have alſo a great number of canals; that which runs from Canton to Pekin, extends about 825 miles in length, and was execute about 800 years ago.

It would be an endleſs taſk to deſcribe the numberleſs canals in Holland, Ruſſia, Germany, *&c.* We ſhall therefore confine ourſelves to thoſe that are either already finiſhed, or at preſent executing in our own country.

As the promoting of commerce is the principal intention of making canals, it is natural to expect that their frequency in any nation ſhould bear ſome proportion to the trade carried on in it, providing the ſituation of the country will admit of them. The preſent ſtate of England and Scotland confirms this obſervation. Though the Romans made a canal between the Nyne, a little below Peterborough, and the Witham, three miles below Lincoln, which is now almoſt entirely filled up, yet it is not long ſince canals were revived in England. They are now however become very numerous, particularly in the counties of York, Lincoln, and Cheſhire. Moſt of the counties betwixt the mouth of the Thames and the Briſtol channel are connected together either by natural or artificial navigations; thoſe upon the Thames and Iſis reaching within about twenty miles of thoſe upon the Severn. The duke of Bridgewater's canal in Cheſhire runs twenty-ſeven miles on a perfect level; but at Barton it is carried by a very high aqueduct bridge over the Irwell, a navigable river; ſo that it is common for veſſels to be paſſing at the ſame time both under and above the bridge. It is likewiſe cut ſome miles into the hills, where the Duke's coal mines are wrought.

Though a navigable communication between the rivers Forth and Clyde in Scotland had been long talked of, it was never conſidered with a view to execution till the year 1761, when the ground was ſurveyed by Mr Smeaton, at the deſire of the truſtees for fiſheries and manufactures in Scotland. From Mr Smeaton's ſurvey and report, the practicability of this canal was fully demonſtrated. But, after the ſcheme became an object of general attention, it was found that a canal of larger dimenſions than the one originally propoſed would be productive of ſtill greater advantages to the nation. Mr Smeaton was therefore directed to make a ſecond ſurvey, and to report to the intended proprietors an eſtimate of the expence of making a canal 24 feet broad at bottom, 54 at top, containing ſeven feet deep of water, and extending from the Forth to the Clyde, a diſtance of about 31 miles, with a collateral branch to the town of Glaſgow, which is about ſix miles, and another from Bainsford to the river Carron, below Carron-works, making in all about 37 miles. This report was approved of, an act of parliament was obtained, and the canal is now cutting upon this very plan. It begins at the Holemerrie in the mouth of the Carron, and terminates at Dammuir-burn-foot on the river Clyde, about ſeven miles below Glaſgow. Above ſeven miles are already cut, from the Holemerrie weſtward; a number of hands are likewiſe employed at the point of partition in Dollater-bog, and the whole is expected to be finiſhed in five years. At the point of partition, which is 168 feet above the level of the ſea at low water, a very large reſervoir is to be made for ſupplying the canal; and the veſſels are to be raiſed and lowered by means of 41 locks. Where the courſe of the canal is interſected by burns or rivers, it is to be carried over them by aqueduct-bridges; three of theſe bridges will be large, and require conſiderable labour and expence, *viz.* one over the Grange-burn, one over Bony-mill-burn, and a third over the Kelvin in the Glaſgow branch. The expence of executing the whole is computed to be about 150,000 l.

Sea-veſſels, about 20 feet wide and 60 feet long, and carrying 70 or 80 tons, may paſs along by this canal from the one frith to the other. But it will admit a free paſſage to veſſels of 140 tons, provided they be built in the manner of the flat veſſels uſed by the Dutch. The toll-duty, allowed by the act of parliament, is not to exceed 2 d. a ton *per* mile. Privileged goods, ſuch as lime and lime-ſtone, are to pay only one third of the uſual toll-duty; ſtones, gravel, and other materials for making or repairing roads, likewiſe dung, ſoil, marle, and all ſorts of manure, are exempted from paying any toll-duty, provided they do not paſs any lock but when the water ſhall flow over the place made for diſcharging the overplus-water in the canal.

We muſt not conclude this article without obſerving, that in Ireland alſo the utility of artificial navigations has not been unattended to. Several canals are there making; in particular, one from Loch-Neach to Newry, about 20 miles; and another from the river Shannon to Dublin, about 70 miles.

Canal, in anatomy, a duct or paſſage through which any of the juices flow.

CANARIES, iſlands, to the number of ſeven, ſituated in the Atlantic ocean, between 12° 21′ W. long. and between 27° and 29° N. lat. the moſt eaſterly of them lying about 150 miles from Cape Non, on the coaſt of Biledulgerid, in Africa.

CANARY, properly ſo called, is a conſiderable iſland, about 150 miles in circumference; the chief town of which is Palma, from whence comes the excellent palm-ſack, and other rich wines.

It lies in 16° W. long. and between 27° and 28° N. lat.

Canary-*bird*. See Fringilla.

CANCALE, a ſmall town of France, near St Malo's, where ſhips may ride in eight fathoms water, with a ſandy bottom.

CANCELIER, in falconry, is when a light-brown hawk, in her ſtooping, turns two or three times upon the wing, to recover herſelf, before ſhe ſeizes.

CANCELLI, a term uſed to denote lattice-windows, or thoſe made of croſs-bars, diſpoſed lattice-wiſe; it is alſo uſed for rails or balluſters, incloſing the communion-table, a court of juſtice, and the like, and for the net-work in the inſide of hollow bones.

CANCER, or Crab, in zoology, a genus of inſects belonging to the order of inſecta aptera. The generic characters are theſe: They have eight legs, (ſeldom ten or ſix), beſides the two large claws which anſwer the purpoſe of hands. They have two eyes at a conſiderable diſtance from each other, and for the moſt part ſupported by a kind of pedunculi or foot-ſtalks; the eyes are likewiſe elongated and moveable. They have two clawed palpi; and the tail is jointed. There are no leſs than 87 ſpecies of cancer, diſtinguiſhed principally by the length of their tails and the margins of their breaſts. This genus includes the lobſter, ſhrimp, *&c.*

Cancer, in medicine, a roundiſh, unequal, hard, and livid tumour, generally ſeated in the glandulous parts of the body, ſuppoſed to be ſo called, becauſe it appears at length, with turgid veins ſhooting out from it, ſo as to reſemble, as it is thought, the figure of a crab-fiſh; or, as others ſay, becauſe, like that fiſh, where it has once got, it is ſcarce poſſible to drive it away. See Medicine, and Surgery.

Cancer, in aſtronomy, one of the twelve ſigns of the zodiac, repreſented on the globe in the form of a crab, and thus marked (♋) in books.

Tropic of **Cancer**, in aſtronomy, a leſſer circle of the ſphere parallel to the equator, and paſſing through the beginning of the ſign cancer.

CANCHERIZANTE, or Cancherizato, in the Italian muſic, a term ſignifying a piece of muſic that begins at the end, being the retrograde motion from the end of a ſong, *&c.* to the beginning.

CANDAROR, the capital of a territory of the ſame name, ſubject to Perſia: E. long. 67°, and N. lat. 33°.

CANDIA, the modern name of Crete, an iſland ſituated in the Mediterranean ſea, between 22° and 27° E. long. and between 35° and 36° N. lat.

There is no river of any conſequence in the whole iſland, which is watered by a multitude of rivulets; whereof Lethe is one. Here too is mount Ida, ſo much celebrated in the writings of the ancients.

CANDIA, or **MUTIUM**, is the capital of the above iſland, ſituated on its northern coaſt, in 25° E. long. and 35° 30′ N. lat.

CANDIDATE, a perſon who aſpires to ſome public office.

In the Roman commonwealth, they were obliged to wear a white gown, during the two years of their ſoliciting for a place. This garment, according to Plutarch, they wore without any other cloaths, that the people might not ſuſpect they concealed money for purchaſing votes; and alſo, that they might the more eaſily ſhow to the people, the ſcars of thoſe wounds they had received in fighting for the defence of the commonwealth.

CANDIDATI MILITES, an order of ſoldiers, among the Romans, who ſerved as the emperor's body-guards, to defend him in battle. They were the talleſt and ſtrongeſt of the whole troops, and moſt proper to inſpire terror. They were called *candidati*, becauſe cloathed in white, either that they might be more conſpicuous, or becauſe they were conſidered in the way of preferment.

CANDISH, a province of the hither India, bounded by Chitor and Malva, on the north; by Orixa, on the eaſt; by Decan, on the ſouth; and by Guzurat, on the weſt: It is ſubject to the Mogul.

CANDLE, a ſmall taper of tallow, wax, or ſpermaceti; the wick of which is commonly of ſeveral threads of cotton, ſpun and twiſted together.

A tallow-candle, to be good, muſt be half ſheeps, and half bullocks tallow; for hogs tallow makes the candle gutter, and always gives an offenſive ſmell, with a thick black ſmoke. The wick ought to be pure, ſufficiently dry, and properly twiſted; otherwiſe the candle will emit an unconſtant vibratory flame, which is both prejudicial to the eyes, and inſufficient for the diſtinct illumination of objects.

There are two ſorts of tallow-candles; the one dipped, the other moulded: The former are the common candles; the others are the invention of the ſieur le Brege at Paris.

As to the method of making candles, in general; After the tallow has been weighed, and mixed in the due proportions, it is cut into very ſmall pieces, that it may melt the ſooner; for the tallow in lumps, as it comes from the butchers, would be in danger of burning or turning black, if it were left too long over the fire. Being perfectly melted and ſkimmed, they pour a certain quantity of water into it, proportionable to the quantity of tallow. This ſerves to precipitate, to the bottom of the veſſel, the impurities of the tallow, which may have eſcaped the ſkimmer. No water, however, muſt be thrown into the tallow deſigned for the three firſt dips; becauſe the wick, being ſtill quite dry, would imbibe the water, which makes the candles crackle in burning, and renders them of bad uſe. The tallow, thus melted, is poured into a tub, through a coarſe ſieve of horſe-hair, to purify it ſtill more, and may be uſed after having ſtood three hours. It will continue fit for uſe twenty-four hours in ſummer, and fifteen in winter.

The wicks are made of ſpun cotton, which the tallow-chandlers buy in ſkains, and which they wind up into bottoms or clues. Whence they are cut out, with an inſtrument contrived on purpoſe, into pieces of the length of the candle required; then put on the ſticks or broaches, or elſe placed in the moulds, as the candles are intended to be either dipped or moulded. Wax-candles are made of a cotton or flaxen wick, ſlightly twiſted, and covered with white or yellow wax. Of theſe, there are ſeveral kinds; ſome of a conical figure, uſed to illumine churches, and in proceſſions, funeral ceremonies, *&c.* See TAPER.

Others of a cylindrical form, uſed on ordinary occaſions.

The firſt are either made with a ladle or the hand.

To make wax candles with the ladle.

The wicks being prepared, a dozen of them are tied by the neck, at equal diſtances, round an iron circle, ſuſpended directly over a large baſon of copper tinned, and full of melted wax: A large ladle full of this wax is poured gently on the tops of the wicks one after another, and this operation continued till the candle arrive at its deſtined bigneſs; with this precaution, that the three firſt ladles be poured on at the top of the wick, the fourth at the height of ¾, the fifth at ½, and the ſixth at ¼, in order to give the candle its pyradimal form. Then the candles are taken down, kept warm, and rolled and ſmoothed upon a walnut-tree table, with a long ſquare inſtrument of box, ſmooth at the bottom.

As to the manner of making wax-candles by the hand, they begin to ſoften the wax, by working it ſeveral times in hot water, contained in a narrow, but deep caldron. A piece of the wax is then taken out, and diſpoſed by little and little, around the wick, which is hung on a hook in the wall, by the extremity oppoſite to the neck; ſo that they begin with the big end, diminiſhing ſtill as they deſcend towards the neck. In other reſpects, the method is nearly the ſame as in the former caſe. However, it muſt be obſerved, that in the former caſe, water is always uſed to moiſten the ſeveral inſtruments, to prevent the wax from ſticking; and in the latter, oil of olives, or lard, for the hands, *&c.* The cylindrical wax-candles are either made, as the former, with a ladle, or drawn. Wax-candles drawn, are ſo called, becauſe actually drawn in the manner of wire, by means of two large rollers of wood, turned by a handle, which turning backwards and forwards ſeveral times, paſs the wick through melted wax contained in a braſs baſon, and at the ſame time through the holes of an inſtrument like that uſed for drawing wire faſtened at one ſide of the baſon.

Makers of candles are not to uſe melting-houſes, without due entry thereof at the exciſe-office, on pain of 100l.; and to give notice of making candles to the exciſe-officer for the duties, and of the number, &c. or ſhall forfeit 50l. Removing the candles before weighed by the officer, or mixing them with others, is likewiſe liable to penalties.

CANDLE is alſo a term in medicine, and is reckoned among the inſtruments of ſurgery. Thus the candela fumalis, or the candela pro ſuffitu odorata, is a maſs of an oblong form, conſiſting of odoriferous powders, mixed up with a third, or more, of the charcoal of willow or lime-tree, and reduced to a proper conſiſtence with a mucilage of gum-tragacanth, ladanum, or turpentine. It is intended to excite a grateful ſmell without any flame, to correct the air, to fortify the brain, and to excite the ſpirits.

Medicated **CANDLE**, or **BOUGIE**, in ſurgery, a ſmall ſtick of wax in form of a candle, which ſurgeons introduce into the uretha, either to dilate it and keep it open, or to conſume carnoſities. There are two ſorts of theſe candles, the one ſimple, and the other compound. The ſimple are made of wax, of cat-gut, or even of lead; and the intention of them is to keep the canal of the urethra properly diſtended. Their thickneſs, therefore, ſhould be proportioned to the diameter of that canal. The compound bougies are loaded with ſome medicine capable of producing a ſuppuration, or of deſtroying carnoſities and excreſcences in the urethra. See SURGERY.

CANDLE. Sale or auction by inch of candle, is when a ſmall piece of candle being lighted, the byſtanders are allowed to bid for the merchandiſe that is ſelling; but the moment the candle is out, the commodity is adjudged to the laſt bidder.

There is alſo an excommunication by inch of candle; when the ſinner is allowed to come to repentance while a lighted candle continues burning; but after it is conſumed, he remains excommunicated to all intents and purpoſes.

CANDLE-BERRY-TREE, in botany. See MYRICA.

CANDLEMAS, a feaſt of the church held on the ſecond day of February, in honour of the purification of the Virgin Mary. It is borrowed from the practice of the ancient Chriſtians, who on that day uſed abundance of lights both in their churches and proceſſions, in memory, as is ſuppoſed, of our Saviour's being, on that day, declared by Simeon, "to be a light to lighten the Gentiles." In imitation of this cuſtom, the Roman catholics, on this day, conſecrate all the tapers and candles which they uſe in their churches during the whole year. At Rome, the pope performs that ceremony himſelf, and diſtributes wax-candles to the cardinals and others, who carry them in proceſſion through the great hall of the pope's palace. This ceremony was prohibited in England, by an order of council in 1548.

CANDLESTICK, an inſtrument to hold a candle, made in different forms, and of all ſorts of matter.

The golden candleſtick was one of the ſacred utenſils made by Moſes to be placed in the Jewiſh tabernacle. It was made of hammered gold, a talent in weight. It conſiſted of ſeven branches, ſupported by a baſe or foot. Theſe branches were adorned at equal diſtances with ſix flowers like lilies, and with as many bowls and knobs placed alternately. Upon the ſtock and ſix branches of the candleſtick, were the golden lamps, which were immoveable, wherein were put oil and cotton.

Theſe ſeven lamps were lighted every evening, and extinguiſhed every morning. The lamps had their tongs or ſnuffers to draw the cotton in or out, and diſhes underneath them to receive the ſparks and droppings of the oil. This candleſtick was placed in the antichamber of the ſanctuary on the ſouth-ſide, and ſerved to illuminate the altar of perfume, and the table of the ſhew-bread. When Solomon had built the temple of the Lord, he placed in it ten golden candleſticks, of the ſame form as that deſcribed by Moſes, five on the north, and five on the ſouth-ſide of the holy. But after the Babyloniſh captivity, the golden candleſtick was again placed in the temple, as it had been before in the tabernacle by Moſes. This ſacred utenſil, upon the deſtruction of the temple by the Romans, was lodged in the temple of Peace, built by Veſpaſian; and the repreſenſation of it is ſtill to be ſeen on the triumphal arch at the foot of mount Palatine, on which Veſpaſian's triumph is delineated.

Water-**CANDLESTICK**, a kind of fountain, the ſpout of which is raiſed upon a pedeſtal in form of a large baluſtrade, which carries a ſmall baſon like a table or ſtand, from which the water falls into a larger baſon, level with the alleys in a garden.

CANDY, in geography, the capital of the iſland of Ceylon, ſituated in the middle of the iſland: E. long. 79°, N. lat. 8°.

CANDY, or *Sugar*-**CANDY**, a preparation of ſugar, made by melting and cryſtalizing it ſix or ſeven times over, to render it hard and tranſparent. It is of three kinds, white, yellow, and red. The white comes from the loaf-ſugar, the yellow from the caſſonado, and the red from the muſcovado.

CANDYING, in pharmacy, the act of preſerving ſimples in ſubſtance, by boiling them in ſugar.

The performance of this originally belonged to the apothecaries, but is now become a part of the buſineſs of a confectioner.

CANE, in botany. See ARUNDO.

CANE denotes alſo a walking-ſtick. It is cuſtomary to adorn it with a head of gold, ſilver, agate, &c. Some are without knots, and very ſmooth and even; others are full of knots, about two inches diſtant from each other. Theſe laſt have very little elaſticity, and will not bend ſo well as the others.

Canes of Bengal, are the moſt beautiful which the Europeans bring into Europe. Some of them are ſo fine, that people work them into veſſels or bowls, which being varniſhed over in the inſide with black or yellow lacca, will hold liquors as well as glaſs or china-ware does, and the Indians uſe them for that purpoſe.

CANE is alſo the name of a long meaſure, which differs according to the ſeveral countries where it is uſed.

At Naples, the cane is equal to 7 feet 3½ inches

Engliſh meaſure: The cane of Tholouſe and the upper Languedoc is equal to the varre of Arragon, and contains 5 feet $8\frac{2}{3}$ inches; at Montpelier, Provence, Dauphine, and the lower Languedoc, to 6 Engliſh feet $5\frac{1}{2}$ inches.

CANEA, a ſea-port town on the north ſide of Candia, eſteemed the ſecond in the iſland. It is a pretty good harbour, but the fortifications are out of repair: E. long. 24°, N. lat. 35° 36′.

CANEPHORÆ, in Grecian antiquity, virgins who, when they became marriageable, preſented certain baſkets full of little curioſities to Diana, in order to get leave to depart out of her train, and change their ſtate of life.

CANEPHORIA, in Grecian antiquity, a ceremony which made part of a feaſt celebrated by the Athenian virgins, on the eve of their marriage-day.

At Athens, the canephoria conſiſted in this; that the maid, conducted by her father and mother, went to the temple of Minerva, carrying with her a baſket full of preſents, to engage the goddeſs to make the marriage-ſtate happy; or, as the ſcholiaſt of Theocritus has it, the baſket was intended as a kind of honourable amends made to that goddeſs, the protectrix of virginity, for abandoning her party; or a ceremony to appeaſe her wrath. Suidas calls it a feſtival in honour of Diana.

Canephoria is alſo the name of a feſtival of Bacchus, celebrated particularly by the Athenians, on which the young maids carried golden baſkets full of fruit, which baſkets were covered, to conceal the myſtery from the uninitiated.

CANETO, a fortified town of the duchy of Mantua, ſituated on the Oglio, about twelve miles ſouth-weſt of Mantua: E. long. 10° 50′, N. lat. 45°.

CANG, a gulf or ſea, lying between China and Tartary, at the eaſt end of the long wall.

CANICULA, in ichthyology, the trivial name of a ſpecies of ſqualus. See Squalus.

CANICULA, or Caniculus, in aſtronomy. See Astronomy, *Of fixed ſtars*.

It is alſo a name given to one of the ſtars of the conſtellation canis major, called the dog-ſtar, and by the Greeks, ſirius.

CANICULAR *days*, commonly called dog-days, a certain number of days preceding and enſuing the heliacal raiſing of canicula, or the dog-ſtar, in the morning. The Ethiopians and Egyptians began their year at the riſing of the dog-ſtar, reckoning to its riſe again the next year, which is called the annus canarius. The Romans ſuppoſed it to be the cauſe of the ſultry weather uſually felt in the dog-days; and therefore ſacrificed a brown dog every year at its riſing, to appeaſe its wrath.

The dog-days begin towards the end of July, and end the beginning of September.

CANINE, whatever partakes of, or has any relation with the nature of a dog. Thus,

Canine *teeth*, are two ſharp-edged teeth in each jaw; one on each ſide, placed between the inciſores and molares.

CANIS, or Dog, in zoology, a genus of quadrupeds, belonging to the order of feræ. The characters of the dog are theſe: He has ſix fore-teeth in the upper jaw, thoſe in the ſides being longer than the intermediate ones, which are lobated; in the under jaw there are likewiſe ſix fore-teeth, thoſe on the ſides being lobated. He has ſix grinders in the upper, and ſeven in the lower jaw. The teeth called dog-teeth are four, one on each ſide, both in the lower and upper jaw; they are ſharp-pointed, bent a little inward, and ſtand at a diſtance from any of the reſt.

There are nine ſpecies of this genus, *viz.* 1. The familiaris, or domeſtic dog, is diſtinguiſhed from the other ſpecies, by having his tail bent to the left ſide; which mark is ſo ſingular, that perhaps the tail of no other quadruped is bent in this manner. Of this ſpecies there are a great number of varieties. Linnæus enumerates eleven, and Bouffon gives figures of no leſs than twenty-ſeven, *viz.* the moloſſus, or maſtiff, which is about the ſize of a wolf, with the ſides of the lips hanging down, and a full robuſt body. The large Daniſh dog, differs only from the former in being fuller in the body, and generally of a larger ſize. The grey-hound is likewiſe the ſame with the maſtiff; but its make is more ſlender and delicate. Indeed the difference betwixt theſe three dogs, although perfectly diſtinguiſhable at firſt ſight, is not greater than that betwixt a Dutchman, a Frenchman, and an Italian. The ſhepherd's dog, the wolf-dog, and what is commonly called the Siberian dog, to which may be joined the Lapland dog, the Canada dog, and, in general, all thoſe which have ſtrait ears and a pointed ſnout, are all one kind, differing only in thickneſs, the roughneſs or ſmoothneſs of their ſkin, the length of their legs, and tails. The hound, or beagle, the terrier, the braque, or ſhort-tailed ſetting-dog, and the ſpaniel, may be conſidered as the ſame kind: they have the ſame form and the ſame inſtincts; and differ only in the length of their legs, and ſize of their ears, which in each of them are long, ſoft, and pendulous. The bull-dog, the ſmall Daniſh dog, the Turkiſh dog, and the Iceland dog, may likewiſe be conſidered as the ſame kind, all the varieties in their appearance taking their riſe merely from climate. For inſtance, the Turkiſh dog, which has no hair, is nothing elſe but the ſmall Daniſh dog tranſported to a warm climate, which makes the hair fall off. A dog of any kind loſes its hair in very warm climates. But this is not the only change which ariſes from difference of climate. In ſome countries, the voice is changed; in others, dogs become altogether ſilent. In ſome climates, they loſe the faculty of barking, and howl like wolves, or yelp like foxes. Warm climates even change their form and inſtincts: They turn ill-ſhaped, and their ears become ſtrait and pointed. It is only in temperate climes that dogs preſerve their natural courage, ardour, and ſagacity.

In order to give an idea of the different kinds of dogs, in different climates, and of the varieties produced by commixtures, we ſhall give an explanation of Bouffon's genealogical tree, See Plate LXI. fig. 1. This tree is conſtructed in the form of a geographical chart, in which the ſituation of the different climates to which the particular dogs belong, is obſerved as accurately as the nature of the thing will admit.

The ſhepherd's dog is the ſtump of the tree. This dog, when tranſported to Lapland, or any very cold climate, aſſumes an ugly appearance, and its legs become ſhort. But, in Britain, Ruſſia, Siberia, *&c.* where the cold is not ſo rigorous, and the people are more civilized, he arrives at greater perfection, both in form and ſagacity. The ſame ſhepherd's dog, when brought up in a country fully civilized. as Britain or France, loſes his ſavage air, his ſtrait ears, his thick long hair, and becomes what is called a bull-dog, a maſtiff, a beagle, or hound. Theſe changes, Bouffon attributes to the influence of the climate, the manners of the people, *&c.* The maſtiff and the bull-dog have their ears ſtill partly ſtrait, or half-pendent, and reſemble in their manners and ſanguine diſpoſition the dog from which they derive their origin. The beagle or hound preſerves leſs of the appearance of its origin than the other two; its ears are long and entirely pendent; the ſoftneſs, the tractability, the timidity of this dog, Bouffon conſiders as ſo many proofs of its great degeneracy, or rather of that perfection which it acquires by culture, and living among a civilized people.

The hound, the ſmall ſpotted ſetting-dog, and the terrier, are all of the ſame family; for all the three kinds are often produced at the ſame litter, although the female hound had been covered only by one of theſe kinds.

When the hound is tranſported to Spain, or Barbary, where almoſt every animal has fine, long, downy hair, it is changed into a water-hound, or ſpaniel. And the ſmall and large ſpaniel, which differ only in the tail, when carried to Britain, are changed from a white to a black colour, and become what is called the large and ſmall ſhagged dogs.

The maſtiff, when carried to the north, is changed into the large Daniſh dog; and when tranſported to the ſouth, it becomes a grey-hound. The large grey-hounds come from the Levant; thoſe of a leſſer ſize come from Italy; and the Italian grey-hounds, when brought to Britain, become what the French call *levrons*, that is, grey-hounds of the leaſt ſize.

The great Daniſh dog, when carried to Ireland, the Ukrain, Tartary, *&c.* is changed into the Iriſh dog, which is the largeſt of all dogs.

The bull-dog, when carried from Britain to Denmark, becomes the ſmall Daniſh dog; and this ſmall Daniſh dog, when tranſported into a warm climate, loſes its hair, and is changed into the Turkiſh dog.

All theſe races or families, with their varieties, are produced by the influence of climate, food, and education: The other kinds marked in the tree are not pure or diſtinct families, but are produced by the commixture of the other families. Theſe mungrel dogs, with the particular parents which produce them, are marked out in the tree by dotted lines. For example,

The grey-hound and maſtiff produce the mungrel grey-hound, which is likewiſe called the grey-hound with wolf's hair. The large Daniſh dog and the large ſpaniel produce the Calabrian dog; which is a beautiful dog, with long buſhy hair, and of a larger ſize than the maſtiff. The ſpaniel and the ſmall Daniſh dog produce the lion-dog, which is a very rare kind. It is needleſs to give more examples, as they can eaſily be traced from the dotted lines in the tree.

Having thus traced the varieties of the dog, and the probable ſources of theſe varieties, we ſhall now give an account of his nature and inſtincts.

From the ſtructure of the teeth, it might be concluded *à priori* that the dog is a carnivorous animal. He does not however eat indiſcriminately every kind of animal ſubſtance. There are ſome birds, as the colymbus arcticus, which the water-dog will lay hold off with keenneſs, but will not bring out of the water, becauſe its ſmell is exceedingly offenſive to him. He will not eat the bones of a gooſe, crow, or hawk: But he devours even the purtrid fleſh of moſt other animals. He is poſſeſſed of ſuch ſtrong digeſtive powers, as to draw nouriſhment from the hardeſt bones. When fleſh cannot be procured, he will eat fiſh, fruits, ſucculent herbs, and bread of all kinds. When oppreſſed with ſickneſs, to which he is very ſubject, eſpecially in the beginning of ſummer, in order to procure a puke, he eats the leaves of the quicken graſs, the bearded wheat-graſs, or the rough cock's-foot-graſs, which gives him immediate relief. When he ſteals a piece of fleſh, as conſcious of the immorality of the action, he runs off with his tail hanging and bent in betwixt his feet.

His drink is water, which he takes in ſmall quantities at a time, by licking with his tongue. He is in ſome meaſure obliged to lick in this manner, otherwiſe his noſe would be immerſed in the water.

His excrements are generally hard ſcybals, which, eſpecially after eating bones, are white, and go by the name of *album græcum* among phyſicians. This album græcum was for a long time in great repute as a ſeptic; but it is now entirely diſregarded. He does not throw out his excrements promiſcuouſly upon every thing that happens to be in the way, but upon ſtones, trunks of trees, or barren places. This is a wiſe inſtitution of nature; for the excrements of a dog deſtroy almoſt every vegetable or animal ſubſtance. They are of ſuch a putrid nature, that if a man's ſhoe touches them when recently expelled, that particular part will rot in a few days. He obſerves the ſame method in making his urine, which he throws out at a ſide. It is remarkable, that a dog will not paſs a ſtone or a wall againſt which any other dog has piſſed, without following his example, although a hundred ſhould occur in a few minutes, in ſo much, that it is aſtoniſhing how ſuch a quantity can be ſecreted in ſo ſhort a time.

The dog is an animal not only of quick motion, but remarkable for travelling very long journeys. He can eaſily keep up with his maſter, either on foot or horſeback, for a whole day. When fatigued, he does not ſweat, but lolls out his tongue. Every kind of dog can ſwim; but the water-dog excells in that article.

The dog runs round when about to lie down, in order to diſcover the moſt proper ſituation. He lies generally on his breaſt, with his head turned to one ſide, and ſometimes with his head above his two fore-feet. He ſleeps little, and even that does not ſeem to be very quiet; for he

Plate LXI.

Fig. 1

A GENEALOGICAL TABLE of the different races of DOGS

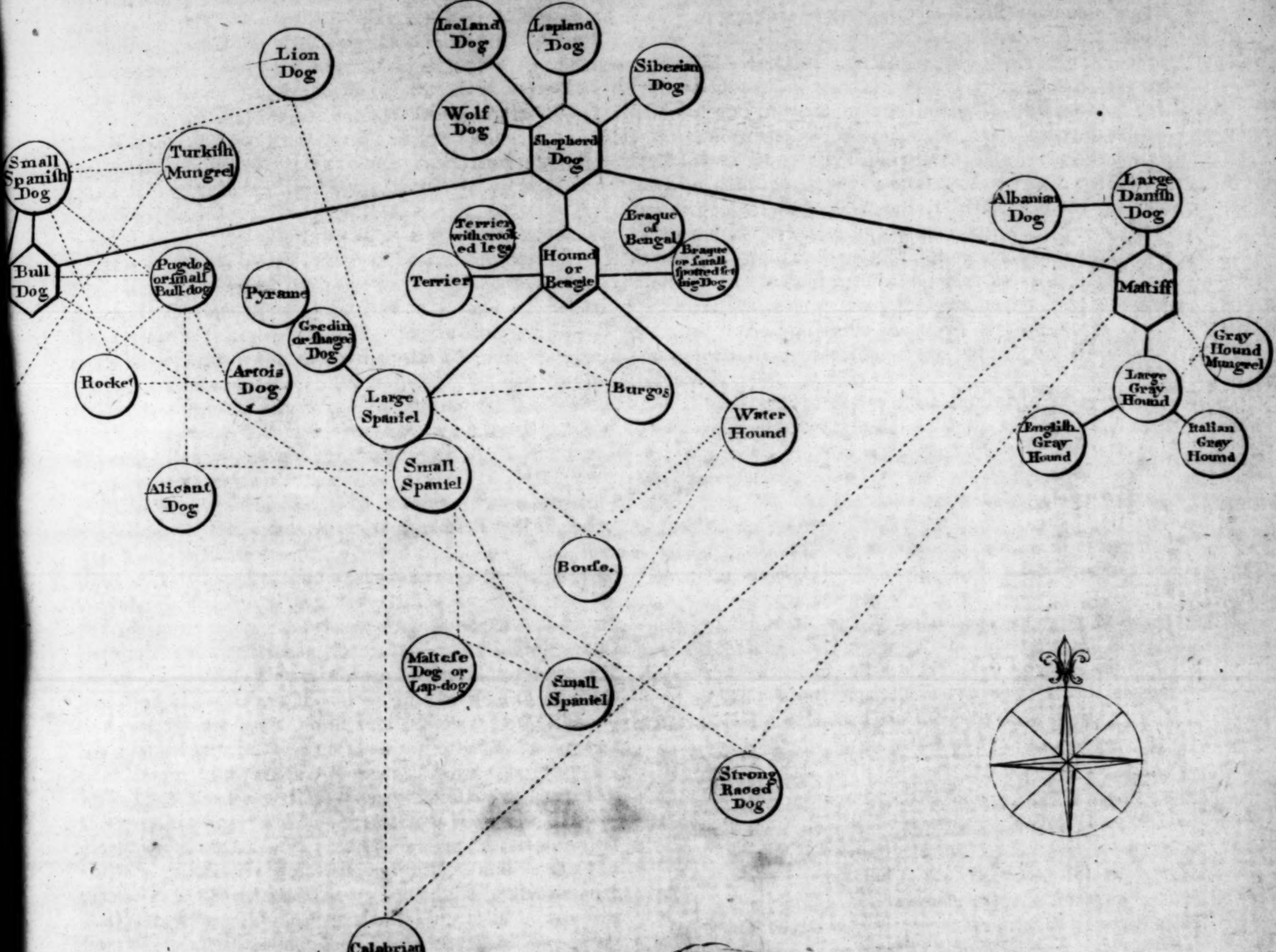

Iceland Dog
Lapland Dog
Lion Dog
Siberian Dog
Wolf Dog
Shepherd's Dog
Small Spanish Dog
Turkish Mungrel
Large Danish Dog
Albanian Dog
Terrier with crooked legs
Braque of Bengal
Bull Dog
Pugdog or small Bull-dog
Hound or Beagle
Braque or small spotted fet[?]ing Dog
Terrier
Mastiff
Pyrame
Gredin or shagged Dog
Gray Hound Mungrel
Rocket
Artois Dog
Large Spaniel
Burgos
Large Gray Hound
Water Hound
English Gray Hound
Italian Gray Hound
Small Spaniel
Alicant Dog
Bouse.
Maltese Dog or Lap-dog
Small Spaniel
Strong Raced Dog
Calabrian Dog

Fig. 2.
SHEPHERD'S DOG

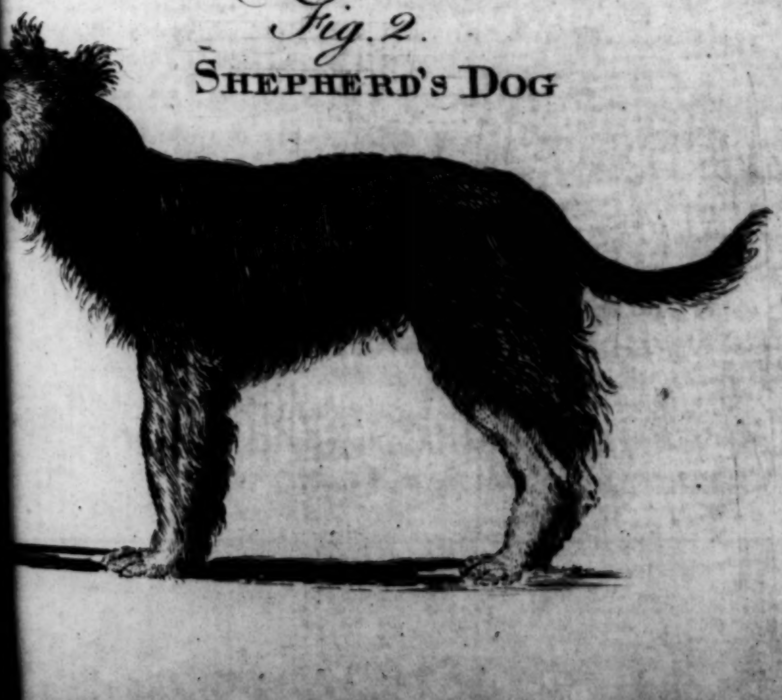
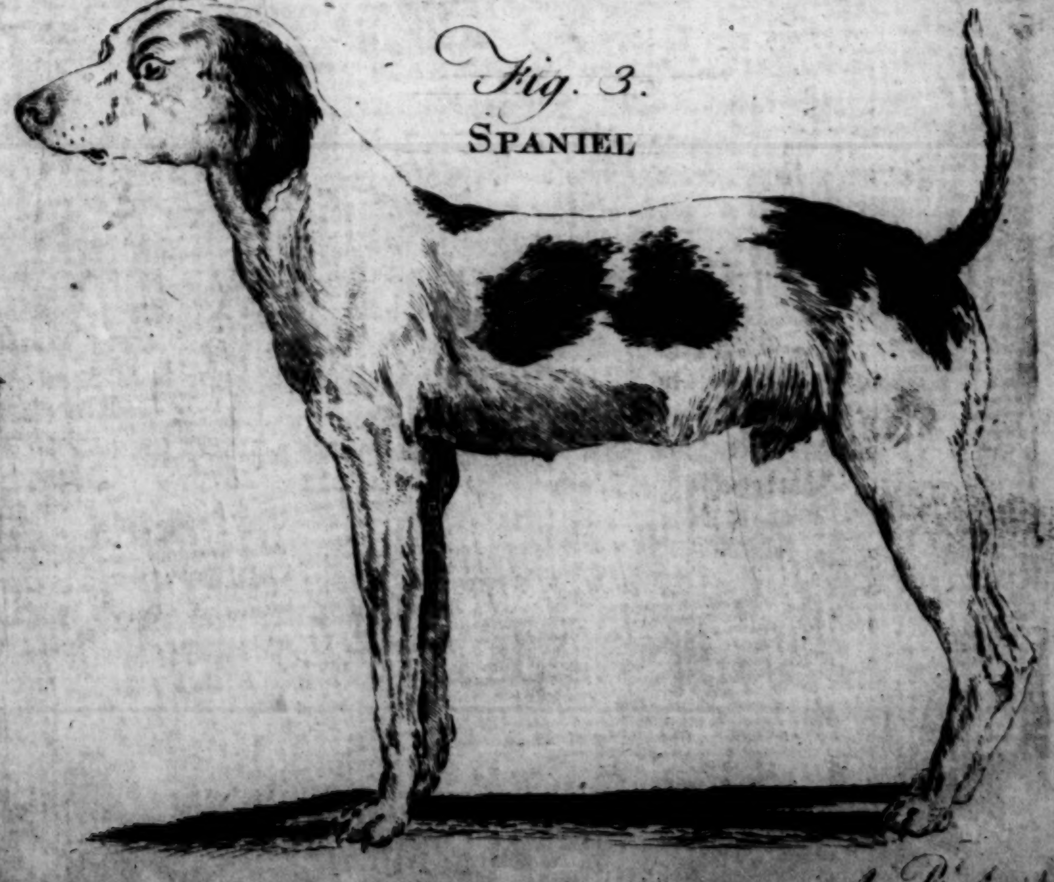


Fig. 3.
SPANIEL



A. B. sc.

4 AP 54

often ſtarts, and ſeems to hear with more acuteneſs in ſleep than when awake. They have a tremulous motion in ſleep, frequently move their legs, and bark, which is an indication of dreaming.

Dogs are poſſeſſed of the ſenſation of ſmelling in a high degree. They can trace their maſter by the ſmell of his feet in a church, or in the ſtreets of a populous city. This ſenſation is not equally ſtrong in every kind. The hound can trace game, or his maſter's ſteps, twenty-four hours afterwards. He barks more furiouſly the nearer he approaches the fowls, unleſs he be beat and trained to ſilence.

With regard to the propagation of dogs; the females admit the males before they are twelve months old. They remain in ſeaſon ten, twelve, or even fifteen days, during which time they will admit a variety of males. They come in ſeaſon generally twice in the year, and more frequently in the cold than in the hot months. The male diſcovers the condition of the female by the ſmell; but ſhe ſeldom admits him the firſt ſix or ſeven days. One coitus will make her conceive a great number of young; but, when not reſtrained, ſhe will admit ſeveral dogs every day: ſhe ſeems to have no choice or predilection, except in favour of large dogs: From this circumſtance, it ſometimes happens, that a ſmall female, who has admitted a maſtiff, periſhes in bringing forth her young. During the time of copulation, theſe animals cannot ſeparate themſelves, but remain united ſo long as the erection ſubſiſts. This is owing to the ſtructure of the parts. The dog has not only a bone in his penis, but in the middle of the corpus cavernoſum there is a large hollow, which is blown up in the time of erection to a conſiderable bulk. The female, on the other hand, has a larger clitoris then perhaps any other animal; beſides a large firm protuberance riſes in the time of copulation, and remains perhaps longer than that of the male, and prevents him from retiring till it ſubſides: Accordingly after the act of copulation is over, the male turns about in order to reſt himſelf on his legs, and remains in that poſition till theſe parts turn flaccid. The female goes with young about nine weeks. They generally bring forth from ſix to twelve puppies. Thoſe of a ſmall ſize bring forth five, four, and ſometimes but two. They continue to copulate and bring forth during life, which laſts generally about fourteen or fifteen years. The whelps are commonly blind, and cannot open their eyes till the tenth or twelfth day. In the fourth month, they loſe ſome of their teeth, which are ſoon ſucceeded by others.

The dog has ſuch a ſtrong reſemblance to the wolf and the fox, that he is commonly ſuppoſed to be the production of one or other of theſe animals tamed and civilized. Bouffon informs us, that he kept a young dog and a young wolf together till they were three years of age, without their diſcovering the leaſt inclination to copulate. He made the ſame experiment upon a dog and a fox; but their antipathy was rather increaſed when the female was in ſeaſon. From theſe experiments he concludes, that dogs, wolfs, and foxes, are perfectly diſtinct ſpecies of animals.

With regard to the natural diſpoſition of the dog: In a ſavage ſtate, he is fierce, cruel, and voracious; but, when civilized and accuſtomed to live with men, he is poſſeſſed of every amiable quality. He ſeems to have no other deſire than to pleaſe and protect his maſter. He is gentle, obedient, ſubmiſſive, and faithful. Thoſe diſpoſitions, joined to his almoſt unbounded ſagacity, juſtly claim the eſteem of mankind. Accordingly no animal is ſo much careſſed or reſpected: He is ſo ductile, and ſo much formed to pleaſe, that he aſſumes the very air and temper of the family in which he reſides.

An animal endowed with ſuch uncommon qualities, muſt anſwer many uſeful purpoſes. His fidelity and vigilance are daily employed to protect our perſons, our flocks, or our goods. The acuteneſs of his ſmell gains him employment in hunting; in ſome parts of Siberia, he is trained to draw carriages from one inn to another; and the negroes eat dogs fleſh with great reliſh.

The dog is liable to many diſeaſes, as the ſcab, madneſs, *&c.* and he ſeldom wants the tænia or tape-worm in his guts, eſpecially if he drinks dirty water. See Plate LXI. and LXII.

2. The ſecond ſpecies of this kind is the lupus or wolf, which is diſtinguiſhed from the dog by having its tail turned inward. The wolf is larger and fiercer than a dog. His eyes ſparkle, and there is a great degree of fury and wildneſs in his looks. He draws up his claws when he walks, to prevent his tread from being heard. His neck is ſhort, but admits of very quick motion to either ſide. His colour is generally blackiſh. Like moſt ferocious animals, he can bear hunger a very long time; but, at laſt, when the appetite for victuals becomes intolerable, he grows perfectly furious, and will attack men, horſes, dogs, and cattle of all kinds; even the graves of the dead are not proof againſt his rapacity. This circumſtance is finely deſcribed, in the following lines.

> By wintry famine rous'd,———
> Cruel as death, and hungry as the grave!
> Burning for blood! bony, and ghant, and grim!
> Aſſembling wolves in raging troops deſcend;
> And, pouring o'er the country, bear along,
> Keen as the north-wind ſweeps the gloſſy ſnow.
> All is their prize. They faſten on the ſteed,
> Preſs him to earth, and pierce his mighty heart.
> Nor can the bull his awful front defend,
> Or ſhake the murthering ſavages away.
> Rapacious at the mother's throat they fly,
> And tear the ſcreaming infant from her breaſt.
> The god-like face of Man avails him nought.
> Even beauty, force divine! at whoſe bright glance
> The generous lion ſtands in ſoften'd gaze,
> Here bleeds, a hapleſs undiſtinguiſh'd prey.
> But if, appris'd of the ſevere attack,
> The country be ſhut up, lur'd by the ſcent,
> On church-yards drear (inhuman to relate!)
> The diſappointed prowlers fall; and dig
> The ſhrouded body from the grave; o'er which,
> Mix'd with foul ſhades, and frighted ghoſts, they howl.
>
> Thomson's Winter.

The wolf is extremely ſuſpicious, and, unleſs preſſed with hunger, ſeldom ventures out of the woods. They make a howling noiſe in the night, and aſſemble together in troops in order to devour their prey. The wolf is a native of Europe, and frequents the woods of many parts of the continent to this day. This country, a few centuries ago, was much infeſted with them. So late as the year 1457, there is an act of parliament obliging all the gentlemen and tenants in the different ſhires of Scotland, to riſe, properly armed, four times in the year, in order to deſtroy the wolves. But they are now ſo effectually rooted out, that not one of them has been ſeen wild, even in the highlands, for a century paſt. See Plate LXII. fig. 5.

3. The hyæna, has a ſtrait jointed tail, with the hair of its neck erect, ſmall naked ears, and four toes on each foot. It is about the ſize of a ſow, and its head reſembles that of a boar. The hairs on the back are about a ſpan long, erect, and black at the points, and the eyes are near each other. The hyæna is a native of India and Africa. He digs holes in the earth like a fox, where he retires from danger. He is very fond of human fleſh, which he digs out of church-yards in the night. When irritated, he lays hold of a weapon, or any thing that offends, and keeps it faſt in his teeth, which makes him an eaſy prey to hunters.

4. The vulpes, or fox, has a ſtrait tail, white at the point. His body is yellowiſh, or rather ſtraw-coloured; his ears are ſmall and erect; his lips are whitiſh, and his fore-feet are black. From the baſe of the tail, a ſtrong ſcent is emitted, which to ſome people is very fragrant, and to others extremely diſagreeable. The fox is a native of almoſt every quarter of the globe: He digs holes or dens in the earth; and is of ſuch a wild and ſavage diſpoſition, that it is impoſſible fully to tame him. He is eſteemed to be the moſt crafty and cunning of all beaſts of prey. His craftineſs is principally diſcovered by the ſchemes he falls upon in order to catch lambs, geeſe, hens, and all kinds of ſmall birds. When the females are in ſeaſon, they make a diſagreeable yelping noiſe in the night. He flies when he hears the exploſion of a gun, or ſmells gun-powder. He is exceedingly fond of grapes, and does much miſchief in vineyards. Various methods are daily employed to deſtroy foxes; they are hunted with dogs; iron-traps are often ſet at their holes; and their holes are ſometimes ſmoked to make them run out, that they may the more readily fall into the ſnares, or be killed by dogs or fire-arms. But all the arts that have been employed are inſufficient for the purpoſe of rooting him out of any country. They have ſo many paſſages in their dens, and often at a great diſtance, that they often make their eſcape. When hunted, they never run directly foreward, but make a great many doublings and turnings; and when in danger of being taken, they emit ſuch a ſmell from their poſteriors, that the hunters can hardly endure it. See Plate LXII. fig. 4.

5. The alopex, or field-fox, is every way the ſame with the common fox, except in the point of the tail, which is black.

6. The lagopus, or white fox, with a ſtrait tail, and the apex of different colours. The legs are very hairy. It inhabits the mountains of Lapland and Siberia.

7. The aureus, or jackall, is a native of the Eaſt Indies. There is no genuine deſcription of this animal. They aſſemble in large troops in the night, in ſeveral parts of Aſia, and make a hideous howling noiſe. When one calls, he is anſwered by numbers even at great diſtances; ſo that in a ſhort time the whole woods reſound with their noiſe. This noiſe rouſes all the other wild animals, as lions, tygers, *&c.* who take advantage of the general conſternation, and devour the weaker animals. This circumſtance has probably given riſe to the notion of the jackall's being the lion's provider. They hide themſelves in holes during the day, and go in queſt of their prey in the night: They ſometimes fall upon children, and devour them when no aſſiſtance is near.

8. The Mexicanus, has a ſmooth crooked tail. The body is aſh-coloured, variegated with yellow ſpots. It is a native of Mexico, and is called the mountain-cat by Seba.

9. The thous, has a ſmooth, crooked tail. The upper part of his body is grey, and the belly is white. He is about the ſize of a large cat, and is found at Surinam.

Canis, the **Dog-fish**, a name given to ſeveral ſpecies of ſqualus. See Squalus.

Canis *major*, in aſtronomy, a conſtellation of the ſouthern hemiſphere.

Canis *minor*, **Caniculus**, or **Canicula**, in aſtronomy, a conſtellation of the northern hemiſphere.

CANKER, a diſeaſe incident to trees, proceeding chiefly from the nature of the ſoil. It makes the bark rot and fall. If the canker be in a bough, cut it off; in a large bough, at ſome diſtance from the tree; and in a ſmall one, cloſe to it: But for over-hot ſtrong ground, the mold is to be cooled about the roots with pond mud, and cow-dung.

CANNA, in botany, a genus of the monandria monogynia claſs. There are four ſpecies of this plant, all natives of the Indies.

CANNABIS, hemp, in botany, a genus of the diœcia pentandria claſs. The calix of the male is divided into five ſegments, and it has no corolla. The calix of the female conſiſts of one leaf, open at the ſide; it has two ſtyli; and the nut or capſule conſiſts of two valves. There is but one ſpecies, *viz.* the ſativa, or common hemp, a native of India. For the method of cultivating and preparing hemp, ſee Flax, and Hemp.

CANNACORUS, in botany. See Canna.

CANNEL-COAL, a ſubſtance which has a long time, though with very little reaſon, been confounded, both by authors and druggiſts, with jet. It is dug up in many parts of England in great abundance, particularly in Lancaſhire, where it is burnt as common fuel. It is worked into toys and utenſils of various kinds, under the name of jet. In medicine, it is ſaid to be good in the colic; but the preſent practice takes no notice of it.

CANNON, in the military art, an engine or fire-arm for throwing iron, lead, or ſtone bullets, by force of gunpowder.

Cannons at firſt were called bombardæ, from the noiſe they made. They had likewiſe the name of culverin, baſiliſk, *&c.* from the beaſts that were repreſented upon them; and the Spaniards, from devotion, gave them the name of ſaints; witneſs the twelve apoſtles which Charles V. ordered to be caſt at Malaga, for his expedition to Tunis.

The metal of which cannons are compoſed, is either iron, or which is more uſual, a mixture of copper, tin, and braſs; the tin being added to the copper, Plate LXII.

Fig. 1.
BULL DOG.

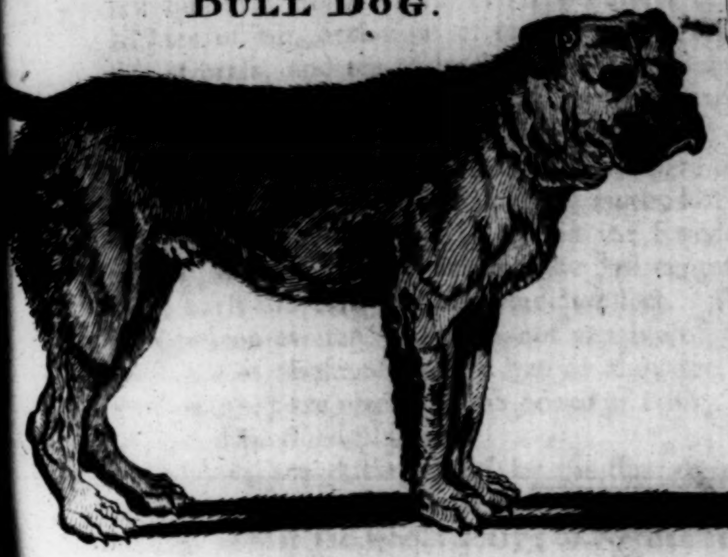


Fig. 2.
MASTIFF.

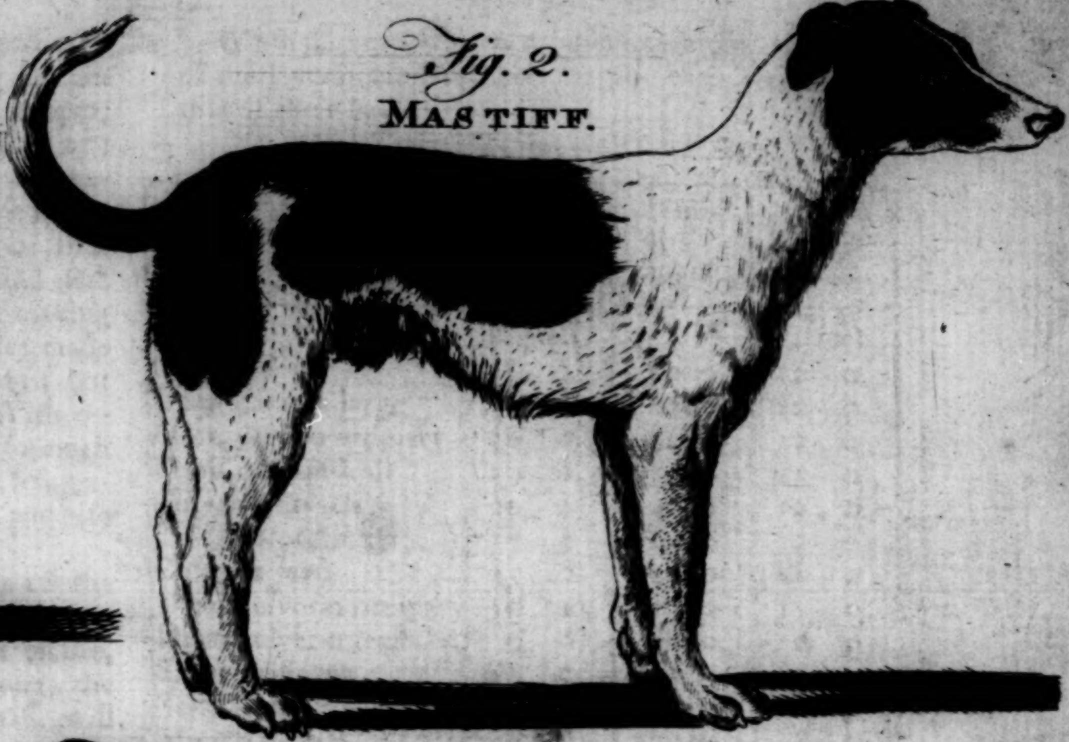


Fig. 3.
GRAY HOUND.

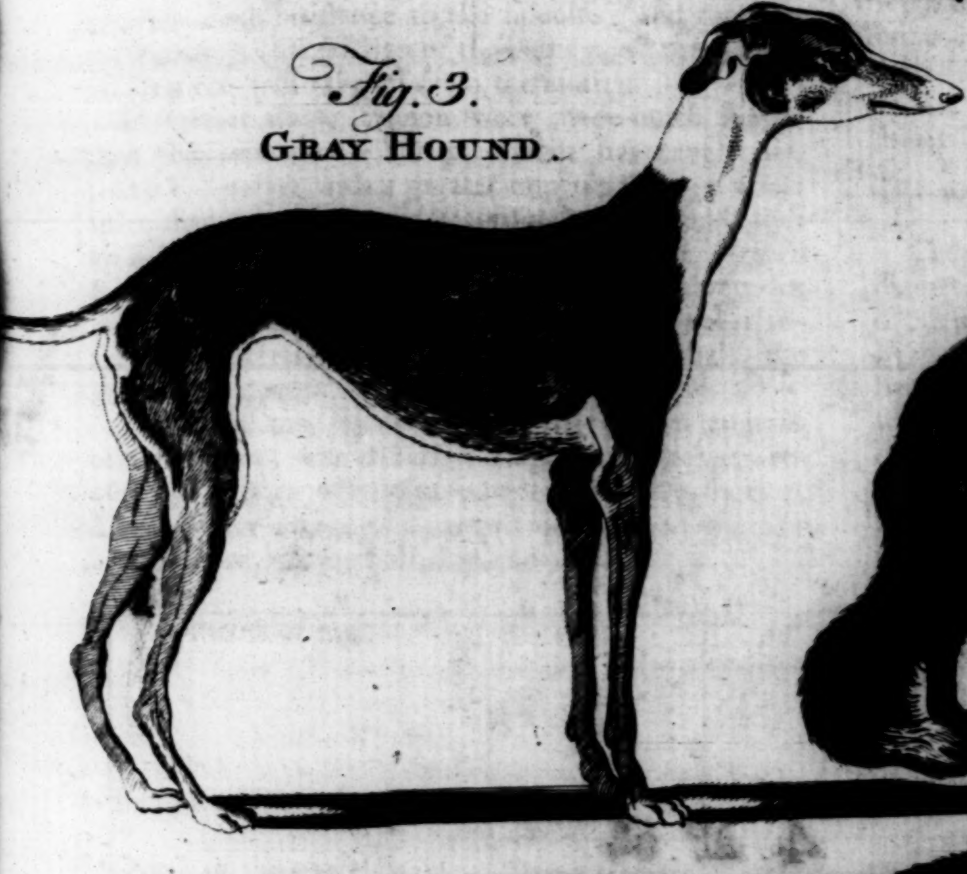
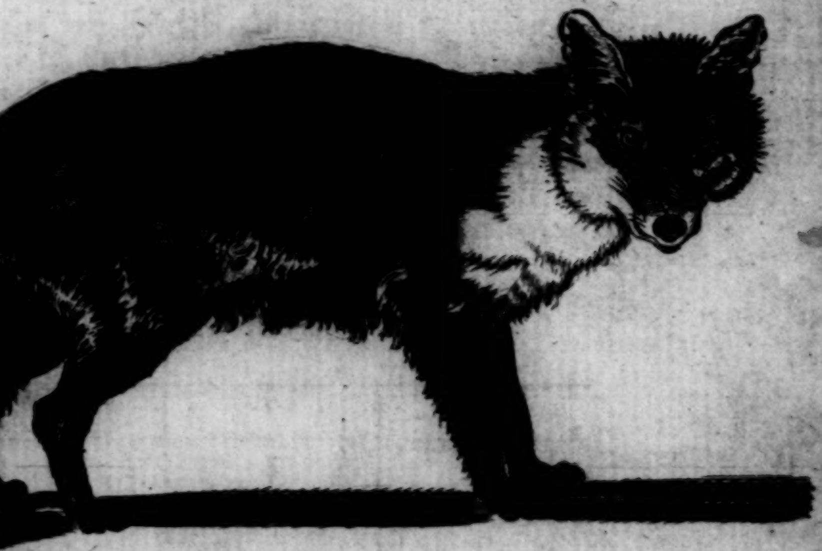


Fig. 4.
FOX.



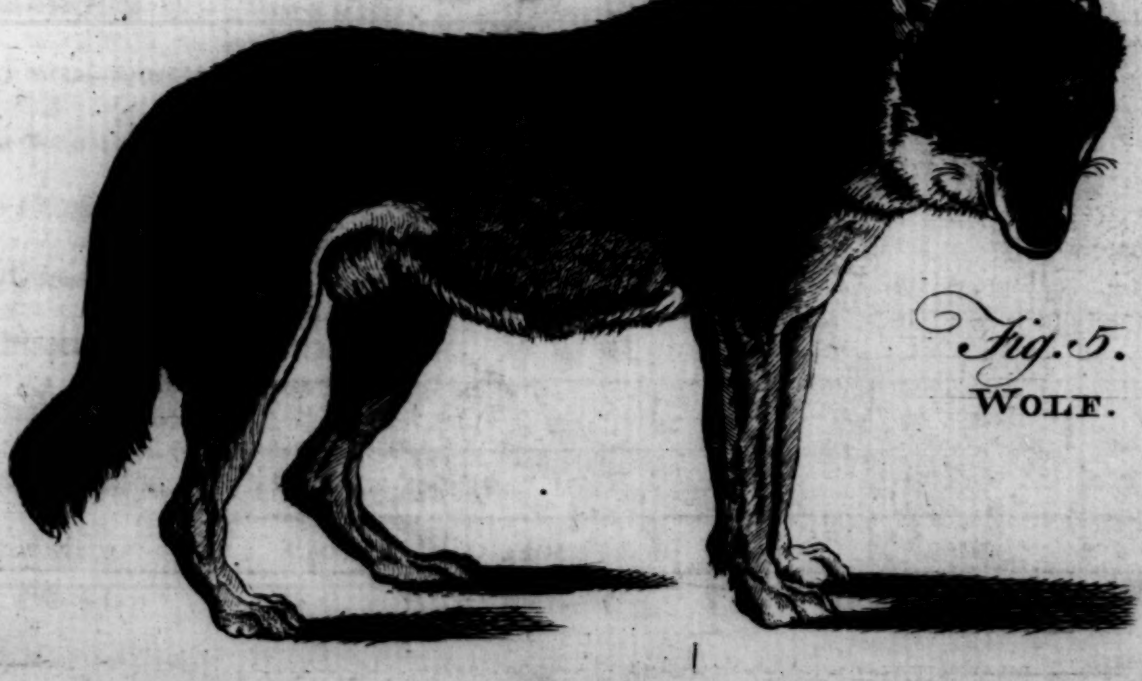


Fig. 5.
WOLF.

A. Bell Sculpt.

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per, to make the metal more denſe and compact; ſo that the better and heavier the copper is, the leſs tin is required. Some to an hundred pounds of copper, add ten of tin, and eight of braſs; others ten of tin, five of braſs, and ten of lead. The ſieur Bereau pretends, that when old pieces of metal are uſed, the founder ought to add to one hundred weight of that metal, twenty-five pounds of good copper, and five pounds of tin. Braudius deſcribes a method of making cannon of leather; and it is certain the Swedes made uſe of ſuch in the long war of the laſt century; but theſe burſt too eaſily to have much effect. With regard to iron cannon, they are not capable of ſo much reſiſtance as thoſe of braſs; but as they are leſs expenſive, they are often uſed on board of ſhips, and alſo in ſeveral fortified places.

Cannons are diſtinguiſhed by the diameters of the balls they carry. The rule for their length is, that it be ſuch as that the whole charge of powder be on fire, before the ball quit the piece. If it be too long, the quantity of air to be drawn out before the ball, will give too much reſiſtance to the impulſe; and that impulſe ceaſing, the friction of the ball againſt the ſurface of the piece will take off from the motion.

In former days, cannon were made much longer than they are now; but experience has taught us, that a ball moves with a greater impetus through a leſs ſpace than a greater: and accordingly it is found, that an iron ball of forty-eight pound weight goes farther from a ſhort cannon, than another ball of ninety-ſix pound out of a longer piece; whereas, in other reſpects, it is certain, the larger the bore and ball, the greater the range.

It is found too, by experience, that of two cannons of equal bore, but different lengths, the longer requires a greater charge of powder than the ſhorter. The ordinary charge of a cannon is, for the weight of its gun-powder to be half that of its ball.

We ſhall here ſubjoin a table exhibiting the names of the ſeveral cannon, their length, their weight, and that of their ball.

Names of cannon.	weight of an iron ball.		weight of the cannon.	length of the cannon.	
	℔.	oz.	℔.	f.	inch.
Cannon royal	48	0	8000	12	0
Demi cannon large	36	0	6000	12	0
Demi cannon ordinary	32	0	5600	12	0
Demi cannon leaſt	30	0	5400	11	0
Culverin largeſt	20	0	4800	12	0
Culverin ordinary	17	5	4500	12	0
Culverin leaſt	15	0	4000	11	0
Demi culverin ordinary	10	11	2700	11	0
Demi culverin leaſt	9	0	2000	10	0
Saker ordinary	6	0	1500	10	0
Saker leaſt	4	12	1400	8	0
Minion largeſt	3	12	1000	8	0
Minion ordinary	3	4	800	7	0
Falcon	2	8	750	6	0
Falconet	1	5	400	5	6
Rabinet	0	8	300	5	6
Baſe	0	5	200	4	6

Cannon are likewiſe diſtinguiſhed according to the diameter of their mouth, or calibre. This calibre is divided, in conſequence of an order from the king of France, into thirty-ſix parts, in order to determine by theſe parts the dimenſions of the different moulds for cannon. We hope the reader, then, will not be diſſatisfied to find an account of the dimenſions of the ſeveral parts of cannon of five different calibres, as they are regulated by that order of the king of France, on Oct. 7, 1732, in the following table:

Pieces of cannon	of 24			of 16			of 12			of 8			of 4		
	feet.	inch.	lines.	feet.	inch.	lines.	feet.	inch.	lines.	feet.	inch.	lines.	feet.	inch.	lines.
Length of the bore	9	6		9	2		8	8		7	10		6	6	
Depth of the chamber	2	6			1	10									
Thickneſs of metal at breech		5	5		4	9		4	4		3	9		3	
Length of the caſcabel		10	11		9	6		8	8		7	7		6	
Diameter of the trunions		5	5		4	9		4	4		3	10		3	
Projection of the trunions		5	5		4	9		4	4		3	10		3	
Calibre of the piece		5	8		4	11		4	6		3	11		3	2
Diameter of the ball		5	6		4	9		4	4		3	9		3	
Length of the whole piece	11			10	6		10			8	10		7	3	
Weight of the piece	5400			4200			3200			2100			1150 ℔.		

Cannon, with letter-founders and printers, the name of the largeſt ſize of the letters they uſe.

CANNULA, in ſurgery, a tube made of different metals, principally of ſilver and lead, but ſometimes of iron.

They are introduced into hollow ulcers, in order to facilitate a diſcharge of pus or any other ſubſtance; or into wounds, either accidental or artificial, of the large cavities, as the thorax or abdomen: they are uſed in the operation of branchotomy, and by ſome, after cutting for the ſtone, as a drain for the urine.

Other cannulas are uſed for introducing cauteries, either actual or potential, in hollow parts, in order to guard the parts adjacent to that to be cauteriſed, from injury. They are of various figures; ſome being oval, ſome round, and others crooked.

CANOE, a ſmall boat, made of the trunk of a tree, bored hollow; and ſometimes alſo of pieces of bark ſewed together.

It is uſed by the natives of America to go a-fiſhing in the ſea, or upon ſome other expedition, either by ſea, or upon the rivers and lakes.

CANON, commonly called prebendary, a perſon who poſſeſſes a prebend, or revenue allotted for the performance of divine ſervice in a cathedral or collegiate church. Originally, canons were only prieſts, or inferior eccleſiaſtics, who lived in community, reſiding near the cathedral church to aſſiſt the biſhop, depending entirely on his will, ſupported by the revenues of his biſhopric, and living in the ſame houſe as his domeſtics or counſellors, *&c.* By degrees theſe communities of prieſts, ſhaking off their dependence, formed ſeparate bodies; in time they freed themſelves from their rules, and at length ceaſed to live in a community. It is maintained, that the colleges of canons, which have been introduced into each cathedral, were not in the ancient church, but are of modern appointment.

In the Romiſh church, when a perſon is promoted to the office of a canon, he muſt be preſented in a very ceremonious manner to the chapter, who aſſemble in the cathedral, in order to receive him: he kiſſes the altar thrice, after which he goes and takes his place in the choir; he afterwards makes his confeſſion of faith aloud, and ſwears to obſerve the ordinances of the church and his holineſs the pope: being thus ſolemnly inſtalled, he is impowered to aſſiſt at the chapter, to chaunt the office of the choir, *&c.*

Canons are of various kinds, as,

Cardinal-**Canons**, thoſe attached, or, as the Latins call it, *incardinati*, to a church, as a prieſt is to a pariſh.

Domicellory-**Canons**, young canons, who, not being in orders, had no right in any particular chapters.

Expectative-**Canons** were ſuch as, without having any revenue or prebend, had the titles and dignities of canons, a voice in the chapter, and a place in the choir, till ſuch time as a prebend ſhould fall.

Foreign **Canons**, ſuch as did not officiate in the canonries to which they belonged. To theſe were oppoſed manſionary canons.

Regular **Canons**, thoſe who ſtill live in community, and who, like religious, have, to the practice of their rules, added the ſolemn profeſſion of vows.

Tertiary **Canon**, a perſon who had only the third part of the revenues of the canonicate.

Canon, in an eccleſiaſtical ſenſe, a law, rule, or regulation of the policy and diſcipline of a church, made by councils either general, national, or provincial.

Canons *of the apoſtles*, a collection of eccleſiaſtical laws, which, though very ancient, were not left us by the apoſtles. It is true, they were ſometimes called apoſtolic canons; but this means no more than that they were made by biſhops, who lived ſoon after the apoſtles, and were called apoſtolical men. They conſiſt of regulations, which agree with the diſcipline of the ſecond and third centuries: The Greeks generally count eighty-five, but the Latins receive only fifty, nor do they obſerve all theſe.

Canon *of maſs*, in the Romiſh church, the name of a prayer which the prieſt reads low to himſelf, the people kneeling.

In this part of the maſs, the prieſt particularly mentions ſome perſons for whom he is going to offer the ſacrifices, and prays to God for the redemption of their ſouls, the hopes of their ſalvation, *&c.*

Paſchal **Canon**, a table of the moveable feaſts, ſhewing the day of Eaſter, and the other feaſts depending on it, for a cycle of nineteen years.

Canon *of ſcripture*, a catalogue or liſt of the inſpired writings, or ſuch books of the Bible as are called canonical; becauſe they are in the number of thoſe books which are looked upon as ſacred, in oppoſition to thoſe which are either not acknowledged as divine books, or are rejected as heretical and ſpurious, and are called apocryphal.

Canon, in monaſtic orders, a book wherein the religious of every convent have a fair tranſcript of the rules of their order, frequently read among them, as their local ſtatutes.

Canon is alſo uſed for the catalogue of ſaints acknowledged and canonized in the Romiſh church.

Canon, in muſic, a ſhort compoſition of two or more parts, in which one leads, and the other follows: Or it is a line of any length, ſhewing, by its diviſions, how muſical intervals are diſtinguiſhed, according to the ratios, or proportions, that the ſounds terminating the intervals, bear one to another, when conſidered according to their degree of being acute or grave.

Canon-Law, a collection of eccleſiaſtical laws, ſerving as the rule and meaſure of church-government.

The power of making laws was exerciſed by the church before the Roman empire became Chriſtian. The canon-law that obtained throughout the Weſt, till the twelfth century, was the collection of canons made by Dionyſius Exiguus in 520, the capitularies of Charlemagne, and the decrees of the popes, from Sircius to Anaſtaſius.

The canon-law, even when papal authority was at its height in England, was of no force when it was found to contradict the prerogative of the king, the laws, ſtatutes, and cuſtoms of the realm, or the doctrine of the eſtabliſhed church.

The eccleſiaſtical juriſdiction of the ſee of Rome in England, was founded on the canon-law; and this created quarrels between kings and ſeveral archbiſhops and prelates, who adhered to the papal uſurpation.

Beſides the foreign canons, there were ſeveral laws and conſtitutions made here for the government of the church; but all theſe received their force from the royal aſſent: And if, at any time, the eccleſiaſtical courts did, by their ſentence, endeavour to enforce obedience to ſuch canons, the courts at common law, upon complaints made, would grant prohibitions. The authority veſted in the church of England of making canons, was aſcertained by a ſtatute of Henry VIII. commonly called the act of the clergy's ſubmiſſion; by which they acknowledged, that the convocation had been always aſſembled by the king's writ; ſo that though the power of making canons reſided in the clergy met in convocation, their force was derived from the authority of the king's aſſenting to, and confirming them.

The old canons continued in force till the reign of James I. when the clergy being aſſembled in convocation, the king gave them leave to treat and conſult upon canons; which they did, and preſented them to the king, who gave them the royal aſſent: Theſe were a collection out of the ſeveral preceding canons and injunctions. Some of theſe canons are now obſolete. In the reign of Charles I. ſeveral canons were paſſed by the clergy in convocation.

CANONESS, in the Romiſh church, a woman who enjoys a prebend, affixed, by the foundation, to maids, without their being obliged to renounce the world, or make any vows.

CANONIZATION, a ceremony in the Romiſh church, by which perſons deceaſed are ranked in the catalogue of the ſaints. It ſucceeds beatification. See BEATIFICATION.

Before a beatified perſon is canonized, the qualifications of the candidate are ſtrictly examined into, in ſome conſiſtories held for that purpoſe; after which one of the conſiſtorial advocates, in the preſence of the pope and cardinals, makes the panegyric of the perſon who is to be proclaimed a ſaint, and gives a particular detail of his life and miracles: Which done, the holy father decrees his canonization, and appoints the day.

On the day of canonization, the pope officiates in white, and their eminences are dreſſed in the ſame colour. St Peter's church is hung with rich tapeſtry, upon which the arms of the pope, and of the prince or ſtate requiring the canonization, are embroidered in gold and ſilver. An infinite number of lights blaze all round the church, which is crowded with pious ſouls, who wait, with a devote impatience, till the new ſaint has made his public entry, as it were, into paradiſe, that they may offer up their petitions to him, without danger of being rejected.

The following maxim, with regard to canonization, is now obſerved, though it has not been followed above a century, *viz.* not to enter into the inquiries prior to canonization, till fifty years, at leaſt, after the death of the perſon to be canonized. By the ceremony of canonization, it appears, that this rite of the modern Romans, has ſomething in it very like the apotheoſis or deification of the ancient Romans, and in all probability owes its riſe to it; at leaſt, ſeveral ceremonies of the ſame nature are conſpicuous in both.

CANONOR, a town on the Malabar coaſt, in the Hither India: E. long. 75°, N. lat. 10°.

Here the Dutch have a fort and factory, which they took from the Portugueſe in 1663.

CANONRY, the benefice filled by a canon. It differs from a prebend, in that the prebend may ſubſiſt without the canonicate; whereas the canonicate is inſeparable from the prebend; again, the rights of ſuffrages, and other privileges, are annexed to the canonicate, and not to the prebend.

CANOPUS, in aſtronomy, a ſtar of the firſt magnitude in the rudder of Argo, a conſtellation of the ſouthern hemiſphere. See ASTRONOMY, *Of the fixed ſtars.*

CANTABRICA, in botany, a ſynonime of a ſpecies of convolvulus. See CONVOLVULUS.

CANTALIVERS, in architecture, pieces of wood framed into the front or other ſides of a houſe, to ſuſpend the mouldings and eyes over it.

CANTAR, or CANTARO, in commerce, a weight uſed in Italy, particularly at Leghorn, to weigh ſome ſorts of merchandiſes.

There are three ſorts of cantari, or quintals, one weighs 150 pounds, the other 151, and the third, 160: The firſt ſerves to weigh alum and cheeſe, the ſecond is for ſugar, and the third for wool and codfiſh.

CANTAR is alſo a meaſure of capacity uſed at Cochin, and containing four rubis.

CANTATA, in muſic, a ſong or compoſition, intermixed with recitatives, airs, and different movements, chiefly intended for a ſingle voice, with a thorough baſs, though ſometimes for other inſtruments.

The cantata, when performed with judgment, has ſomething in it very agreeable; the variety of the movement not clogging the ear, like other compoſitions. It was firſt uſed in Italy, then in France, whence it paſſed to us.

CANTERBURY, the capital city of Kent, fifty-five miles eaſt of London, and ſixteen north-weſt of Dover: E. long. 1° 15′, N. lat. 51° 16′.

It is a county of itſelf, and the ſee of an archbiſhop, who is primate and metropolitan of all England. It is a large, populous, and trading city; has a good ſilk manufactory, and ſends two members to parliament.

CANTERBURY-BELL, in botany. See CAMPANULA.

CANTHARIS, in zoology, a genus of inſects belonging to the order of inſecta coleoptera. The feelers of this genus are ſetaceous; the breaſt is marginated, and ſhorter than the head; the elytra, or wing-caſes, are flexile; and the ſides of the belly are plaited and papillous. Linnæus enumerates 27 ſpecies of the cantharis, moſt of them to be found in differents parts of

Europe. The cantharis uſed in making bliſtering plaſters, is ranked under a different genus, *viz.* the Meloe. See Meloe.

CANTICLES, a canonical book of the Old Teſtament. The Talmudiſts aſcribe it to Hezekiah, but the learned are agreed that king Solomon was the author of it; and his name is prefixed to it in the title of the Hebrew text, and of the ancient Greek verſion.

CANTO, in muſic, the treble, or at leaſt the higher part of a piece.

This word more properly ſignifies the firſt treble, unleſs the word *ſecundo*, for the ſecond, or *ripieno*, for the treble of the grand chorus, be added.

CANTON, in geography, denotes a ſmall country, or diſtrict, conſtituting a diſtinct government: ſuch are the cantons of Switzerland.

Canton is alſo the name of a large, populous, and wealthy city and port-town of China, ſituated on the river Ta, about fifty miles from the Indian ocean: E. long. 112° 30′, N. lat. 23° 25′.

It is a fortified place, within the walls of which no Chriſtians are permitted to enter, notwithſtanding their great trade thither; it being from thence that they import all manner of Chineſe goods, as china-ware, tea, cabinets, raw and wrought ſilks, gold-duſt, *&c.*

CANTONING, in the military art, is the allotting diſtinct and ſeparate quarters to each regiment of an army; the town where they are quartered, being divided into ſo many cantons, or diviſions, as there are regiments.

CANTRED, or Cantref, ſignifies an hundred villages, being a Britiſh word, compounded of the adjective *cant*, i. e. hundred, and *tref*, a town or village. In Wales, ſome of the countries are divided into cantreds, as in England into hundreds.

CANVAS, in commerce, a very clear unbleached cloth of hemp, or flax, wove very regularly in little ſquares. It is uſed for working tapeſtry with the needle, by paſſing the threads of gold, ſilver, ſilk, or wool, through the intervals or ſquares.

Canvas is alſo a coarſe cloth of hemp, unbleached, ſomewhat clear, which ſerves to cover womens ſtays, alſo to ſtiffen mens cloaths, and to make ſome other of their wearing-apparel, *&c.*

Canvas is alſo a very coarſe cloth made of hemp, unbleached, ſerving to make towels, and anſwering other domeſtic purpoſes. It is alſo uſed to make ſails for ſhipping, *&c.*

Canvas is uſed among the French, for the model and firſt words, where an air or piece of muſic is compoſed, and given to a poet to regulate and finiſh.

CANATUS, in ornithology, the trivial name of a ſpecies of tringa. See Tringa.

CANZONE, in muſic, ſignifies, in general, a ſong where ſome little figures are introduced: But it is ſometimes uſed for a ſort of Italian poem, uſually pretty long, to which muſic may be compoſed in the ſtyle of a cantata. If this term be added to a piece of inſtrumental muſic, it ſignifies much the ſame as cantata: If placed in any part of a ſonata, it implies the ſame meaning as *allegro*, and only denotes that the part to which it is prefixed, is to be played or ſung in a briſk and lively manner.

CANZONETTA, a diminutive of canzone, denoting a little ſhort ſong: The canzonette neapolitane have two ſtrains, each whereof is ſung twice over, as the vaudevilles of the French: The canzonette ſiciliane are a ſpecies of jigg, the meaſure whereof is uſually twelve eights, and ſix eights, and ſometimes both, as rondeaus.

CAP, a part of dreſs made to cover the head, and much in the figure thereof.

The uſe of caps and hats is referred to the year 1449, the firſt ſeen in theſe parts of the world being at the entry of Charles VII. into Rouen: from that time they began to take place of the hoods, or chaperoons, that had been uſed till then. When the cap was of velvet, they called it mortier; when of wool, ſimply bonnet. None but kings, princes, and knights, were allowed the uſe of the mortier. The cap was the head-dreſs of the clergy and graduates: Churchmen and members of univerſities, ſtudents in law, phyſic, *&c.* as well as graduates, wear ſquare caps in moſt univerſities. Doctors are diſtinguiſhed by peculiar caps, given them in aſſuming the doctorate. Paſquier ſays, that the giving the cap to ſtudents in the univerſities, was to denote that they had acquired full liberty, and were no longer ſubject to the rod of their ſuperiors, in imitation of the ancient Romans, who gave a pileus or cap to their ſlaves, in the ceremony of making them free. The cap is alſo uſed as a mark of infamy in Italy. The Jews are diſtinguiſhed by a yellow cap at Lucca, and by an orange one in France.

Cap *of maintenance*, one of the regalia, or ornaments of ſtate belonging to the kings of England, before whom it was carried at the coronation, and other great ſolemnities. Caps of maintenance are alſo carried before the mayors of the ſeveral cities in England.

CAPE, in geography, an high land running out with a point, into the ſea, as Cape-Nord, Cape-Horn, the Cape of Good-Hope, *&c.*

Cape *of Good-Hope.* See Good-Hope.

Cape-*coaſt-caſtle*, the principal Britiſh fort and ſettlement on the gold-coaſt of Guinea, ſituated under the meridian of London, in 5° N. lat.

CAPELLA, in aſtronomy, a bright fixed ſtar in the left ſhoulder of the conſtellation auriga.

CAPER, in botany. See Capparis.

CAPERQUIN, a town of Ireland, in the county of Waterford, and province of Munſter, ſituated on the river Blackwater: W. long. 7° 50′, and N. lat. 52° 5′.

CAPHAR, a duty which the Turks raiſe on the Chriſtians, who carry or ſend merchandiſes from Aleppo to Jeruſalem, and other places in Syria.

This duty of caphar was firſt impoſed by the Chriſtians themſelves, when they were in poſſeſſion of the Holy land, for the maintenance of the troops, which were planted in difficult paſſes, to obſerve the Arabs, and prevent their incurſions. It is ſtill continued, and much increaſed by the Turks, under pretence of defending the Chriſtians againſt the Arabs, with whom, nevertheleſs, they keep a ſecret intelligence, favouring their excurſions and plunders.

CAPI-AGA, or Capou-Agassi, a Turkiſh officer, who is, as it were, grand-maſter of the ſeraglio.

He is the firſt in dignity and repute of all the white eunuchs, and is always near the Grand Signior's perſon. It is he who introduces embaſſadors to audience; and all great affairs paſs through his hands before they come to that of the prince.

CAPIAS, in law, a writ of two ſorts, one before judgement in an action, and the other after: That before judgment is called *capias ad reſpondendum*, where an original is ſued out, *&c.* to take the defendant, and make him anſwer the plantiff; and that after judgement is the *capias ad ſatisfaciendum*, &c.

CAPIGI, in the Turkiſh affairs, the name of certain inferior officers belonging to the ſeraglio, to the number of five hundred, whoſe buſineſs is to aſſiſt the janizaries in guarding the firſt and ſecond gate of that palace; whence alſo the name capighi, which ſignifies a gate.

CAPILLAMENT, in a general ſenſe, ſignifies a hair, whence the word is applied to ſeveral things, which, on account of their length or their fineneſs, reſemble hairs: As,

Capillaments *of the nerves*, in anatomy, the fine fibres, or filaments, whereof the nerves are compoſed.

CAPILLARY, in a general ſenſe, an appellation given to things on account of their extreme fineneſs, or reſembling hair.

Capillary *tubes*, in phyſics, little pipes whoſe canals are extremely narrow, their diameter being only a half, third, or fourth of a line. See Hydrostatics.

CAPILLUS *veneris*, in botany. See Adiantum.

CAPITAL, in geography, denotes the principal city of a kingdom, province, or ſtate.

Capital, among merchants, traders, and bankers, ſignifies the ſum of money which individuals bring to make up the common ſtock of a partnerſhip.

Capital *crime*, ſuch a one as ſubjects the criminal to capital puniſhment, that is, the loſs of life.

Capital, in architecture, the uppermoſt part of a column or pilaſter, ſerving as the head, or crowning, and placed immediately over the ſhaft, and under the entablature. See Architecture.

CAPITANATE, a province of the kingdom of Naples, ſituated on the gulf of Venice, and having the province of Moliſe on the north, and the Principate on the ſouth.

CAPITANIA, in geography, an appellation given to the twelve governments eſtabliſhed by the Portugueſe in the Braſils.

CAPITATION, a tax or impoſition raiſed on each perſon in conſideration of his labour, induſtry, office, rank, *&c.* It is a very ancient kind of tribute. The Latins call it *tributum*, by which taxes on perſons are diſtinguiſhed from taxes on merchandiſe, which were called *vectigalia*.

Capitations are never practiſed among us but in exigencies of ſtate. In France, the capitation was introduced by Lewis XIV. in 1695, and is a tax very different from the taille, being levied from all perſons whether they be ſubject to the taille or not. The clergy pay no capitation, but the princes of the blood are not exempted from it.

CAPITOL, in antiquity, a caſtle on the Mons Capitolinus at Rome, where there was a temple dedicated to Jupiter, in which the ſenate anciently aſſembled. The capitol conſiſted of three parts; a nave, ſacred to Jupiter; and two wings, the one conſecrated to Juno, and the other to Minerva: It was aſcended to by ſtairs; the frontiſpiece and ſides were ſurrounded with galleries, in which thoſe who were honoured with triumphs entertained the ſenate at a magnificent banquet, after the ſacrifices had been offered to the gods.

Both the inſide and outſide were enriched with infinite ornaments, the moſt diſtinguiſhed of which was the ſtatue of Jupiter, with his golden thunder-bolt, his ſceptre, and crown. In the capitol alſo were a temple to Jupiter the guardian, and another to Juno, with the mint; and on the deſcent of the hill was the temple of Concord.

This beautiful edifice contained the moſt ſacred depoſits of religion, ſuch as the ancylia, the books of the ſybils, *&c.*

Capitoline *games*, annual games inſtituted by Camillus, in honour of Jupiter Capitolinus, and in commemoration of the capitol's not being taken by the Gauls. Plutarch tells us, that a part of the ceremony conſiſted in the public crier's putting up the Hetrurians to ſale by auction: They alſo took an old man, and, tying a golden bulla about his neck, expoſed him to the public deriſion. Feſtus ſays, they alſo dreſſed him in a prætexta. There was another kind of capitoline games, inſtituted by Domitian, wherein there were rewards and crowns beſtowed on the poets, champions, orators, hiſtorians, and muſicians. Theſe laſt capitoline games were celebrated every five years, and became ſo famous, that inſtead of calculating time by luſtra, they began to count by capitoline games, as the Greeks did by olympiads. It appears, however, that this cuſtom was not of long continuance.

CAPITOUL, an appellation given to the chief magiſtrates of Tholouſe, on account of their meeting in a place called the Capitol: They are eight in number, are choſen annually, and have each the government of a capitoulate, or precinct, like the wards of London.

CAPITULATION, in military affairs, a treaty made between the garriſon or inhabitants of a place beſieged, and the beſiegers, for the delivering up the place on certain conditions.

The moſt honourable and ordinary terms of capitulation are, to march out at the breach, with arms and baggage, drums beating, colours flying, a match lighted at both ends, and ſome pieces of cannon, waggons and convoys for their baggage, and for the ſick and wounded.

Capitulation, in the German polity, a contract which the emperor makes with the electors, in the name of all the princes and ſtates of the empire, before he is declared emperor, and which he ratifies before he is raiſed to that ſovereign dignity. The principal points which the emperor undertakes to obſerve, are, 1. To defend the church and the empire. 2. To obſerve the fundamental laws of the empire. And, 3. To maintain and preſerve the rights, privileges, and immunities of the electors, princes, and other ſtates of the empire, ſpecified in the capitulation. Theſe articles and capitulations are preſented to the emperor by the electors only, without the concurrence of the other ſtates, who have complained from time to time of ſuch proceedings; and in the time of the Weſtphalian treaty, in 1648, it was propoſed to deliberate in the following diet, upon a way of making a perpetual capitulation; but the electors have always found means of eluding the execution of this article. In order however to give ſome ſatisfaction to their adverſaries, they have inſerted in the capitulations of the emperors, and in that of Francis I. in particular, a promiſe to uſe all their influence to bring the affair of a perpetual capitulation to a concluſion. Some German authors own, that this capitulation limits the emperor's power; but maintain that it does not weaken his ſovereignty: Though the moſt part maintain, that he is not abſolute, becauſe he receives the empire under conditions which ſet bounds to an abſolute authority.

CAPNOIDES, in botany, the trivial name of a ſpecies of fumaria. See FUMARIA.

CAPON, a cock-chicken, gelded as ſoon as left by the dam, or as ſoon as he begins to crow. They are of uſe either to lead chickens, ducklings, pheaſants, *&c.* and defend them from the kites and buzzards; or to feed for the table, they being reckoned more delicate than either a cock or a hen.

CAPPACIA, a town of the hither principate, in the kingdom of Naples. It is a biſhop's ſee, and ſituated about fifty-five miles ſouth-eaſt of the city of Naples: E. long. 15° 20′, and N. lat. 40° 40′.

CAPPARIS, in botany, a genus of the polyandria monogynia claſs. The calix conſiſts of four coriaceous leaves; the corolla has four petals; the ſtamina are long; and the capſule is fleſhy within, unilocular, and ſupported by a pedunculus. There are ten ſpecies, none of which are natives of Britain

CAPRA, or GOAT, a genus of quadrupeds belonging to the order of pecora. The horns are hollow, turned upwards, erect, and ſcabrous. There are eight fore-teeth in the under jaw, and none in the upper; and they have no dog-teeth. This genus conſiſts of twelve ſpecies, *viz.*

1. The hircus, or common goat, with arched carinated horns, and a long beard. The goat of Angora is only a variety of this ſpecies; its hair is white, and hangs down to the feet; and the ears are plain and pendent. The common goat is a native of the eaſtern mountains. See Plate LXIII.

The goat is an animal of more ſagacity than the ſheep. Inſtead of having an antipathy at mankind, they voluntarily mingle with them, and are eaſily tamed. Even in uninhabited countries, they betray no ſavage diſpoſitions. In the year 1698, an Engliſh veſſel having put in to the iſland of Bonoviſta, two negroes came aboard, and offered gratis to the captain as many goats as he pleaſed. The captain expreſſed his aſtoniſhment at this offer. But the negroes replied, that there were only twelve perſons in the iſland; that the goats had multiplied to ſuch a degree, that they were become extremely troubleſome; and that, inſtead of having any difficulty in catching them, they followed the men where-ever they went, and were ſo obſtinately officious, that they could not get quit of them upon any account whatever.

Goats are ſenſible of careſſes, and capable of a conſiderable degree of friendſhip. They are ſtronger, more agile, and leſs timid than ſheep. They have a lively, capricious, and wandering diſpoſition; are fond of high and ſolitary places; and frequently ſleep upon the very points of rocks. They are more eaſily ſupported than any other animal of the ſame ſize; for there is hardly an herb or the bark of a tree, which they will not eat with pleaſure. Neither are they liable to ſo many diſeaſes as ſheep: They can bear heat and cold with leſs inconvenience. The actions and movements of animals depend more upon the force and variety of their ſenſations, than the ſtructure of their bodies: The natural inconſtancy or fancifulneſs of goats is accordingly expreſſed by the irregularity of their actions: They walk, ſtop ſhort, run, jump, ſhew, and hide themſelves, as it were by mere caprice, and without any other cauſe than what ariſes from the natural vivacity of their temper.

The buck will copulate when he is a year old, and the female when ſhe is ſeven months. But as this is rather premature, they are generally reſtrained till they be eighteen months or two years. The buck is bald, beautiful, and vigorous; one is ſufficient to ſerve 150 females. A buck for propagation ſhould be large, handſome, and about two years of age; his neck ſhould be ſhort, and fleſhy; his head ſlender; his ears pendent; his thighs thick; his limbs firm; his hair black, thick, and ſoft; and his beard ſhould be long, and buſhy. The females are generally in ſeaſon from September to the end of November. The time of going with young is five months. They generally produce one kid, ſometimes two, ſeldom three, and never more than four; and continue fruitful till they be ſeven years of age: But a buck is ſeldom kept after he is five.

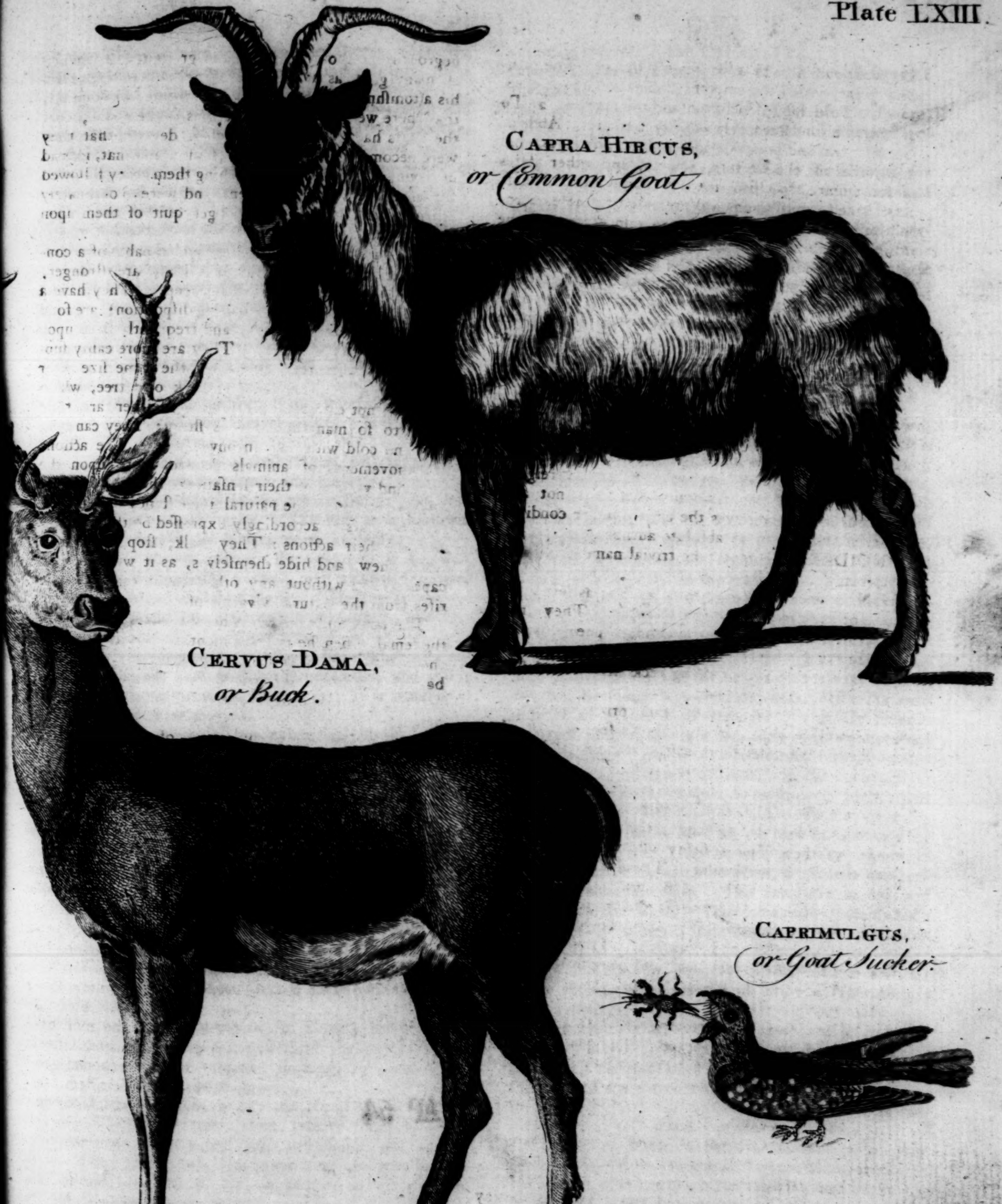
Goat's fleſh is not ſo good as mutton: The rank ſmell of the buck does not proceed from the fleſh, but from the ſkin.

The food of this animal coſts next to nothing, as it lives moſtly upon ſuch plants as are rejected by other cattle, and can ſupport itſelf even upon the moſt barren mountains. But their produce is valuable. Cheeſe is made of their milk, which beſides is reckoned good in conſumptions, and other diſeaſes. Their fleſh, tallow, hair, and hides, are all uſeful and ſaleable commodities.

2. The ibex, has large knotty horns reclined upon its back, is of a yellowiſh colour, and its beard is black. This ſpecies is a native of Crete; and is likewiſe to be met with in the mountains of ſome of the northern parts of Europe.

3. The

Plate LXIII.



CAPRA HIRCUS,
or Common Goat.

CERVUS DAMA,
or Buck.

CAPRIMULGUS,
or Goat Sucker.

A. Bell Sculpt.

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3. The mambrica, with reclined horns, about the length of the neck, pendent ears, and a beard. It is a native of India.

4. The rupicapra, or ſhamoy-goat, has erect and hooked horns. It inhabits the inacceſſible mountains of Switzerland. The body is of a duſky red colour; but the front, top of the head, gullet, and inſide of the ears are white; the under part of the tail is blackiſh; and the upper lip is a little divided. They ſeldom deſcend from the mountains but in hard winters, when they come down to feed upon the branches and barks of fir-trees, *&c.* On occaſions of this kind, one of the herd always keeps watch to give notice to the reſt of any approaching danger.

5. The depreſſa, is an American goat, with ſmall depreſſed horns, bent inwards and lying upon the head. It is about the ſize of a kid; and the hair is long and pendulous.

6. The reverſa, is likewiſe an American goat, with erect horns curved back at the points. It is about the ſize of a kid of a year old.

7. The gazella, is an Indian goat, with long, erect, cylindrical horns, annulated near the baſe.

8. The cervicapra, is likewiſe an Indian goat, with plaited, cylindrical horns. The hair near the horns is longer than in any other part of the body.

9. The Bezoartica, or Bezoar-goat, is bearded, and has cylindrical, arched, and wholly annulated horns. It is a native of Perſia. The bezoar is found in one of the ſtomachs called *abomaſus*. See Bezoar.

10. The dorcas, or antelope, has cylindrical, annulated horns, bent backward, contorted, and ariſing from the front between they eyes. It is a native of Africa and Mexico.

11. The tartarica, has cylindrical, ſtrait, annulated horns, diaphonous at the points. It has no beard, and is found in the northern parts of Aſia.

12. The ammon, has ſemicircular, plain, white horns, and no beard. It is about the ſize of a ram, and is a native of Siberia.

CAPRAIA, an iſland on the coaſt of Tuſcany, about thirty miles ſouth-weſt of Leghorn: E. long. 11°, and N. lat. 43° 15′.

CAPRARIA, in botany, a genus of the didynamia angioſpermia claſs. The calix is divided into five ſegments; the corolla is bell ſhaped, and divided into five parts; the capſule has two valves, and contains many ſeeds. There are three ſpecies, none of them natives of Britain.

CAPRAROLA, a town of St Peter's patrimony in Italy, about twenty miles north of the city of Rome, and eight ſouth of Viterbo: E. long. 13°, and N. lat. 42° 30′.—It is a biſhop's ſee.

CAPRI, or Caprea, a city and iſland at the entrance of the gulf of Naples, about twenty miles ſouth of that city: E. long. 14° 50′, and N. lat. 40° 45′.

The iſland is only four miles long, and one broad; the city is a biſhop's ſee, ſituated on a high rock, at the weſt end of the iſland.

CAPRICORN, in zoology. See Mordella.

Capricorn-*beetle*. See Cerambyx.

Capricorn, in aſtronomy, one of the twelve ſigns of the zodiac.

Tropic of Capricorn, a leſſer circle of the ſphere, which is parallel to the equinoxial, and at 23° 30 diſtance from it ſouthwards.

CAPRIFICATION, a method uſed in the Levant, for ripening the fruit of the domeſtic fig-tree, by means of inſects bred in that of the wild fig-tree.

It is ſaid, that theſe figs will never come to maturity, unleſs wounded by the inſects depoſiting their eggs. Poſſibly the reaſon of this effect, may be their lacerating the veſſels of the fruit, and thereby deriving thither a greater quantity of nutricious juice.

Plumbs and pears, wounded in the ſame manner, are found to ripen ſooneſt, and the pulp about the wound has a more exquiſite taſte than the reſt.

CAPRIFICUS, in botany. See Ficus.

CAPRIFOLIUM, in botany. See Lonicera.

CAPRIMULGUS, Goat-sucker, or Fern-owl, in ornithology, a genus of birds belonging to the order of paſſeres. The beak is incurvated, ſmall, tapering, and depreſſed at the baſe; the hairs at the mouth, which it opens very wide, are placed in a row. There are two ſpecies, *viz.* the Europæus, with the tubes of the noſtrils hardly viſible. It is a native of Europe, and feeds upon moths and nocturnal inſects. This bird is ſaid to ſuck goats in the night. 2. The Americacanus, has the tubes of the noſtrils very conſpicuous. This is a night-bird, and is found in America.

CAPRIOLES, in the menage, leaps that a horſe makes in the ſame place, without advancing, in ſuch a manner, that when he is at the height of the leap, he jerks out with his hinder legs even and near. It is the moſt difficult of all the high menage. It differs from a croupade in this, that in a croupade the horſe does not ſhew his ſhoes; and from a ballotade, becauſe in this he does not jerk out. To make a horſe work well at caprioles, he muſt be put between two pillars, and taught to raiſe firſt his fore-quarters, and then his hind-quarters, while his fore are yet in the air, for which end you muſt give the whip and the poinſon.

CAPSICUM, or Guinea-pepper, a genus of the pentandria monogynia claſs. The corolla is rotated, and the berry wants juice. There are two ſpecies, both natives of the Indies. The ſeeds are uſed in ſauces and pickles.

CAPSQUARES, in gunnery, ſtrong plates of iron which come over the trunnions of a gun, and keep it in the carriage.

They are faſtened by a hinge to the prize-plate, that they may lift up and down, and form a part of an arch in the middle to receive a third part of the thickneſs of the trunnions; for two thirds are let into the carriage, and the other end is faſtened by two iron wedges, called the fore-locks and keys.

CAPSTAN, or Main-capstan, in a ſhip, a great piece of timber in the nature of a windlaſs, placed next behind the main-maſt, its foot ſtanding in a ſtep on the lower deck, and its head between the upper decks; formed into ſeveral ſquares with holes in them. Its uſe is to weigh the anchors, to hoiſe up or ſtrike down top-maſts, to heave any weighty matter, or to ſtrain any rope that requireth a main force.

Jear **CAPSTAIN** is placed between the main-maſt and the mizen, and ſerves to ſtrain any rope, heave up on the jear rope or upon the viol, or hold off by at the weighing of an anchor.

CAPSTAN-*bars*, the pieces of wood that are put into the capſtan-holes, to heave up any thing of weight into the ſhip.

Pawl of a **CAPSTAN**, a ſhort piece of iron made faſt to the deck, and reſting upon the whelps, to keep the capſtan from recoiling, which is of dangerous conſequence.

Whelps of a **CAPSTAN** are ſhort pieces of wood, made faſt to it, to keep the cable from coming too nigh, in turning it about.

Pawling the **CAPSTAN**, is ſtopping it from turning by means of the pawl.

Come up **CAPSTAN**, or *launch out the* **CAPSTAN**, that is, ſlacken the cable which you heave by.

CAPSULE, in a general ſenſe, denotes a receptacle, or cover in form of a bag.

CAPSULE, among botaniſts, a ſpecies of pericarpium, or ſeed-veſſel, compoſed of ſeveral dry elaſtic valves, which uſually burſt open at the points, when their ſeeds are ripe: It differs from a pod, in being roundiſh and ſhort. This kind of pericarpium ſometimes contains one cell or cavity, ſometimes more: In the firſt caſe it is called unilocular, as it is bilocular, trilocular, *&c.* when it contains two, three, *&c.* cells or cavities.

CAPSULÆ *atrabiliariæ*, called alſo *glandulæ renales*, and *renes ſuccenturiati*. See p. 269.

CAPTAIN, a military officer, whereof there are various kinds, according to their commands.

CAPTAIN *of a troop or company*, an inferior officer, who commands a troop of horſe, or company of foot, under a colonel. In the ſame ſenſe we ſay, captain of dragoons, of grenadiers, of marines, of invalids, *&c.*

In the horſe and foot guards, the captains have the rank of colonels.

CAPTAIN *general*, he who commands in chief.

CAPTAIN *lieutenant*, he who with the rank of captain, but the pay of lieutenant, commands a troop or company in the name and place of ſome other perſon who is diſpenſed with on account of his quality from performing the functions of his poſt.

Thus the colonel, being uſually captain of the firſt company of his regiment; that company is commanded by his deputy, under the title of captain-lieutenant.

So in England, as well as in France, the king, queen, dauphin, princes, *&c.* have uſually the title of captains of the guards, *gens d' armes*, &c. the real duty of which offices is performed by captain-lieutenants.

CAPTAIN *reformed*, one who, upon the reduction of the forces, has his commiſſion and company ſuppreſſed; yet is continued captain, either as ſecond to another, or without any poſt or command at all.

CAPTAIN *of militia*, he who commands a company of the militia, or trained bands. See **MILITIA**.

CAPTAIN *of a ſhip of war*, the commanding officer of a ſhip, galley, fire-ſhip, or the like. This officer ranks with a colonel in the land-ſervice.

CAPTAIN *of a merchant-ſhip*, he who has the direction of the ſhip, her crew, and lading, *&c.* In ſmall ſhips and ſhort voyages, he is more ordinarily called the maſter. In the mediterranean, he is called the patroon.

The proprietor of the veſſel appoints the captain or maſter, and he is to form the crew, and chuſe and hire the pilots, mates, and ſeamen; though, when the proprietor and maſter reſide on the ſame ſpot, they generally act in concert together.

CAPTAIN BASHAW, or **CAPONDAN BASHAW**, in the polity of the Turks, ſignifies the Turkiſh high admiral. He poſſeſſes the third office of the empire, and is inveſted with the ſame power at ſea that the vizir has on ſhore. Soliman II. inſtituted this office in favour of the famous Barbaroſſa, with abſolute authority over the officers of the marine and arſenal, whom he may puniſh, caſhier, or put to death, as ſoon as he is without the Dardanelles. He commands in chief in all the maritime countries, cities, caſtles, *&c.* and, at Conſtantinople, is the firſt magiſtrate of police in the villages on the ſide of the Porte, and the canal of the Black-ſea. The mark of his authority is a large Indian cane, which he carries in his hand, both in the arſenal and with the army.

The captain-baſhaw enjoys two ſorts of revenues; the one fixed, the other caſual. The firſt ariſe from a capitation of the iſlands in the Archipelago, and certain governments in Natolia and Galipoli. The latter conſiſt in the pay of the men who die during a campaign; in a fifth of all prizes made by the begs; in the profits accruing from the labour of the ſlaves, whom he hires as rowers to the grand ſignior; and in the contributions he exacts in all places where he paſſes.

CAPTION, in Scots law, a writ iſſuing under his majeſty's ſignet, in his majeſty's name, obtained at the inſtance of a creditor in a civil debt, commanding meſſengers at arms and other officers of the law to apprehend and impriſon the perſon of the debtor until he pay the debt. See **SCOTS LAW**, title, *Sentences and their execution.*

CAPTIVITY, a puniſhment which God inflicted upon his people for their vices and infidelities. The firſt of theſe captivities is that of Egypt, from which Moſes delivered them; after which, are reckoned ſix during the government of the judges; but the greateſt and moſt remarkable, were thoſe of Judah and Iſrael, which happened under the kings of each of theſe kingdoms. It is generally believed, that the ten tribes of Iſrael never came back again after their diſperſion; and Joſephus and St Jerom are of this opinion: nevertheleſs, when we examine the writings of the prophets, we find the return of Iſrael from captivity pointed out in a manner almoſt as clear as that of the tribes of Benjamin and Judah. See Hoſea i. 10. xi. 12. Amos ix. 14. Iſaiah xi. 13, 14. Ezekiel xxxvii. 16, *&c.*

The captivities of Judah are generally reckoned four; the fourth and laſt of which fell in the year of the world 3416, under Zedekiah; and from this period begins the ſeventy years captivity, foretold by Jeremiah.

Since the deſtruction of the temple by the Romans, the Hebrews boaſt, that they have always had their heads, or particular princes, whom they call princes of the captivity, in the eaſt and weſt. The princes of the captivity in the eaſt governed the Jews who dwelt at Babylon, in Chaldea, Aſſyria, and Perſia; and the prince of the captivity in the weſt governed thoſe who dwelt in Judea, Egypt, Italy, and in other parts of the Roman empire. He who reſided in Judæa, took up his abode commonly at Tiberias, and aſſumed the title of Roſchabboth, head of the fathers or patriarchs. He preſided in aſſemblies, decided in caſes of conſcience, levied taxes for the expences of his viſits, and had officers under him, who were diſpatched through the provinces, for the execution of his orders. As to the princes of the captivity of Babylon, or the eaſt, we know neither the original nor ſucceſſion of them; it appears only, that they were not in being before the end of the ſecond century.

CAPTURE ſignifies, particularly, prizes taken by privateers in time of war.

CAPUA, a city of the province of Lavoro, in the kingdom of Naples, ſituated on the river Volturno, about fifteen miles north-weſt of the city of Naples: E. long. 15°, and N. lat. 41° 20′.

It is the ſee of an archbiſhop.

CAPUCHINS, in the church of Rome. See Franciſcans.

CAPUT *mortuum*, in chemiſtry, that thick dry matter which remains after diſtillation of any thing, but of minerals eſpecially.

CAPY-BARA, in zoology. See Sus.

CARABINE, a fire-arm, ſhorter than a muſket, carrying a ball of twenty-four in the pound, borne by the light-horſe, hanging at a belt over the left ſhoulder.

The barrel is two feet and a half long, and is ſometimes furrowed ſpirally within, which is ſaid to add to the range of the piece.

CARABINEERS, or Carabiniers, regiments of light horſe, carrying longer carabines than the reſt, and uſed ſometimes on foot.

CARABUS, in zoology, a genus of inſects belonging to the order of inſecta coleoptera. The feelers are briſtly; the breaſt is ſhaped like a heart, and marginated; and the elytra are likewiſe marginated. There are 43 ſpecies of this genus, moſtly diſtinguiſhed by their colour.

CARACATY, a large country in the north of Aſia, extending from the wall of China to the ancient Mogoliſtan.

CARACOL, in the menage, the half turn which a horſeman makes, either to the right or left.

In the army, the horſe always make a caracol after each diſcharge, in order to paſs to the rear of the ſquadron.

Caracol, in architecture, denotes a ſtair-caſe in a helix or ſpiral form.

CARACOLI, a kind of metal, of which the Caribbees, or natives of the Leſſer Antilles, make a ſort of ornament in the form of a creſcent, which they alſo call caracoli.

This metal comes from the main land; and the common opinion is, that it is a compound of ſilver, copper, and gold, ſomething like the Corinthian braſs among the ancients. Theſe metals are ſo perfectly mixed and incorporated together, that the compound which reſults from them, it is ſaid, has a colour that never alters, how long ſoever it remains in the ſea, or under ground. It is ſomething brittle, and they who work at it, are obliged to mix a large proportion of gold with it, to make the compound more tough and malleable.

CARACT, Carat, or Carrat, the name of that weight which expreſſes the degree of fineneſs that gold is of.

The mint-maſter, or cuſtom, have fixed the purity of gold at 24 caracts; though it is not poſſible ſo to purify and refine that metal, but it will want ſtill about one fourth part of a caract in abſolute purity and perfection. The caract is divided into $\frac{1}{4}$, $\frac{1}{8}$, $\frac{1}{16}$, and $\frac{1}{32}$. Theſe degrees ſerve to diſtinguiſh the greater or leſſer quantity of alloy therein contained; for inſtance, gold of 22 caracts, is that which has two parts of ſilver, or of any other metal, and 22 of fine gold.

Caract is alſo a certain weight which goldſmiths and jewelers uſe wherewith to weigh precious ſtones and pearls.

This caract weighs four grains, but ſomething lighter than the grains of other weights. Each of theſe grains is ſubdivided into $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, $\frac{1}{16}$, *&c.*

CARAGROUTH, in commerce, a ſilver-coin of the empire, weighing nine drachms. It goes at Conſtantinople for 120 aſpers. There are four ſorts of them, which are all equally current, and of the ſame value.

CARAGUATA, in botany. See Tillandſia.

CARAITES, in the eccleſiaſtical hiſtory of the Jews, a religious ſect among that people, who adhere cloſely to the text and letter of the ſcriptures, rejecting the rabbinical interpretations, and the cabbala. The Caraites paſs for the moſt learned of the Jewiſh doctors; they are chiefly to be met with in Poland, Muſcovy, and the eaſt: they are but few in compariſon of the bulk of the Jews, who are of the party of the rabbins: the latter have ſo great an averſion for the Caraites, that they will have no alliance, nor even converſation with them: they treat them as baſtards; and if a caraite would turn rabbiniſt, the other Jews would not receive him.

CARAMANIA, a province of Natolia, in Aſia, ſituated on the Mediterranean ſea, oppoſite to the iſland of Cyprus.

CARAMANICO, a large well-peopled town of the kingdom of Naples, in the hither Abruzzo.

CARAMANTA, the name of a province of South America, bordered on the north by the diſtrict of Carthagena;

thagena; on the eaſt, by New Grenada; and on the ſouth and weſt, by Popayan.

Caramanta is alſo the name of the capital of that province, ſituated in 5° 18′ N. lat.

CARANNA, a reſinous ſubſtance brought from New Spain in little maſſes rolled up in leaves of flags. It is rarely kept in the ſhops, and is rejected by the catalogue of the London college, though it is ſtill retained in the Edinburgh.

CARAPO, in ichthyology, the trivial name of a ſpecies of gymnotus. See Gymnotus.

CARAVAN, or **Caravanne**, in the eaſt, ſignifies a company or aſſembly of travellers and pilgrims, and more particularly of merchants, who, for their greater ſecurity, and in order to aſſiſt each other, march in a body through the deſarts, and other dangerous places, which are infeſted with Arabs or robbers.

There is a chief, or aga, who commands the caravan, and is attended by a certain number of janizaries, or other militia, according to the countries from whence the caravans ſet out; which number of ſoldiers muſt be ſufficient to defend them and conduct them with ſafety to the places for which they are deſigned, and on a day appointed. The caravan encamps every evening near ſuch wells or brooks, as their guides are acquainted with; and there is a ſtrict diſcipline obſerved upon this occaſion, as in armies in time of war. Their beaſts of burden are partly horſes, but moſt commonly camels, who are capable of undergoing a very great fatigue.

CARAVANSERA, or **Karavanſera**, a place appointed for receiving and loading the caravans.

It is commonly a large ſquare building, in the middle of which there is a very ſpacious court; and under the arches or piazzas that ſurround it there runs a bank, raiſed ſome feet above the ground, where the merchants, and thoſe who travel with them in any capacity, take up their lodgings as well as they can; the beaſts of burden being tied to the foot of the bank. Over the gates, that lead into the court, there are ſometimes little rooms, which the keepers of the caravanſeras let out at a very high price to ſuch as have a mind to be private.

The caravanſeras in the eaſt are ſomething in the nature of the inns in Europe, only that you meet with little accommodation either for man or beaſt, but are obliged to carry almoſt every thing with you: there is never a caravanſera without a well, or ſpring of water. Theſe buildings are chiefly owing to the charity of the Mahometans; they are eſteemed ſacred dwellings, where it is not permitted to inſult any perſon, or to pillage any of the effects that are depoſited there. They even carry their precautions ſo far, as not to ſuffer any man who is not married to lodge there; becauſe they are of opinion, that a man who has no wife is more dangerous than another.

CARAVANSERASKIER, the ſteward, or keeper of a caravanſera.

He keeps an account of all the merchandiſes that are ſold upon truſt, and demands the payments of the ſums due to the merchants for what has been ſold in the caravanſera, on the ſeller's paying two *per cent*.

CARAWAY, in botany. See Carum.

CARBUNCLE, in natural hiſtory, a very elegant gem, whoſe colour is deep red, with an admixture of ſcarlet.

This gem was known among the ancients by the name of anthrax. It is uſually found pure and faultleſs, and is of the ſame degree of hardneſs with the ſapphire: it is naturally of an angular figure, and is found adhering, by its baſe, to a heavy and ferrugineous ſtone of the emery kind: its uſual ſize is near a quarter of an inch in length, and two thirds of that in diameter in its thickeſt parts: when held up againſt the ſun, its loſes its deep tinge, and becomes exactly of the colour of a burning charcoal, whence the propriety of the name which the ancients gave it. It bears the fire unaltered, not parting with its colour, nor becoming at all the paler by it. It is only found in the Eaſt Indies, ſo far as is yet known, and there but very rarely.

Carbuncle, or **Anthrax**, in ſurgery, an inflammation which ariſes, in time of the plague, with a veſicle or bliſter almoſt like thoſe produced by burning.

Carbuncle, in heraldry, a charge or bearing, conſiſting of eight radii, four whereof make a common croſs, and the other four a ſaltier.

Some call theſe radii buttons, or ſtaves, becauſe round, and enriched with buttons, or pearled like pilgrims ſtaves, and frequently tipped or terminated with flower-de-luces; others blazon them, royal ſceptres, placed in ſaltier, pale and feſſe.

CARCHARIAS, in ichthyology. See Squalus.

CARCASSE, or **Carcuss**, in the art of war, an iron-caſe, or hollow capacity, about the bigneſs of a bomb, of an oval figure, made of ribs of iron, filled with combuſtible matters, as meal-powder, ſaltpetre, ſulphur, broken glaſs, ſhavings of horns, turpentine, tallow, *&c.*; the deſign of it is to be thrown out of a mortar to ſet houſes on fire, and do other execution. It has two or three apertures through which the fire is to blaze.

CARCASSONE, a town of Languedoc, in France, ſituated on the river Ande, about twenty-five miles weſt of Narbonne: E. long. 2°, and N. lat. 43° 20′. It is a biſhop's ſee.

CARCERES, in the ancient Circenſian games, were incloſures, in the circus, wherein the horſes were reſtrained till the ſignal was given for ſtarting, when, by an admirable contrivance, they all at once flew open.

CARCINOMA. See Canker.

CARD, among artificers, an inſtrument conſiſting of a block of wood, beſet with ſharp teeth, ſerving to arrange the hairs of wool, flax, hemp, and the like: there are different kinds of them, as hand-cards, ſtock-cards, *&c.*

CARDS, among gameſters, little pieces of fine thin paſteboard of an oblong figure, of ſeveral ſizes, but moſt commonly in England three inches and an half long, and two and an half broad, on which are painted ſeveral points and figures.

The moulds and blocks for making cards, are exactly like thoſe that were uſed for the firſt books: they lay a ſheet of wet or moiſt paper on the block, which is firſt ſlightly done over with a ſort of ink made with lamp-black diluted in water, and mixed with ſome ſtarch to give it a body They afterwards rub it off with a round liſt. The court-cards are coloured by means of ſeveral patterns, ſtyled *ſtane-files*. Theſe conſiſt of papers cut through with a pen-knife, and in theſe apertures they apply ſeverally the various colours, as red, black, *&c.* Theſe patterns are painted with oil-colours, that the bruſhes may not wear them out; and when the pattern is laid on the paſteboard, they ſlightly paſs over it a bruſh full of colour, which, leaving it within the openings, forms the face or figure of the card.

Cards, upon ſufficient ſecurity, may be exported without payment of the ſtamp-duty; but for every pack ſold without the label of the ſtamp-office, in England, there is a penalty of 10l.

CARDAMINDUM, in botany. See Tropæolum.

CARDAMINE, lady's smock, in botany, a genus of the tetradynamia ſiliquoſa claſs. The pod opens with a ſpring, and the valves are revoluted: The ſtigma is entire; and the calix gapes a little. There are fifteen ſpecies, ſeven of which are natives of Britain, *viz.* the bellidifolia, or daiſy-leaved lady's-ſmock; the petræa, or mountain lady's-ſmock; the pratenſis, or common lady's-ſmock; the amara, bitter creſſes, or lady's-ſmock; the impatiens, or impatient lady's-ſmock; the parviflora, or ſmall-flowered lady's-ſmock; and the hirſuta, or hairy lady's ſmock.

CARDAMOM, in materia medica, the ſeeds of a ſpecies of amomum. They are diſtinguiſhed into the leſſer and greater. The greater cardamom is a dried fruit or pod containing two rows of ſmall triangular ſeeds of a warm aromatic flavour. The leſſer is about half the ſize of the former, and the ſeeds are conſiderably ſtronger both in ſmell and taſte. Hence this ſort is the only one now uſed as a medicine. The ſeeds are warm, grateful, pungent, aromatic, and frequently employed as ſuch in practice.

CARDIAC, an appellation given to ſuch medicines as are ſuppoſed to preſerve or increaſe the ſtrength of the heart.

CARDIACA, in botany. See Leonurus.

CARDIALGIA, the heart-burn, in medicine, a diſorder of the ſtomach attended with anxiety, a nauſea, and often a reaching or actual vomiting. See Medicine.

CARDIFF, a borough-town of Glamorganſhire, in ſouth Wales, ſituated on the river Tave, about two miles ſouth-eaſt of Landaff: W. long. 3° 20′, N. lat. 51° 30′. It ſends only one member to parliament.

CARDIGAN, the capital of Cardiganſhire, near the mouth of the river Tivy and the Iriſh channel, about thirty miles north of Pembroke: W. long. 4° 40, N. lat. 52° 15′. It gives the title of earl to the noble family of Brudenel, and ſends only one member to parliament.

CARDINAL, in a general ſenſe, an appellation given to things on account of their preheminence: thus we ſay, cardinal virtues, *&c.*

Cardinal signs in the zodiac, are Aries, Libra, Cancer, and Capricorn.

Cardinal, more particularly ſignifies an eccleſiaſtical prince in the Romiſh church, being one who has a voice in the conclave at the election of a pope. The cardinals were originally nothing more than deacons, to whom was intruſted the care of diſtributing the alms to the poor of the ſeveral quarters of Rome; and as they held aſſemblies of the poor in certain churches of their ſeveral diſtricts, they took the title of theſe churches. They began to be called cardinals in the year 300, during the pontificate of St Sylveſter, by which appellation was meant the chief prieſts of a pariſh, and next in dignity to a biſhop. This office grew more conſiderable afterwards, and by ſmall degrees arrived at its preſent height, in which it is the reward of ſuch as have ſerved his holineſs well, even princes thinking it no diminution of their honour to become members of the college of cardinals.

The cardinals compoſe the pope's council, and till the time of Urban VIII. were ſtyled *moſt illuſtrious*; but by a decree of that pope in 1630, they had the title of *eminence* conferred upon them.

At the creation of a new cardinal, the pope performs the ceremony of ſhutting and opening his mouth, which is done in a private conſiſtory. The ſhutting his mouth, implies the depriving him of the liberty of giving his opinion in congregations; aud the opening his mouth, which is performed fifteen days after, ſignifies the taking off this reſtraint. However, if the pope happens to die during the time a cardinal's mouth is ſhut, he can neither give his voice in the electiou of a new pope, nor be himſelf advanced to that dignity.

The cardinals are divided into ſix claſſes or orders, conſiſting of ſix biſhops, fifty prieſts, and fourteen deacons, making in all ſeventy; which conſtitute the ſacred college. The number of cardinal-biſhops has very ſeldom been changed, but that of prieſts and deacons have varied at different times.

The privileges of the cardinals are very great: They have an abſolute power in the church during the vacancy of the holy ſee: They have a right to elect the new pope, and are the only perſons on whom the choice can fall: Moſt of the grand offices in the court of Rome are filled by cardinals. The dreſs of a cardinal is a red ſoutanne, a rochet, a ſhort purple mantle, and the red hat. When they are ſent to the courts of princes, it is in quality of legates *a latere*; and when they are appointed governors of towns, their government is called by the name of legation.

Cardinal is alſo a title given to ſome biſhops, as thoſe of Mentz and Milan, to the archbiſhop of Bourges; and the abbot of Vendome calls himſelf cardinalis natus.

Cardinal's flower. See Rapuntium.

CARDIOID, in the higher geometry, an algebraical curve, ſo called from its reſemblance to a heart.

CARDIOSPERMUM, in botany, a genus of the octandria trigynia claſs. The calix has four leaves; there are four petals; an unequal four-leaved nectarium; and there are three inflated capſules. There are two ſpecies, both natives of the Indies.

CARDIUM, in zoology, a genus of inſects belonging to the order of vermes teſtacea. The ſhell conſiſts of two equal valves, and the ſides are equal. There are 21 ſpecies of this genus.

CARDONNA, a city of Catalonia, in Spain, ſituated on a river of the ſame name, about forty miles north-weſt of Barcelona: E. long. 1° 20′, N. lat. 41° 35′.

CARDUEL, a province of Georgia, in Aſia, lying between the Caſpian and Euxine ſeas, the capital whereof is Teflis. It belongs partly to the Turks, and partly to the Perſians.

CARDUELIS, in ornithology, a ſynonime of a ſpecies of fringilla. See FRINGILLA.

CARDUUS, in botany, a genus of the ſyngeneſia polygamia æqualis claſs. The calix is ovated, and imbricated with ſpinous ſcales; and the receptacle is hairy. There are 26 ſpecies, ten of which are natives of Britain, *viz.* the lanceolatus, or ſpear-thiſtle; the nutans, or muſk-thiſtle; the acanthoides, or welted-thiſtle; the criſpus, or thiſtle upon thiſtle; the paluſtris, or marſh-thiſtle; the diſſectus, or Engliſh ſoft thiſtle; the helenioides, or melancholy thiſtle; the marianus, or milk-thiſtle; and the acaulos, or dwarf carline-thiſtle.

CAREENING, in the ſea-language, the bringing a ſhip to lie down on one ſide, in order to trim and caulk the other ſide.

A ſhip is ſaid to be brought to the careen, when the moſt of her lading being taken out, ſhe is halled down on one ſide by a ſmall veſſel as low as neceſſary; and there kept by the weight of the ballaſt, ordnance, &c. as well as by ropes, leſt her maſts ſhould be ſtrained too much; in order that her ſides and bottom may be trimmed, ſeams caulked, or any thing that is faulty under water mended. Hence when a ſhip lies on one ſide when ſhe ſails, ſhe is ſaid to ſail on the careen.

CARELIA, in geography, a province of Finland, bounded by the province of Savolaxia on the north, and by the gulph of Finland on the ſouth. It is ſubject to Ruſſia.

CARELSCROON, a port-town of the province of Gothland, in Sweden, ſituated on the coaſt of the Baltic: E. long. 15°, and N. lat. 56° 20′.

It is an excellent harbour, where the Swedes lay up their royal navy.

CARENTAN, a town of Normandy, in France, ſituated at the mouth of a river of the ſame name: W. long. 1° 15′, and N. lat. 49° 20′.

CARET, among grammarians, a character marked thus ^, ſignifying that ſomething is added on the margin, or interlined, which ought to have come in where the caret ſtands.

CARETTA, in zoology, the trivial name of a ſpecies of teſtudo. See TESTUDO.

CAREX, in botany, a genus of the monœcia triandria claſs. The amentum of the male is imbricated; it has no corolla; and the calix conſiſts of one leaf. The amentum of the female is likewiſe imbricated; the corolla is wanting; and the calix conſiſts of one leaf; the nectarium is inflated and three-teethed; there are three ſtigmata; and the ſeeds are triangular and contained within the nectarium. There are 37 ſpecies, 26 of which are natives of Britain.

CARGADORS, a name which the Dutch give to thoſe brokers, whoſe buſineſs is to find freight for ſhips outward bound, and to give notice to the merchants, who have commodities to ſend by ſea, of the ſhips that are ready to ſail, and of the places for which they are bound.

CARGAPOL, or KARGAPOL, the capital of a territory of the ſame name, in the province of Dwina, in Muſcovy: E. long. 36°, and N. lat. 63°.

CARGO denotes all the merchandiſes and effects which are laden on board a ſhip.

Super-**CARGO**, a perſon employed by merchants to go a voyage, and overſee the cargo, and diſpoſe of it to the beſt advantage.

CARIAMA, in ornithology, a ſynonime of the palamedea. See PALAMEDEA.

CARIBBE-ISLANDS, a cluſter of iſlands, ſituated in the Atlantic ocean, between 59° and 63°, W. long. and between 11° and 18° N. lat. They belong partly to the Britiſh, and partly to the French, Dutch, &c.

CARIBBIANA, or CARIBIANA, the north-eaſt coaſt of Terra-firma, in ſouth America, otherwiſe called New-Andaluſia. See ANDALUSIA.

CARICA, in botany, a genus of the diœcia decandria claſs. The male has hardly any calix; the corolla is bell-ſhaped, and divided into five ſegments; the filaments are inſerted into the tube of the corolla, and are alternately ſhorter. The calix of the female has five teeth; the corolla conſiſts of five petals; there are five ſtigmata; and the berry is unilocular, and contains many ſeeds.

CARICATURA, in painting, denotes the concealment of real beauties, and the exaggeration of blemiſhes, but ſtill ſo as to preſerve a reſemblance of the object.

CARICOUS, an epithet given to ſuch tumours as reſemble the figure of a fig. They are frequently found in the piles.

CARIES, in ſurgery, the corruption or mortification of a bone. See SURGERY.

CARIGNAN, a fortified town of Piedmont, ſituated on the river Po, about ſeven miles ſouth of Turin: E. long. 7° 25′, and N. lat. 44° 30′.

CARIGUE, or CARIGUEYA, in zoology, a ſynonime of a ſpecies of didelphis. See DIDELPHIS.

CARINTHIA, a duchy in the circle of Auſtria, in Germany, bounded by the archbiſhopric of Saltzburg on the north, and by Carniola and the dominions of Venice on the ſouth. It is ſubject to the houſe of Auſtria.

CARIONOLA, a city of the province of Lavoro, in the kingdom of Naples, about twenty miles north of the city of Naples: E. long. 15°, and N. lat. 41° 20′. It is a biſhop's ſee.

CARIPI, a kind of cavalry in the Turkiſh army.

The caripi, to the number of about one thouſand, are not ſlaves, nor bred up in the ſeraglio, like the reſt, but are generally Moors, or renegado Chriſtians, who, having followed adventures, and being poor, and having their fortune to ſeek by their dexterity and courage, have arrived to the rank of horſe-guards to the grand ſignior.

CARISBROOK-CASTLE, a caſtle ſituated in the middle of the iſle of Wight, where king Charles I. was impriſoned: W. long. 1° 30′, and N. lat. 50° 40′.

CARKE denotes the thirtieth part of a ſarplar of wool. See Sarplar.

CARLINA, or Carline thistle, in botany, a genus of the ſyngeneſia polygamia æqualis claſs. The calix is radiated, with long coloured ſcales. There are ſeven ſpecies, only one of which, *viz.* the vulgaris, is a native of Britain. The roots are ſaid to be diaphoritic and alexipharmic.

CARLINE, or Caroline, a ſilver coin, current in the Neapolitan dominions, and worth about four-pence of our money.

CARLINGFORD, a port-town of Ireland, in the county of Lowth, and province of Leinſter, about twenty-two miles north of Drogheda: W. long. 6° 23′, and N. lat. 54° 5′.

CARLINGS, or Carlines, in a ſhip, two pieces of timber, lying fore and aft, along from beam to beam, whereon the ledges reſt on which the planks of the ſhip are faſtened. All the carlings have their ends let into the beams culvertail-wiſe: They are directly over the keel, and ſerve as a foundation for the whole body of the ſhip.

CARLISLE, the capital city of Cumberland, ſituated near the mouth of the river Eden, and the Solway frith: W. long. 2° 30′, and N. lat. 54° 45′.

It is a biſhop's ſee.

CARLOCK, in commerce, a ſort of iſing-glaſs made with the ſturgeon's bladder, imported from Archangel. The chief uſe of it is for clarifying wine; but it is alſo uſed by dyers. The beſt carlock comes from Aſtracan, where a great quantity of ſturgeon is caught.

CARLOWITZ, a town of Sclavonia, ſituated on the weſt ſide of the Danube, about thirty-five miles north-weſt of Belgrade: E. long. 20° 45′, and N. lat. 45° 25′.

CARLSTADT, the capital of Croatia, a frontier province of Chriſtendom againſt the Turks: E. long. 16°, and N. lat. 45° 5′. It is ſubject to the houſe of Auſtria.

Carlstadt is alſo the name of a town in the biſhopric of Wurtſburg, in the circle of Franconia in Germany, ſituated on the river Maine, about fourteen miles north of Wurtſburg: E. long. 9° 50′. and N. lat. 50°.

CARMAGNIOL, a fortified town of Piedmont, ſituated on the river Po, about ten miles ſouth of Turin: E. long. 7° 30′, and N. lat. 44° 45′.

CARMELITES, or White friers, are an order of our lady of Mount Carmel, making one of the four orders of mendicants. They pretend to derive their original from the prophets Elijah and Eliſha. Their original rules contained ſixteen articles, one of which confined them to their cells, and enjoined them to employ themſelves day and night in prayer; another prohibited the brethren having any property; another enjoined faſting, from the feaſt of the exaltation of the holy croſs till Eaſter, excepting on Sundays; abſtinence at all times from fleſh, was enjoined by another article; one obliged them to manual labour; another impoſed a ſtrict ſilence on them, from veſpers till the tierce the next day: However, theſe conſtitutions have been in ſome reſpects altered.

This order is ſo much increaſed, that it has at preſent thirty-eight provinces, beſides the congregation of Mantua (in which there are fifty-four monaſteries, under a vicar-general) and the congregation of bare-footed Carmelites in Italy and Spain, which have their peculiar generals.

If a monk of this order lie with a woman, he is prohibited ſaying maſs for three or four years, is declared infamous, and obliged to diſcipline himſelf publicly once a week: If he is again guilty of the ſame offence, his penance is doubled: And if a third time, he is expelled to order.

CARMENTALIA, feaſts celebrated by the Romans, in honour of the propheteſs Carmenta, the mother of Evander.

They were ſolemnized twice in the month of January, *viz.* on the 11th and 15th.

CARMINATIVES, in pharmacy, medicines uſed in colics, or other flatulent diſorders, to diſpel the wind.

The four carminative flowers are thoſe of camomile, melilot, motherwort, and dill; beſides, angelica, fennel, lovage, aniſe, caraway, coriander, cummin, *&c.* all agree in their carminative qualities, and are therefore uſed in compoſitions of that intention.

CARMINE, a powder of a very beautiful red colour, bordering upon purple, and uſed by painters in miniature; though but rarely, becauſe of its great price.

It is extracted from cochineal, by means of water, wherein chouan and antour have been infuſed; ſome add rocou, but this gives it too much of the oval caſt. Others make carmine with braſil-wood, fernambouc, and leaf-gold, beat in a mortar, and ſteeped in white-wine vinegar; the ſcum ariſing from this mixture, upon boiling, when dried, makes carmine; but this kind is vaſtly inferior to the former: There is another carmine, made of braſil-wood and fernambouc, by a different preparation.

CARMONA, a town of Andaluſia in Spain, about ſeventeen miles eaſt of Sevil: W. long. 5° 35′, N. lat. 37° 20′.

CARNARVON, a borough-town of Carnarvonſhire, in north Wales, about five miles ſouth-weſt of Bangor: W. long. 4° 25′, and N. lat. 53° 20′. It gives the title of earl to the noble family of Bridges; and ſends one member to parliament.

CARNATION, in botany. See CARYOPHYLLUS.

CARNATION-*colour*, among painters, is underſtood of all the parts of a picture, in general, which repreſent fleſh, or which are naked and without drapery.

In colouring for fleſh, there is ſo great a variety, that it is hard to lay down any general rules for inſtruction therein; neither are there any regarded by thoſe who have acquired a ſkill this way: The various colouring for carnations, may be eaſily produced, by taking more or leſs red, blue, yellow, or biſtre, whether for the firſt colouring, or for the finiſhing: The colour for women ſhould be bluiſh, for children a little red, both freſh and gay; and for the men it ſhould incline to yellow, eſpecially if they are old.

CARNELIAN, in natural hiſtory, a precious ſtone, of which there are three kinds, diſtinguiſhed by three colours, a red, a yellow, and a white. The red is very well known among us, and is found in roundiſh or oval maſſes, much like our common pebbles; and is generally met with between an inch and two or three inches in diameter: It is of a fine, compact, and cloſs texture, of a gloſſy ſurface; and, in the ſeveral ſpecimens, is of all the degrees of red, from the paleſt fleſh-colour to the deepeſt blood-red. It is generally free from ſpots, clouds, or variegations; but ſometimes it is veined very beautifully with an extremely pale red, or with white; the veins forming concentric circles, or other leſs regular figures, about a nucleus, in the manner of thoſe of agates. The pieces of carnelian which are all of one colour, and perfectly free from veins, are thoſe which our jewellers generally make uſe of for ſeals, though the variegated ones are much more beautiful. The carnelian is tolerably hard, and capable of a very good poliſh: It is not at all affected by acid menſtruums: The fire diveſts it of a part of its colour, and leaves it of a pale red; and a ſtrong and long continued heat will reduce it to a pale dirty gray.

The fineſt carnelians are thoſe of the Eaſt Indies; but there are very beautiful ones found in the rivers of Sileſia and Bohemia; and we have ſome not deſpicable ones in England.

Though the ancients have recommended the carnelian as aſtringent, and attributed a number of fanciful virtues to it, we know no other uſe of the ſtone, than the cutting ſeals on it, to which purpoſe it is excellently adapted, as being not too hard for cutting, and yet hard enough not to be liable to accidents, to take a good poliſh, and to ſeparate eaſily from the wax.

CARNERO, in geography, a name given to that part of the gulf of Venice, which extends from the weſtern coaſt of Iſtria to the iſland of Groſſa and the coaſt of Morlachia.

CARNERO is likewiſe the name of the cape to the weſt of the mouth of the bay of Gibraltar.

CARNIOLA, a territory of Auſtria, in Germany, bounded by Carinthia and Stiria on the north, and by the dominions of Venice on the ſouth.

CARNIVAL, or CARNAVAL, a time of rejoicing, a ſeaſon of mirth, obſerved with great ſolemnity by the Italians, particularly at Venice, holding from twelfth-day till lent.

Feaſts, balls, operas, concerts of muſic, intrigues, marriages, *&c.* are chiefly held in carnival-time. The carnival begins at Venice the ſecond holiday in Chriſtmas: Then it is they begin to wear maſks, and open their play-houſes and gaming-houſes; the Place of St Mark is filled with mountebanks, jack-puddings, pedlars, whores, and ſuch like mob, who flock thither from all parts: There have been no leſs than ſeven ſovereign princes, and thirty thouſand foreigners here, to partake of theſe diverſions.

CAROB-*tree*. See CERATONIA.

CAROLINA, a province of N. America, belonging to Great Britain: It is ſituated, comprehending Georgia, between 75° and 86° W. long. and between 31° and 36° N. lat. and bounded by Virginia on the north, by the Atlantic ocean on the eaſt, by Spaniſh Florida on the ſouth, and by the Apalachian mountains on the weſt; or rather extends weſtward, without any limits. It is divided into three diſtinct governments, *viz.* North and South Carolina, and Georgia.

CAROLINE-*books*, the name of four books, compoſed by order of Charlemagne, to refute the ſecond council of Nice. Theſe books are couched in very harſh and ſevere terms, containing one hundred and twenty heads of accuſation againſt the council of Nice, and condemning the worſhip of images.

CAROLSTAT, a town of Gothland in Sweden, ſituated at the north end of the Wener-lake, about one hundred and forty miles weſt of Stokholm: E. long. 13° 30′, and N. lat. 59° 40′.

CAROLUS, an ancient Engliſh broad piece of gold, ſtruck under Charles I. its value has of late been at twenty-three ſhillings ſterling, though at the time it was coined, it is ſaid to have been rated at twenty ſhillings.

CAROLUS, a ſmall copper coin, with a little ſilver mixed with it, ſtruck under Charles VIII. of France.

The carolus was worth twelve deniers, when it ceaſed to be current.

Thoſe which are ſtill current in trade, in Lorrain, or in ſome neighbouring provinces, go under the name of French ſols.

CAROTID *arteries*, in anatomy. See p. 226.

CARP, in ichthyology, the Engliſh name of a ſpecies of cyprinus. See CYPRINUS.

CARPENTRY, the art of cutting, framing, and joining large pieces of wood, for the uſes of building. It is one of the arts ſubſervient to architecture, and is divided into houſe-carpentry and ſhip-carpentry: The firſt is employed in raiſing roofing, flooring of houſes, *&c.* and the ſecond in the building of ſhips, barges, *&c.* The rules in carpentry are much the ſame with thoſe of joinery; the only difference is, that carpentry is uſed in the larger coarſer work, and joinery in the ſmaller and curious. See JOINERY.

CARPET, a ſort of covering of ſtuff, or other materials, wrought with the needle or on a loom, which is part of the furniture of a houſe, and commonly ſpread over tables, or laid upon the floor.

Perſian and Turkey carpets are thoſe moſt eſteemed; though at Paris there is a manufactory after the manner of Perſia, where they make them little inferior, not to ſay finer, than the true Perſian carpets. They are velvety, and perfectly imitate the carpets which come from the Levant. There are alſo carpets of Germany, ſome of which are made of woollen ſtuffs, as ſerges, &c. and called ſquare carpets: Others are made of wool alſo, but wrought with the needle, and pretty often embelliſhed with ſilk; and laſtly, there are carpets made of dog's hair. We have likewiſe carpets made in England, which are uſed either as floor-carpets, or to make chairs and other houſehold furniture: It is true, we are not arrived at the like perfection in this manufacture with our neighbours the French; but may not this be owing to the want of the like public encouragement?

CARPI, a town of the Veroneſe in Italy, ſituated on the river Adige, twenty four miles ſouth-eaſt of Verona: E. long 11° 40′, and N. lat. 45° 10′.

CARPINUS, the HORN-BEAN, in botany, a genus of the monœcia polyandria claſs. The calix of the male is bell-ſhaped, and divided into five ſegments; it has no corolla; and the ſtamina are ten. The calix of the female has four teeth; there is no corolla; the ſtyli are three; and the capſule has four valves, containing two ſeeds. There are but two ſpecies, both natives of America.

CARPIO, in ichthyology, the trivial name of a ſpecies of ſalmo and cyprinus. See SALMO, and CYPRINUS.

CARPOBALSAM, in the materia medica, the fruit of the tree which yields the true oriental balſam.

The caprobalſam is uſed in Egypt, according to Proſper Alpinus, in all the intentions for which the balſam itſelf is applied: But the only uſe the Europeans make of it is in venice-treacle and mithridate, and in theſe not a great deal; for cubebs and juniper-berries are generally ſubſtituted in its place.

CARPOBOLUS, in botany. See LYCOPERDON.

CARPUS, the WRIST, in anatomy. See p. 179, 180.

CARR, among the ancients, a kind of throne mounted on wheels, and uſed in triumphs and other ſolemn occaſions.

CARRIAGE, a vehicle ſerving to convey perſons, goods, merchandiſes, and other things from one place to another.

For the conſtruction and mechanical principles of wheel-carriages, ſee MECHANICS.

CARRIAGE *of a cannon*, the frame or timber-work on which it is mounted, ſerving to point it for ſhooting, or to carry it from one place to another. It is made of two planks of wood, commonly one half the length of the gun, called the cheeks, and joined by three wooden tranſums, ſtrengthened with three bolts of iron. It is mounted on two wheels; but on a march has two fore-wheels, with limbers added. The principal parts of a carriage are the cheeks, tranſums, bolts, plates, train, bands, bridge, bed, hooks, trunion-holes, and capſquare.

Block CARRIAGE, a cart made on purpoſe for carrying mortars and their beds from place to place.

Truck-CARRIAGE, two ſhort planks of wood ſupported on two axle-trees, having four trucks of ſolid wood for carrying mortars or guns upon battery, where their own carriages cannot go. They are drawn by men.

CARRICK, the moſt ſoutherly diviſion of the ſhire of Air in Scotland.

CARRICK *on the Sure*, a town of Ireland, in the county of Tipperary, and province of Munſter, about fourteen miles north-weſt of Waterford: W. long. 7° 24′, and N. lat. 52° 16′.

CARRICK-FERGUS, a town in the county of Antrim, and province of Ulſter, in Ireland, about eighty-five miles north of Dublin: W. long. 6° 15′, and N. lat. 54° 45′.

CARROT, in botany. See DAUCUS.

Candy-CARROT. See MYRRHIS.

Deadly-CARROT. See THAPSIA.

Mountain CARROT. See FOENICULUM.

CARROUSAL, a courſe of horſes and chariots, or a magnificent entertainment exhibited by princes on ſome public rejoicing. It conſiſts in a cavalcade of ſeveral gentlemen richly dreſſed and equipped, after the manner of ancient cavaliers divided into ſquadrons, meeting in ſome public place, and practiſing juſts, tournaments, &c. The laſt carrouſals were in the reign of Lewis XIV.

CARS, or KARS, a city of Turcomania, or the greater Armenia, ſituated on a river of the ſame name: E. long. 44°, and N. lat. 41° 30′. It is ſubject to the Turks.

CARSE, or CARSE *of Gowry*, the name of a diſtrict of Perthſhire in Scotland, lying eaſtward of Perth, on the northern bank of the Tay.

CART, a land-carriage with two wheels, drawn commonly with horſes, to carry heavy goods, &c. from one place to another. See MECHANICS.

CARTAMA, a town of Granada, in Spain, about ten miles north-weſt of Malaga: W. long. 4° 30′, and N. lat. 36° 40′.

CARTEL, an agreement made between two ſtates for the exchange of their priſoners of war.

CARTEL ſignifies alſo a letter of defiance, or a challenge, to decide a controverſy, either in a tournament, or in ſingle combat. See DUEL.

CARTERET, a county of South Carolina, in North America.

CARTESIANS, a ſect of philoſophers, who adhere to the ſyſtem of Des Cartes, and founded on the two following principles; the one metaphyſical, the other phyſical: the metaphyſical one is, *I think, therefore I am*; the phyſical principal is, *That nothing exiſts but ſubſtance.* Subſtance he makes of two kinds; the one a ſubſtance that thinks, the other a ſubſtance extended; whence actual thought and actual extenſion are the eſſence of ſubſtance.

The eſſence of matter being thus fixed in extenſion, the Carteſians conclude, that there is no vacuum, nor any poſſibility thereof in nature, but that the world is abſolutely full: mere ſpace is precluded by this principle,

ciple, in regard, extenſion being implied in the idea of ſpace, matter is ſo too.

Upon theſe principles, the Carteſians explain mechanically, and according to the laws of motion, how the world was formed, and whence the preſent appearances of nature do riſe. They ſuppoſe, that matter was created of an indefinite extenſion, and divided into little ſquare maſſes, full of angles; that the Creator impreſſed two motions on this matter; one whereby each part revolved round its centre, another whereby an aſſemblage, or ſyſtem, turned round a common centre; whence aroſe as many different vortices as there were different maſſes of matter, thus moving round common centres.

The conſequences of this hypotheſis, according to the Carteſians, will be, that the parts of matter in each vortex could not revolve among each other, without having their angles gradually broken, and that this continual friction of parts and angles produced three elements; the firſt, an infinitely fine duſt, formed of the angles broken off; the ſecond, the ſpheres remaining, after all the angular irregularities are thus removed: theſe two make the matter of Des Cartes's firſt and ſecond element; and thoſe particles not yet rendered ſmooth and ſpherical, and which ſtill retain ſome of their angles, make the third element.

Now, according to the laws of motion, the ſubtileſt element muſt take up the centre of each ſyſtem, being that which conſtitutes the ſun, the fixed ſtars above, and the fire below; the ſecond element, compoſed of ſpheres, makes the atmoſphere, and all the matter between the earth and the fixed ſtars, in ſuch a manner as that the largeſt ſpheres are always next the circumference of the vortex or ſyſtem, and the ſmalleſt next its centre; the third element, or the hooked particles, is the matter that compoſes the earth, all terreſtrial bodies, comets, ſpots in the ſun, *&c.* Though both philoſophers and divines have a juſt plea againſt this romantic ſyſtem, yet it muſt be owned, that Des Cartes, by introducing geometry into phyſics, and accounting for natural phœnomena by the laws of mechanics, did infinite ſervice to philoſophy.

CARTHAGE, or NEW CARTHAGE, the capital of Coſtarica, a province of Mexico, in North America: W. long. 86°, and N. lat. 9° 44′.

CARTHAGENA, a large city, with one of the beſt harbours in Spain, ſituated in the province of Murcia, about twenty miles ſouth of that city: W. long. 1° 5′, and N. lat. 37° 40′. It is a biſhop's ſee.

New CARTHAGENA, the capital of a province of the ſame name, in South America, ſituated on a kind of peninſula: W. long. 77°, and N. lat. 11°. It is one of the largeſt and beſt fortified towns in South America.

CARTHAMUS, or BASTARD-SAFFRON, in botany, a genus of the ſyngeneſia polygamia æqualis claſs. The calix is ovated, and imbricated with foliaceous ſcales of an oval ſhape. There are nine ſpecies, none of them natives of Britain. The ſeeds are purgative; but operate ſlowly, and diſorder the bowels.

CARTHUSIANS, a religious order, founded in the year 1080, by one Bruno. Their rules are very ſevere. They are not to go out of their cells, except to church, without leave of their ſuperior; nor ſpeak to any perſon without leave. They muſt not keep any portion of their meat or drink till next day; their beds are of ſtraw, covered with a felt; their cloathing two hair-cloths, two cowls, two pair of hoſe, and a cloke, all coarſe. In the refectory, they are to keep their eyes on the diſh, their hands on the table, their attention on the reader, and their hearts fixed on God. Women are not allowed to come into their churches.

CARTHUSIAN-POWDER, the ſame with kermes mineral. See KERMES.

CARTILAGE, in anatomy, a body approaching much to the nature of bones; but lubricous, flexible, and elaſtic.

CARTMEL, a market-town of Lancaſhire, about ten miles north-weſt of Lancaſter: W. long. 2° 40′, and N. lat. 54° 15′,

CARTON, or CARTOON, in painting, a deſign drawn on ſtrong paper, to be afterwards calked through, and transferred on the freſh plaſter of a wall to be painted in freſco.

Carton is alſo uſed for a deſign coloured, for working in moſaic, tapeſtry, *&c.* The cartons at Hampton-court are deſigns of Raphael Urbin, intended for tapeſtry

CARTOUCHE, in architecture and ſculpture, an ornament repreſenting a ſcroll of paper. It is uſually a flat member, with wavings, to repreſent ſome inſcription, device, cypher, or ornament of armoury. They are, in architecture, much the ſame as modillions; only theſe are ſet under the cornice in wainſcotting, and thoſe under the cornice at the eaves of a houſe.

CARTOUCHE, in the military art, a caſe of wood, about three inches thick at the bottom, girt with marlin, holding about four hundred muſket-balls, beſides ſix or eight balls of iron, of a pound weight, to be fired out of a hobit, for the defence of a paſs, *&c.*

A cartouche is ſometimes made of a globular form, and filled with a ball of a pound weight; and ſometimes it is made for the guns, being of ball of half or quarter pound weight, according to the nature of the gun, tied in form of a bunch of grapes, on a tompion of wood, and coated over. Theſe were made in the room of partridge-ſhot.

CARTRIDGE, in the military art, a caſe of paſteboard or parchment. holding the exact charge of a fire-arm. Thoſe for muſkets, carabines, and piſtols, hold both the powder and ball for the charge; and thoſe of cannon and mortars are uſually in caſes of paſteboard or tin, ſometimes of wood, half a foot long, adapted to the calibre of the piece.

CARTRIDGE-BOX, a caſe of wood or turned iron, covered with leather, holding a dozen muſquet-cartridges. It is wore upon a belt, and hangs a little lower than the right pocket-hole.

CARVA, in botany. See LAURUS.

CARUI, or CARVI, in botany. See CARUM.

CARVING. See SCULPTURE.

CARUM, CARAWAY, in botany, a genus of the pentandria digynia claſs. The fruit is oblong and ſtriated; the involucrum conſiſts of but one leaf; and the petals are carinated and emarginated. There is but one ſpecies, *viz.* the caroi, a native of Britain. The ſeeds have an aromatic ſmell and pungent taſte; and are frequently employed as a ſtomachic and carminative in flatulent caſes.

CARUNCULA, in anatomy, a term denoting a little piece of fleſh, and applied to ſeveral parts of the body, thus:

CARUNCULÆ MYRTIFORMES. See p. 276.

CARUS, in medicine, a ſudden deprivation of ſenſe and motion, affecting the whole body.

CARWAR, a town on the coaſt of Malabar, in the Hither India, ſixty miles ſouth of Goa: E. long. 73°, and N. lat. 15°. Here our Eaſt-India company have a factory, from whence they import pepper.

CARYATIDES, or CARAITES, in architecture. See p. 353.

CARYOCATACTES, in ornithology, the trivial name of a ſpecies of corvus. See CORVUS.

CARYOCOSTINUM, or ELECTORIUM ET SCAMMONIO, in pharmacy, is compoſed of the following ingredients: An ounce and a half of ſcammony; of cloves and ginger, each ſix drams; half a pound of honey; half a dram of eſſential oil of caraway-ſeeds; the ſpices muſt be ground together and mixed with the honey; then add the powdered ſcammony, and afterwards the oil. This electuary is a warm briſk purgative.

CARYOPHYLLATA, in botany. See GEUM.

CARYOPHYLLUS, the PINK, in botany. See DIANTHUS.

CARYOPHYLLUS, the CLOVE-TREE, in botany, a genus of the polyandria monogynia claſs. The corolla has four petals; the calix conſiſts of four duplicated leaves; and the berry contains one ſeed. There is but one ſpecies, *viz.* the aromaticus, a native of the Molucca iſlands. The cloves are the flower-cups, have a ſtrong agreeable aromatic ſmell, and a bitteriſh pungent taſte. The eſſential oil of cloves is an ingredient in many of our officinal compoſitions.

CARYOTA, in botany, a genus of plants ranged under the palmæ bipennatifoliæ. The calix of the male is common; the corolla is divided into three parts; and the ſtamina are numerous. The calix and corolla of the male are the ſame with thoſe of the female; there is but one piſtillum; and the berry contains two ſeeds. There is but one ſpecies, *viz.* the urens, a native of India.

CASAL, the capital of the duchy of Montſerrat, in Italy, ſituated on the river Po, forty-five miles eaſt of Turin: E. long. 8° 35′, and N. lat. 45°.

CASAN, or KASAN, a province of Ruſſia, lying between the province of Moſcow on the weſt, and Siberia on the eaſt.

CASCADE, a ſteep fall of water from a higher into a lower place.

They are either natural, as that at Tivoli, *&c.* or artificial, as thoſe of Verſailles, *&c.* and either falling with gentle deſcent, as thoſe of Sceaux; or in form of a buffet, as at Trianon; or down ſteps, in form of a perron, as at St Clou; or from baſon to baſon, *&c.*

CASCAIS, a town of Eſtremadura, in Portugal, ſituated at the mouth of the river Tagus, ſeventeen miles eaſt of Liſbon: W. long. 10° 15′, and N. lat. 38° 40′.

CASCARILLA, in botany. See CINCHONA.

CASE, among grammarians, implies the different inflexions or terminations of nouns, ſerving to expreſs the different relations they bear to each other, and to the things they repreſent.

CASE, among printers, denotes a ſloping frame, divided into ſeveral compartments, each containing a number of types or letters of the ſame kind. See PRINTING.

CASE *of crown glaſs* contains uſually twenty-four tables, each table being nearly circular, and about three feet ſix inches diameter.

CASE *of Newcaſtle glaſs* contains thirty-five tables; of Normandy glaſs twenty-five.

CASE-HARDENING, a method of preparing iron, ſo as to render its outer ſurface hard, and capable of reſiſting any edged tool.

This is a leſſer degree of ſteel-making, and is practiſed by baking, calcination, or cementation in an oven or other cloſe veſſel, ſtratified with charcoal and powdered hoofs and horns of animals, ſo as to exclude the air. See STEEL.

CASE-SHOT, in the military art, muſket-ball, ſtones, old iron, *&c.* put into caſes, and ſhot out of great guns.

CASERTA, a city of the province of Lavoro, in the kingdom of Naples, about ſixteen miles north of the city of Naples: E. long. 15° 5′, and N. lat. 41° 10′. It is a biſhop's ſee.

CASH BOOK. See BOOK-KEEPING, p. 618.

CASHELL, or CASHILL, a city of the county of Tipperary, in Ireland, about eighty miles ſouth-weſt of Dublin: W. long. 7° 40′, and N. lat. 52° 16′. It is a biſhop's ſee.

CASHEW-NUT, in botany. See ANACARDIUM.

CASIA, in botany. See OSYRIS.

CASK, a veſſel of capacity, for preſerving liquors of divers kinds; and alſo ſometimes dry goods, as ſugar, almonds, *&c.*

A caſk of ſugar is a barrel of that commodity, containing from eight to eleven hundred weight. A caſk of almonds is about three hundred weight.

CASPIAN-SEA, a large ſea, or lake of Aſia, bounded by the province of Aſtracan on the north, and by part of Perſia on the eaſt, ſouth, and weſt. It is upwards of four hundred miles long from ſouth to north, and three hundred miles broad from eaſt to weſt.

CASSANDRA, the ſame with the lyra, or harp-ſhell, a ſpecies of dolium.

CASSANO, a fortreſs, in the Milaneſe, in Italy, ſituated on the river Adda, about twelve miles north-eaſt of Milan: E. long. 10°, and N. lat. 45° 20′.

CASSEL, the capital of the landgravate of Heſſe-caſſel, in the circle of the Upper Rhine, in Germany, ſituated on the river Fulde: E. long. 2° 20′, and N. lat. 51° 20′.

Cassel is alſo the name of a town in French Flanders, about ſifteen miles ſouth of Dunkirk: E. long. 2° 30′, and N. lat. 50° 5′.

CASSIA, in botany, a genus of the decandria monogynia claſs. The calix conſiſts of five leaves; the petals are five; and the antheræ are roſtrated and barren; the pod is a legumen. There are 30 ſpecies, all natives of warm climates. The caſſia fiſtula is a native of Egypt, and the Eaſt Indies. The fruit is a cylindrical pod, the pulp of which is a gentle laxative medicine.

CASSIDA, in botany. See Scutellaria.

Cassida, in zoology, a genus of inſects belonging to the order of coleoptera. The feelers are like threads, but thicker on the outſide; the elytra are marginated; and the head is hid under the thorax. There are 31 ſpecies of this inſect, diſtinguiſhed principally by differences in their colour.

CASSIMERE, the capital city of a province of the ſame name in the Hither India: E. long. 75°, and N. lat. 35°. It was once the capital of a kingdom, and is ſtill ſometimes the reſidence of the Mogul.

CASSINE, in botany, a genus of the pentandria trigynia claſs. The calix conſiſts of five parts or ſegments; the petals are five, and the berry contains three ſeeds. There are only two ſpecies, both natives of Æthiopia.

CASSIOPEIA, in aſtronomy, a conſtellation of the northern hemiſphere, ſituated oppoſite to the great bear, on the other ſide of the pole.

CASSIS, the helmet-shell. See Murex.

CASSITERIA, in the hiſtory of foſſils, a genus of cryſtals, the figures of which are influenced by an admixture of ſome particles of tin.

The caſſiteria are of two kinds: the whitiſh pellucid caſſiterion, and the brown caſſiterion; the firſt is a tolerably bright and pellucid cryſtal, and ſeldom ſubject to the common blemiſhes of cryſtal: It is of a perfect and regular form, in the figure of a quadrilateral pyramid, and is found in Devonſhire and Cornwall principally. The brown caſſiterion is like the former in figure: It is of a very ſmooth and gloſſy ſurface, and is alſo found in great plenty in Devonſhire and Cornwall.

CASSOCK, or Cassula, a kind of robe or gown, wore over the reſt of the habit, particularly by the clergy. The word caſſock comes from the French *caſaque*, an horſeman's coat.

CASSOWARY, in ornithology. See Struthio.

CASSUMBAZAR, a town of India, in Aſia, ſituated on the river Ganges, in the province of Bengal: E. long. 37°, and N. lat. 24°.

CASSUMUNAR, in the materia medica, a root approaching to that of zedoary.

It is cardiac and ſudorific, and famous in nervous caſes: It is alſo an ingredient in many compoſitions, and is preſcribed in powders, boluſſes, and infuſions. Its doſe is from five to fifteen grains.

CASTANEA, in botany. See Fagus.

CASTANOVITZ, a town of Croatia, ſituated on the river Unna, which divides Chriſtendom from Turky: E. long. 17° 20′, and N. lat. 45° 40′. It is ſubject to the houſe of Auſtria.

CASTEL-ARAGONESE, a fortreſs of Sardinia, ſituated on the north-weſt coaſt of that iſland: E. long. 8° 45′, and N. lat. 41°.

Castel-bar, a town of Ireland, in the county of Mayo, and province of Connaught, about thirty-eight miles north of Gallway: W. long. 9° 24′, N. lat. 53° 25′.

Castel-brancho, a city of the province of Beira, in Portugal, about ninety five miles north-eaſt of Liſbon: W. long. 8°, N. lat. 39° 35′.

Castel de vide, a town of Alentejo, in Portugal, about twelve miles eaſt of Portalegre, and thirty-five weſt of Alcantara: W. long. 7° 40, N. lat. 39°.

CASTELLA, a town of the Mantuan, in Italy, about five miles north-eaſt of the city of Mantua: E. long. 11° 15′, N. lat. 45° 30′.

CASTELLAN, the name of a dignity or charge in Poland: The caſtellans are ſenators of the kingdom, but ſenators only of the lower claſs, who, in diets, ſit on low ſeats, behind the palatines, or great ſenators. They are a kind of lieutenants of provinces, and command a part of the palatinate under the palatine.

CASTELLANY, the territory belonging to any city or town, chiefly uſed in France and Flanders: Thus we ſay, the caſtellany of Liſle, Ypres, *&c.*

CASTIGLIONE, a fortified town in the duchy of Mantua, about twenty miles north-weſt of the city of Mantua: E. long. 11°, N. lat. 45° 15′.

CASTILE, the name of two inland provinces of Spain, ſituated almoſt in the middle of that kingdom: The moſt ſoutherly one is called New Caſtile, and the other, towards the north, Old Caſtile; Madrid being the capital of the former, and Burges of the latter.

CASTILLAN, or Castillane, a gold-coin, current in Spain, and worth fourteen rials and ſixteen deniers.

Castillan is alſo a weight uſed in Spain for weighing gold. It is the hundredth part of a pound Spaniſh weight.

What they commonly call a weight of gold in Spain, is always underſtood of the caſtillan.

CASTILLARA, a town of the Mantuan, in Italy, ſituated ſix miles north-eaſt of the city of Mantua: E. long. 11° 25′, N. lat. 45° 20′.

CASTILLON, a town of Perigort, in the province of Guienne, in France, ſituated on the river Dordonne, ſixteen miles eaſt of Bourdeaux: W. long. 2° 40, N. lat. 44° 50′.

CASTLE, a fortreſs or place rendered defenceable, either by nature or art.

A caſtle is a fort, or little citadel. See Citadel.

It frequently ſignifies with us the principal manſion of noblemen.

In the time of Henry II. there were no leſs than 1115 caſtles in England, each of which contained a manor.

Castle, in the ſea-language, is a part of the ſhip, of which there are two, the fore-caſtle, being the elevation

tion at the prow, or the uppermoſt deck, towards the mizen, the place where the kitchens are. Hind-caſtle is the elevation which reigns on the ſtern, over the laſt deck, where the officers cabins and places of aſſembly are.

Castle-carey, a market town of Somerſetſhire, ſituated ten miles ſouth-eaſt of Wells: W. long. 2° 40′, N. lat. 51° 15′.

Castle-rising, a borough-town of Norfolk, ſituated near the ſea coaſt, about thirty miles weſt of Norwich, and ſeven north of Lynn: E. long. 40′, N. lat. 52°. 46′. It ſends two members to parliament.

Castle-work, ſervice or labour done by inferior tenants, for the building and upholding of caſtles of defence, towards which ſome gave their perſonal aſſiſtance, and others paid their contributions. This was one of the three neceſſary charges to which all lands among our Saxon anceſtors were expreſsly ſubject.

CASTON, a market-town of Norfolk, about eight miles north-weſt of Norwich: E. long. 1° 20′, N. lat. 52° 45′.

CASTOR, or **Beaver**, in zoology, a genus of quadrupeds belonging to the order of glires. The fore-teeth of the upper jaw are truncated, and hollowed in a tranſverſe angular direction. The tops of the fore-teeth of the lower-jaw lie in a tranſverſe direction; and the tail is depreſſed. There are three ſpecies of caſtor, *viz.* 1. The fiber, with a plane ovated tail, is found on the banks of rivers in Europe, Aſia, and America. It is from the inguinal glands of this animal that the caſtor is obtained; it is contained in cods or pouches which reſemble a dog's teſticles.

Several writers have taken notice of the ingenuity of American beavers in making their houſes, of which we ſhall here give ſome account. The firſt thing they do when they are about to build, is to aſſemble in companies, ſometimes of two or three hundred together; then they chuſe a place where plenty of proviſions are to be had, and where all neceſſaries are to be found proper for their uſe. Their houſes are always in the water, and when they can find neither lake nor pond, they endeavour to ſupply that defect by ſtopping the current of a brook or ſmall river, by means of a dam. To this end they firſt cut down trees in the following manner: Three or four beavers will go to work about a large tree, and by continually gnawing of it with their teeth, they at laſt throw it down, and ſo contrive matters that it always falls towards the water, that they may have the leſs way to carry it, when they have divided it into pieces. After they have done this, they take each piece by itſelf, and roll it towards the water, where they intend to place it.

Theſe pieces are more or leſs thick and long, according to the nature and ſituation of the places where they are required. Sometimes they make uſe of the large trunks of trees, which they lay down flat; ſometimes the dam only conſiſts of branches as thick as one's thigh, which are ſupported by ſtakes interwoven with the branches of trees; and all the vacant places are filled up with a ſort of clay, in ſuch a manner, that no water can paſs through them. They prepare the clay with their paws or hands; and their tails ſerve inſtead of a carriage, as well as a trowel to lay on their clay.

The foundation of the dams are generally ten or twelve feet thick, and they leſſen gradually till they come to two or three. They always obſerve an exact proportion, inſomuch, that the moſt curious architects are not capable of performing their work more regularly. That ſide towards the current of the water is always ſloping, but the other is perpendicular.

The conſtruction of the houſes is altogether as wonderful; for they are generally built upon piles in ſmall lakes, which are formed by making of the dams. Sometimes they are on the bank of a river, or on the extremity of a point of land, which advances into the water. They are of a round or oval form, and the top of them is like a dome.

This deſcription of one of their houſes, which was examined and meaſured, will perhaps give the reader more ſatisfaction than an account in general. It was about three parts ſurrounded with water, and the other part was joined to the land. It was round, with an oval dome at the top, and the height above the ſurface of the water, was eight feet. It was about forty feet in diameter, and one hundred and twenty in circumference, which perhaps may ſeem ſtrange, becauſe the proportion is geometrical; this however is fact, for it was meaſured ſeveral times. The part that joined to the bank was not made out of it, but was of the ſame materials with the reſt.

The bottom of the houſe was of earth, or ſoil, with pieces of wood laid in it, above three inches in circumference; then a parcel of poplar ſticks laid with one end in the houſe, and another ſlanting a long way under water; then a layer of earth again, and then poplar ſticks, which were repeated to the height of eighteen inches. From thence to the top of the houſe there was a mixture of earth, ſtones, and ſticks, curiouſly put together; and the whole was covered with ſods, that had long graſs growing thereon. The largeſt pieces of wood made uſe of near the top, were about three inches in diameter, and all the reſt was ſmall ſtuff, not above two or three fingers thick.

The outermoſt part of this houſe did not ſtand farther out in the creek than the edge of the ſhore; but that which brought the water almoſt round the houſe were the trenches, which were made by taking out the earth; theſe were nine feet in the broadeſt part, and eighteen feet in length. The creek at the front of the houſe was ſix and thirty feet broad, and ſeemed to be pretty deep. The houſe was ſo contrived as to be very ſolid, for there was no breaking into it without an ax; and in the froſty ſeaſon it was quite impenetrable. From this houſe there were ſeveral paths into the wood, through which they drew the ſticks and trees, which they made uſe of for food or building.

The wall of the houſe was two feet thick, and it was covered with ſmooth clay on the inſide in ſuch a manner that it would not admit the leaſt breath of air. Two thirds of the ſtructure was out of the water; and in the upper part, each beaver had his particular place, whereon leaves were ſtrewed to lie upon.

There never was any filth ſeen in any of theſe houſes, which are made like an oven in the inſide, with a paſſage for theſe animals to go and bathe in the water. One of theſe will generally lodge about eight or ten beavers, though ſometimes they have held thirty; but this is very uncommon.

Theſe creatures are never ſurpriſed by the froſt and ſnow; for they finiſh their work towards the end of September; and then they lay in proviſions for the winter. In the ſummer-time they live upon fruits, and the barks and leaves of trees; and they likewiſe catch ſmall fiſh, and particularly crabs or craw-fiſh. However, their winter-proviſion is the tender branches of trees, particularly poplar, of which they ſeem to be very fond. It is uſually ſaid, and upon pretty good authority, that theſe beavers make the walls of their houſes of a thickneſs in proportion to the ſeverity of the ſucceeding winter; which if true, theſe animals muſt be furniſhed with uncommon foreſight.

When there are great floods cauſed by the melting of the ſnow, which damage the houſes of the beavers, they then leave them, and ſhift for themſelves as well as they can; however, the females return as ſoon as the waters are abated; but the males keep the field till July, when they aſſemble again to repair the damage that has been done by the flood, either to their houſes or dams. When any of their houſes are demoliſhed by the hunters, they never repair them again, but build others quite new. Some authors have ſaid, that the beavers make ſeveral rooms in their houſes; but this upon examination has been found to be falſe.

In hunting the beavers, the ſavages ſometimes ſhoot them, always getting on the contrary ſide of the wind; for they are very ſhy, quick in hearing, and of a very keen ſcent. This is generally done when the beavers are at work, or on ſhore feeding on poplar bark. If they hear any noiſe when at work, they immediately jump into the water, and continue there ſome time; and when they riſe, it is at a diſtance from the place where they went in.

They ſometimes are taken with traps: theſe are nothing but poplar ſticks laid in a path near the water; which when the beaver begins to feed upon, they cauſe a large log of wood to fall upon their necks, which is put in motion by their moving of the ſticks, and conſequently requires an ingenious contrivance. The ſavages generally prefer this way of taking them, becauſe it does not damage their ſkins.

In the winter-time they break the ice in two places at a diſtance from the houſe, the one behind the other. Then they take away the broken ice with a kind of a racket, the better to ſee where to place their ſtakes. They faſten their nets to theſe, which have large meſhes, and ſometimes are eighteen or twenty yards in length. When theſe are fixed, they proceed to demoliſh the houſe, and turn a dog therein; which terrifying the beaver, he immediately leaves it, and takes to the water; after which, he is ſoon entangled by the net.

Mr Lawſon who was general ſurveyor of North Carolina, affirms, that beavers are very plenty in that country. He confirms what has been ſaid about their ingenuity in building of their dams and houſes, and obſerves, that their food is chiefly the bark of trees and ſhrubs; ſuch as that of the ſaſſafras, aſh, ſweet gum, and ſeveral others. He adds, that if they are taken young, they will become very tame; but then they will do a great deal of miſchief in the orchards, by breaking the trees. They will likewiſe block up the doors of the houſes in the night, with the ſticks and wood which they bring thither. He farther informs us, that it is certain death for them to eat any thing that is ſalt. The fleſh is looked upon as very delicate food.

2. The moſchatus, with a long, compreſſed, lanceolated tail, and palmated feet. It is the exotic water-rat of Cluſius, and is a native of Ruſſia.

3. The zibethicus, or muſk-rat, with a long, compreſſed, and lanceolated tail, and the toes of the feet ſeparate from each other. The follicles of the tail are ſaid to baniſh moths and other inſects from cloaths, *&c.* For this reaſon the inhabitants of Ruſſia and Canada ſew them into the folds of their cloaths, to keep off vermin and contagious diſeaſes.

Castor is alſo the name of a market-town of Lincolnſhire, twenty miles north-eaſt of Lincoln: W. long. 12′, and N. lat. 53° 30′.

CASTOREA, in botany. See Duranta.

CASTOREUM, in the materia medica, a ſubſtance obtained from the inguinal glands of the caſtor. See Castor.

CASTRATION, in ſurgery, the operation of gelding.

It was prohibited by a decree of the ſenate of Rome under Hadrian; and the Cornelian law ſubjected the perſon who performed the operation, to the ſame penalties as the perſon on whom it was performed, although it was done with his conſent.

Caſtration is much in uſe in Aſia and Turkey, where it is practiſed upon the ſlaves, to prevent any commerce with their women. In Italy, caſtration is frequent from another motive, namely, to preſerve the voice for ſinging. It is ſometimes found neceſſary in chirurgical caſes, as in a ſarcocele and cancer of the teſticles. For the method of performing this operation, ſee Surgery.

CASTRES, a city of Languedoc, in France, about thirty-five miles eaſt of Thoulouſe: E. long. 2°, and N. lat. 43° 40′. It is a biſhop's ſee.

CASTRO, the capital of the iſland of Chiloe, on the coaſt of Chili, in ſouth America: W. long. 82°, S. lat. 43°.

Castro is alſo the capital of a duchy of the ſame name in the pope's territories, in Italy, ſituated on the confines of Tuſcany: E. long. 12° 35′, N. lat. 42° 30′.

Castro is likewiſe a town in the territory of Otranto, in the kingdom of Naples, about ſeven miles ſouth of Otranto: E. long. 19° 25′, N. lat. 40° 8′.

Castro *marino*, a town in the province of Algarva, in Portugal, ſituated near the mouth of the river Guadiana, on the confines of Andaluſa: W. long. 8° 15′. N. lat. 37°.

CASUALTIES *of ſuperiority*, in Scots law, thoſe duties and emoluments which a ſuperior has right to demand out of his vaſſal's eſtate, over and beſides the conſtant yearly duties eſtabliſhed by the *reddendo* of his charter, upon certain caſual events. See Scots Law, title, *Of the caſualties due to the ſuperior.*

CASUS *amiſſionis*, in Scots law. In actions of proving the tenor of obligations extinguiſhable by the debtor's retiring or cancelling them, it is neceſſary for the purſuer, before he is allowed a proof of the tenor, to condeſcend upon ſuch a *caſus amiſſionis*, or accident, by which the writing was deſtroyed, as ſhews it was loſt while in the creditor's poſſeſſion. See Scots Law, title, *Actions.*

CAT, in zoology. See Felis.

Cat-*mint*, in botany. See Mentha.

Cat, or Cat-*head*, on ſhipboard, a ſhort piece of timber in a ſhip lying aloft right over the hawſe, having at one end two ſhivers, wherein is reeved a rope, with a great iron-hook faſtened to it, called

Cat-*hook*. Its uſe is to trice up the anchor, from the hawſe to the top of the fore-caſtle.

Cat *holes*, in a ſhip, are over the parts as right with the capſtan as they can be: Their uſe is to heave the ſhip a-ſtern, upon occaſion, by a cable, or hawſe, called ſtern-faſt. See Stern-fast.

Cat *of the mountain*. See Felis.

Cat-*ſilver*, in natural hiſtory. See Micæ.

CATACAUSTIC *curves*, in the higher geometry, that ſpecies of cauſtic curves which are formed by reflexion. See Fluxions.

CATACRHESIS, in rhetoric, a trope which borrows the name of one thing to expreſs another. Thus Milton deſcribing Raphael's deſcent from the empyreal heaven to paradiſe, ſays,

"Down thither prone in flight
"He ſpeeds, and thro' the vaſt etherial ſky
"Sails between worlds and worlds."

CATACOMB, a grotto or ſubterraneous place for the burial of the dead.

The term is particularly uſed in Italy, for a vaſt aſſemblage of ſubterraneous ſepulchres, three leagues from Rome, in the *via Appia*, ſuppoſed to be the ſepulchres of the ancients. Others imagine theſe catacombs to be the cells wherein the primitive Chriſtians hid themſelves. Each catacomb is three feet broad, and eight or ten high, running in form of an alley or gallery, and communicating with one another.

CATAGMATICS, in pharmacy, remedies proper for curing a catagma or fracture.

CATALEPSY, in medicine. See Medicine.

CATALONIA, a province of Spain, bounded by the Pyrenean mountains which divide it from France, on the north; by the Mediterranean, on the eaſt and ſouth; and by the provinces of Aragon and Valencia, on the weſt.

CATAMENIA, in medicine. See Menses.

CATAMITE, a boy kept for ſodomitical practices.

CATANANCHE, in botany, a genus of plants belonging to the ſyngeneſia polygamia æqualis claſs. The receptacle is paleaceous; the calix is imbricated; and the pappus has an awn, with a kind of cetaceous calix. There are three ſpecies, none of which are natives of Britain.

CATAPASM, among ancient phyſicians, ſignifies any dry medicine reduced to powder, in order to be uſed by way of inſpiration in the whole body, or any part of it.

CATAPHONICS, the ſcience which conſiders the properties of reflected ſounds.

CATAPHORA, in medicine, the ſame as coma. See Coma.

CATAPHRACTA, in antiquity, a kind of coat of mail, which covered the ſoldier from head to foot.

Hence, cataphracti were horſemen armed with the cataphracta, whoſe horſes, as Salluſt ſays, were covered with linen full of iron plates diſpoſed like feathers.

CATAPLASM, an external topical medicine, prepared of ingredients of different virtues, according to the intention of the phyſician. Hence there are different ſorts of cataplaſms with reſpect to the matter of which they conſiſt, as emollient, reſolvent, diſcutient, ſuppurative, corroborative, anodyne, and antiſeptic cataplaſms. They are commonly applied hot, or lukewarm, rolled up in linen cloths, which by means of the oils which are added preſerve heat for a conſiderable time; for which end alſo ſome, upon theſe, apply a ſwine's or ox's bladder, and ſometimes on the top of all apply an earthen tile.

CATAPULTA, in antiquity, a military engine contrived for the throwing of arrows, darts, and ſtones, upon the enemy.

Some of theſe engines were of ſuch force, that they would throw ſtones of an hundred weight. Joſephus takes notice of the ſurpriſing effects of theſe engines, and ſays, that the ſtones thrown out of them beat down the battlements, knocked off the angles of the towers, and would level a whole file of men, from one end to the other, were the phalanx never ſo deep.

CATARACT, in hydrography, a precipice in the channel of a river, cauſed by rocks, or other obſtacles, ſtopping the courſe of the ſtream, from whence the water falls with a greater noiſe and impetuoſity: Such are the cataracts of the Nile, the Danube, Rhine, and the famous one of Niagara in America.

Cataract, in medicine and ſurgery, a diſorder of the humours in the eye, by which the pupilla, that ought to appear tranſparent and black, looks opaque, grey, blue, brown, *&c.* by which viſion is variouſly impeded, or totally deſtroyed. See Medicine, and Surgery.

CATARO, the capital of a territory of the ſame name, in the Venetian Dalmatia, about twenty five miles ſouth-eaſt of Raguſa: E. long. 19° 20', N. lat. 42° 25'.

CATARACTES, in ornithology, the trivial name of a ſpecies of larus. See Larus.

CATARRH, in medicine, a diſtillation or defluxion from the head upon the mouth and aſpera arteria, and through them upon the lungs. See MEDICINE.

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Ruri cras ſtabo, nec tunicatus ero.

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Cavaliers are a double defence for the faces of the oppoſite baſtion; they defend the ditch, break the beſiegers galleries, command the traverſes in dry moats, ſcowr the ſailliant angle of the counterſcarpe where the beſiegers have their counter-batteries, and inſilade the enemies trenches, or oblige them to multiply their parallels; they are likewiſe very ſerviceable in defending the breach, and the retrenchments of the beſieged, and can very much incommode the entrenchments which the enemy make, being lodged in the baſtion.

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CAVEATING, in fencing, is the ſhifting the ſword from one ſide of that of your adverſary to the other.

CAVEDO, in commerce, a Portugueſe long meaſure, equal to $27\frac{354}{1000}$ Engliſh inches.

CAVETTO, in architecture, a hollow member, or round concave moulding, containing a quadrant of a circle, and having a quite contrary effect to that of a quarter round: it is uſed as an ornament in cornices.

CAVEZON, in the menage, a ſort of noſe-band, either of iron, leather, or wood, ſometimes flat, and at other times hollow or twiſted, clapt upon the noſe of a horſe, to wring it, and ſo forward the ſuppling and breaking of the horſe.

CAVIA-cobaya, a ſynonime of the mus porcellinus, or Guinea-pig. See Mus.

CAVILLON, a town of Provence in France, ſituated on the river Durance, about fifteen miles ſouth of Avignon: E. long. 5°, and N. lat. 43° 50′. It is a biſhop's ſee, and ſubject to the pope.

CAUKING, or Caulking *of a ſhip*, is driving oakum, or the like, into all the ſeams of the planks of a ſhip, to prevent leaking, and keep out the water.

Caulking-irons, are iron chiſſels for that purpoſe. Some of theſe irons are broad, ſome round, and others grooved. After the ſeams are ſtopped with oakum, it is done over with a mixture of tallow, pitch, and tar, as low as the ſhip draws water.

CAUL, in anatomy. See p. 266. col. 2.

CAULIFLOWERS, in gardening, a much eſteemed ſpecies of cabbage.

Cauliflowers have of late years been ſo much improved in Britain, as to exceed in goodneſs and magnitude any produced in moſt parts of Europe; and, by the ſkill of the gardener, are continued for ſeveral months together, but the moſt common ſeaſon for them is in May, June, and July.

CAULIS, in botany. See p. 641. col. 2. and Plate LVII. fig. 148.

CAUSALTY, among metaphyſicians, the action or power of a cauſe in producing its effect.

Causalty, among miners, denotes the lighter, ſulphureous, earthy parts of ores, carried off in the operation of waſhing.

This, in the mines, they throw in heaps upon banks, which, in ſix or ſeven years, they find it worth their while to work over again.

CAUSE, that from whence any thing proceeds, or by virtue of which any thing is done: it ſtands oppoſed to effect. We get the ideas of cauſe and effect from our obſervation of the viciſſitude of things, while we perceive ſome qualities or ſubſtances begin to exiſt, and that they receive their exiſtence from the due application and operation of other beings. That which produces, is the cauſe; and that which is produced, the effect: thus, fluidity in wax is the effect of a certain degree of heat, which we obſerve to be conſtantly produced by the application of ſuch heat.

Firſt Cause, that which acts of itſelf, and of its own proper power or virtue: God is the only firſt cauſe in this ſenſe.

Second Causes are thoſe which derive the power and faculty of action from a firſt cauſe.

Efficient Causes are the agents employed in the production of any thing.

Material Causes, the ſubjects whereon the agents work; or the materials whereof the thing is produced.

Final Causes are the motives inducing an agent to act; or the deſign and purpoſe for which the thing was done.

Phyſical Cause, that which produces a ſenſible corporeal effect; as the ſun is the phyſical cauſe of light.

Moral Cause, that which produces a real effect, but in things immaterial; as repentance is the cauſe of forgiveneſs. A moral cauſe is alſo defined, that which determines us, though not neceſſarily, to do, or not to do, any thing; as advice, intreaties, commands, menaces, *&c.*

It is to be obſerved, that, in this ſenſe, a moral cauſe is only applicable to a free intelligent agent: it is alſo obſervable, that the latter notion of a phyſical as well as a moral cauſe is the moſt juſt, clear, and diſtinct.

Cause, among civilians, the ſame with action. See Action.

CAUSTICS, in phyſic, an appellation given to medicines of ſo hot and fiery a nature, that, being applied, conſume, and, as it were, burn the texture of the parts, like hot iron.

Cauſtics are generally divided into four ſorts, the common ſtronger cauſtic, the common milder cauſtic, the antimonial cauſtic, and the lunar cauſtic.

The ſtronger cauſtic is prepared by boiling to a fourth part any quantity of the lees of almond-ſoap, adding lime that has been kept in a veſſel pretty cloſe ſtopt for ſeveral months; the lime is to be added till all the liquor is abſorbed, and the whole reduced to a paſte, which is to be kept in a veſſel well ſtopt.

The common milder cauſtic is prepared by taking equal parts of ſoft ſoap and freſh quick-lime, and mixing them at the time of uſing.

The antimonial cauſtic is prepared thus: Take of antimony one pound, of corroſive ſublimate two pounds; and being reduced ſeparately into powder, mix them well, and diſtill them in a retort with a wide neck, in a gentle heat of ſand; let what aſcends into the neck of the retort be expoſed to the air, that it may run into a liquor.

The method of preparing the lunar cauſtic is as follows: Diſſolve pure ſilver by a ſand-heat, in about twice its weight of aqua-fortis; then dry away the humidity with a gentle fire, afterwards melt it in a crucible, that it may be poured into proper moulds, carefully avoiding over-much heat, leſt the matter ſhould grow too thick.

Caustic curve, in the higher geometry, a curve formed by the concourſe or coincidence of the rays of light reflected from ſome other curve.

Caustic glasses. See Burning-glasses.

CAUSTICUM antimoniale, in the London Diſpenſatory, the ſame with the oil of antimony.

CAUSUS, or Burning-fever, a ſpecies of continual fever, accompanied with a remarkable inflammation of the blood.

CAUTERIZATION, the application of cauteries to any part of the body.

CAUTERY, in ſurgery, a medicine for burning, eating, or corroding any ſolid part of the body.

Cauteries are diſtinguiſhed into two claſſes, actual and potential: by actual cauteries, are meant red hot inſtruments, uſually of iron, and by potential cauteries are underſtood certain kinds of corroding medicines. See Medicine, and Surgery.

CAUTION, in the civil and Scots law, denotes much the ſame with what, in the law of England, is called bail. See Bail.

CAUTIONER, in Scots law, that perſon who becomes bound for another to the performance of any deed or obligation. As to the diifferent kinds and effects of cautionry, ſee Scots Law, title, *Obligations ariſing from conſent*.

CAXA, a little coin made of lead, mixed with ſome ſcoria of copper, ſtruck in China, but current chiefly at Bantam in the iſland of Java, and ſome of the neighbouring iſlands.

The caxas are of two kinds, great and ſmall. Of the ſmall, 300,000 are equal to fifty-ſix livres five ſols French money; and of the great, 6000 are equal to four ſhillings and ſixpence ſterling.

CAXAMALCA, the name of a town and diſtrict of Peru, in South America, where there was a moſt ſumptuous palace belonging to the Yncas, and a magnificent temple dedicated to the ſun. It was at Caxamalca that Pizarro put to death Athualpha, their laſt king.

CAY, in zoology, a ſynonime of the ſimia midas. See Simia.

CAZEROM, or Cazeron, a city of Perſia, the capital of the province of Kurch Schabour, ſituated in 70° E. long. and 29° 15′ N. lat.

CAZIMIR, a town of Poland, in the palatinate of Lublin.

CEANOTHUS, in botany, a genus of the pentandria monogynia claſs. The petals are vaulted; and the berry is dry, having three cells, containing each one ſeed. There are three ſpecies, none of them natives of Britain.

CECROPIA, in botany, a genus of the diœcia diandria claſs. The ſpatha of the male is caducous; the amenta are imbricated with helmet-ſhaped ſcales; and the corolla is wanting. The germina of the female are imbricated; it has but one ſtylus; the ſtigma is lacerated; and the berry contains but one ſeed. There is one ſpecies, *viz.* the peltata, a native of Jamaica.

CEDAR, in botany, the Engliſh name of a ſpecies of juniperus. See Juniperus.

CEDRELA, in botany, a genus of the pentandria monogynia claſs. The calix is bell-ſhaped, and divided into three ſegments; the corolla is ſhaped like a funnel, and has five petals inſerted into the baſe of the receptacle; the capſule is lignous, and has five cells and five valves; the ſeeds are imbricated on the back part, and have membranaceous edges. There is but one ſpecies, *viz.* the odorata, a native of America.

CEDRUS, in botany. See Juniperus, and Pinus.

CELANDINE, in botany. See Chelidonium.

CELASTRUS, in botany, a genus of the pentandria monogynia claſs. The corolla conſiſts of five open petals; the capſule is triangular, and has three cells; and the ſeeds have a calyptra. There are five ſpecies, none of them natives of Britain.

CELERES, in Roman antiquity, a regiment of body-guards, belonging to the Roman kings, eſtabliſhed by Romulus, and compoſed of 300 young men, choſen out of the moſt illuſtrious Roman families, and approved by the ſuffrages of the curiæ of the people, each of which furniſhed ten.

CELERI, in botany, the Engliſh name of the apium graveolens, or celery, which is cultivated in our gardens as a pot-herb.

CELERITY, in mechanics, the ſwiftneſs of any body in motion.

It is alſo defined to be an affection of motion, by which any moveable body runs through a given ſpace in a given time. See Mechanics.

CELESTINS, in church-hiſtory, a religious order of Chriſtians, reformed from the Bernardins by pope Celeſtin V. Their rules are divided into three parts; the firſt, of the provincial chapters, and the elections of ſuperiors; the ſecond contains the regular obſervances; and the third, the viſitation and correction of the monks.

The Celeſtins riſe two hours after midnight to ſay matins: they eat no fleſh at any time, except when they are ſick: they faſt every Wedneſday and Friday to the feaſt of the exaltation of the holy croſs; and from that feaſt to Eaſter, every day.

CELIBACY, the ſtate of unmarried perſons, to which, according to the doctrine, or at leaſt the diſcipline, of the church of Rome, the clergy are obliged.

That celibacy has no pretence of divine or apoſtolical inſtitution, ſeems no difficult point to prove: whence it is, at firſt, hard to conceive from what motive the court of Rome perſiſted ſo very obſtinately to impoſe this inſtitution on the clergy. But we are to obſerve, that this was a leading ſtep to the execution of the project formed of making the clergy independent of princes, and rendering them a ſeparate body, to be governed by their own laws. In effect, while prieſts had children, it was very difficult to prevent their dependence upon princes, whoſe favours have ſuch an influence on private men; but having no family, they were more at liberty to adhere to the pope.

CELOSIA, in botany, a genus of the pentandria monogynia claſs. The calix has three leaves; the ſtamina are joined to the baſe of a plaited nectarium; and the capſule opens horizontally. There are eight ſpecies, none of them natives of Britain.

CELSIA, in botany, a genus of the didynamia angioſpermia claſs. The calix is divided into five ſegments; the corolla is rotated; the filaments are barbed; and the capſule is bilocular. There is but one ſpecies, *viz.* the orientalis, a native of Greece.

CELTIS, in botany, a genus of the polygamia monœcia claſs. The calix of the hermaphrodite is divided into five ſegments; it has no corolla; there are five ſtamina, and two ſtyli; the drupa contains but one ſeed. The calix of the male is divided into ſix ſegments; it has no corolla; and the ſtamina are ſix. The ſpecies are three, none of them natives of Britain.

CEMENT, or Cæment. See Cæment.

CEMENTATION. See Cæmentation.

CEMETERY. See Coemetery.

CENADA, a town of the Venetian territories in Italy, ſituated about thirty-two miles north of Padua: E. long. 12° 40′. and N. lat. 46° 5′.

CENCHRAMIDEA, in botany. See Clusia.

CENCHRIS, in zoology, a ſynonime of the boa conſtrictor. See Boa.

CENCHRUS, in botany, a genus of the polygamia monœcia claſs. The involucrum is laciniated, and incloſes two flowers; the calix is a two-flowered gluma, one of the flowers being a male, and the other a female. The corolla of the hermaphrodite is a blunt gluma; the ſtamina are three; and the ſtylus is bifid; there is but one ſeed. The corolla of the male is likewiſe an obtuſe gluma; and there are three ſtamina. The ſpecies are ſix, none of them natives of Britain.

CENCONTLTAOLLI, in ornithology. See Turdus.

CENOBITE, or Coenobite. See Coenobite.

CENOTAPH, in antiquity, a monument erected in honour of the dead, but not containing any of their remains. Of theſe there were two ſorts; one erected for ſuch perſons as had been honoured with funeral rites in another place; and the ſecond ſort, for thoſe that had never obtained a juſt funeral.

The ſign whereby honorary ſepulchres were diſtinguiſhed from others, was commonly the wreck of a ſhip, to denote the deceaſe of the perſon in ſome foreign country.

CENSER, a ſacred inſtrument made uſe of in the religious rites of the ancients. It was a vaſe, containing incenſe to be uſed in ſacrificing to the gods. Cenſers were likewiſe in uſe among the Jews, as we find in 1 Kings vii. 50. The cenſer is alſo uſed in Romiſh churches.

CENSOR, in Roman antiquity, a magiſtrate, whoſe buſineſs it was to reform the manners, and to value the eſtates of the people.

There were two cenſors firſt created in the 311th year of Rome, upon the ſenate's obſerving that the conſuls were generally ſo much taken up in military actions as to have no leiſure to attend to private affairs. At firſt they were choſen out of the ſenate, but after the plebeians had got the conſulate open to them, they ſoon arrived at the cenſorſhip.

After the cenſors were elected in the comitia centurialia, they proceeded to the capitol, where they took an oath not to manage either by favour or diſaffection, but to act equitably and impartially through the whole courſe of their adminiſtration: and, notwithſtanding their great authority, they were obliged to give an account of their management to the tribunes and *ædiles curules*. In proceſs of time, the dignity of this office dwindled very much; under the emperors it ſunk to nothing, as their majeſties engroſſed all the branches of that juriſdiction. The republic of Venice has at this day a cenſor of manners of their people, whoſe office laſts ſix months.

Censors *of books*, are a body of doctors or others eſtabliſhed in divers countries, to examine all books before they go to the preſs, and to ſee they contain nothing contrary to faith and good manners.

At Paris, the faculty of theology claim this privilege, as granted to them by the pope; but in 1624, new commiſſions of four doctors were created, by letters-patent, the ſole cenſors of all books, and anſwerable for every thing contained therein.

In England, we had formerly an officer of this kind, under the title of Licenſer of the preſs; but, ſince the revolution, our preſs has been laid under no ſuch reſtraint.

CENSURE, a judgment which condemns ſome book, perſon, or action, or more particularly a reprimand from a ſuperior. Eccleſiaſtical cenſures, are penalties by which, for ſome remarkable miſbehaviour, Chriſtians are deprived of the communion of the church, or prohibited to execute the ſacerdotal office.

CENSUS, in Roman antiquity, an authentic declaration made before the cenſors, by the ſeveral ſubjects of the empire, of their reſpective names and places of abode. This declaration was regiſtered by the cenſors, and contained an enumeration, in writing, of all the eſtates, lands, and inheritances they poſſeſſed; their quantity, quality, place, wives, children, domeſtics, tenants, ſlaves.

The cenſus was inſtituted by Servius Tullius, and was held every five years. It was of great ſervice to the republic, becauſe, by means of it, they diſcovered the number of citizens capable of bearing arms, and the money they could afford for the expence of a war. It went through all ranks of people, though under different names: that of the common people was called *cenſus;* that of the knights, *cenſus, recenſio, recognitio;* that of the ſenators, *lectio, relectio*.

The cenſus which intitled one to the dignity of a knight, was 400,000 ſeſterces: that of a ſenator, was double that ſum.

In the Voconian law, cenſus is uſed for a man, whoſe eſtate in the cenſor's books is valued at 100,000 ſeſterces.

CENTAUR, in ancient poetry, denotes a fabulous kind of animal, half man, half horſe.

The Theſſalians, who firſt taught the art of breaking horſes, appearing on horſeback to make only one body with the animal on which they rode, gave riſe to the fiction of the hippocentaur.

CENTAUREA, in botany, a genus of the ſyngeneſia polygamia fruſtranea claſs. The receptacle is briſtly; the pappus is ſimple; the rays of the corolla are tunnel-ſhaped, long, and irregular. There are 61 ſpecies, five of which are natives of Britain, *viz.* the cyanus, or blue-bottle; the ſcabioſa, or great knapweed; the jacea, or common knapweed; the calcitrapa, or ſtar-thiſtle; and the ſolſtitialis, or St-Barnaby's thiſtle.

CENTAURY. See CHELIDONIUM.

CENTER *of gravity*, in mechanics, that point about which all the parts of a body do, in any ſituation, exactly balance each other. See MECHANICS.

CENTER *of motion*, that point which remains at reſt, while all the other parts of a body move about it. See MECHANICS.

CENTESIMATION, a milder kind of military puniſhment, in caſes of deſertion, mutiny, and the like, when only every hundredth man is executed.

CENTIPES, in zoology. See SCOLOPENDRA.

CENTONARII, in antiquity, certain officers of the Roman army, who provided tents and other ſtuff, called centones, made uſe of to quench the fire which the enemy's engines threw into the camp.

Theſe centonarii kept with the carpenters and other officers of the artillery.

CENTRAL FORCES, the powers which cauſe a moving body to tend towards, or recede from the centre of motion. See MECHANICS.

CENTRAL RULE, a rule diſcovered by Mr Thomas Baker, whereby to find the centre of a circle deſigned to cut the parabola in as many points, as an equation to be conſtructed hath real roots. Its principal uſe is in the conſtruction of equations, and he has applied it with good ſucceſs as far as biquadratics.

The central rule is chiefly founded on this property of the parabola, that if a line be inſcribed in that curve perpendicular to any diameter, a rectangle formed of the ſegments of the inſcript, is equal to the rectangle of the intercepted diameter and parameter of the axis.

The central rule has the advantage over Cartes and De Latere's methods of conſtructing equations, in that both theſe are ſubject to the trouble of preparing the equation, by taking away the ſecond term.

CENTRIFUGAL FORCE, that force by which all bodies that move round any other body in a curve, endeavour to fly off from the axis of their motion in a tangent to the periphery of the curve, and that in every point of it. See MECHANICS.

CENTRINA, in ichthyology, the trivial name of a ſpecies of ſqualus. See SQUALUS.

CENTRIPETAL FORCE, that force by which a body is every where impelled, or any how tends towards ſome point as a centre. See MECHANICS.

CENTRISCUS, in ichthyology, a genus belonging to the order of amphibia nantes. The head gradually ends in a narrow ſnout; the aperture is broad and flat; the belly is carinated; and the belly-fins are united. There are two ſpecies, *viz*. 1. The ſcutatus has its back covered with a ſmooth bony ſhell, which ends in a ſharp ſpine, under which is the tail; but the back-fins are between the tail and the ſpine. It is a native of the Eaſt Indies. 2. The ſcolopax has a rough ſcabrous body, and a ſtrait extended tail. It has two belly-fins, with four rays in each, and has no teeth. It is found in the Mediterranean.

CENTUMVIRI, in Roman antiquity, judges appointed to decide common cauſes among the people: they were choſen three out of each tribe; and though five more than an hundred, were nevertheleſs called centumviri, from the round number centum, an hundred.

CENTUNCULUS, in botany, a genus of the tetrandria monogynia claſs. The calix conſiſts of four ſegments; the corolla has four diviſions, and open; the ſtamina are ſhort; and the capſule has but one cell. There is only one ſpecies, *viz*. the minimus, or baſtard pimpernel, a native of Britain.

CENTURION, among the Romans, an officer in the infantry, who commanded a century, or an hundred men.

The centurions held the firſt rank in the firſt cohort of a legion, and two of them the place of the two firſt haſtati or pike-men: the firſt among the principes was alſo a centurion.

The centurion primipilus was the chief of the centurions: he was not under the command of any tribune, as all the reſt were; he had four centuries under his direction, and guarded the ſtandard and the eagle of the legion.

CENTURY, in a general ſenſe, any thing divided into or conſiſting of an hundred parts.

The Roman people, when they were aſſembled for the electing of magiſtrates, enacting of laws, or deliberating upon any public affair, were always divided into centuries, and voted by centuries, in order that their ſuffrages might be the more eaſily collected; whence theſe aſſemblies were called *comitia centuriata*. The Roman cohorts were alſo divided into centuries. See CENTURION and COHORT.

CENTURY, in chronology, the ſpace of one hundred years.

This method of computing by centuries is generally obſerved in church hiſtory, commencing from the time of our Saviour's incarnation; in which ſenſe we ſay, the firſt century, the ſecond century, *&c.*

CENTURIES *of Magdeburg*, a famous eccleſiaſtical hiſtory, ranged into thirteen centuries, carried down to the year 1298, compiled by ſeveral hundred Proteſtants of Magdeburg, the chief of whom was Matthias Flacius Illyricus.

CENTUSSIS, in Roman antiquity, a coin containing an hundred aſſes.

CEPA, in botany, the trivial name of a ſpecies of allium. See ALLIUM.

CEPÆA, in botany. See SEDUM.

CEPHALANTHUS, in botany, a genus of the tetrandria monogynia claſs. It has no common calix; the proper calix is tunnel-ſhaped; the receptacle is globular, and naked; and the ſeeds are downy. There is but one ſpecies, *viz*. the occidentalis, a native of America.

CEPHALIC, in a general meaning, ſignifies any thing belonging to the head.

CEPHALIC *medicines* are remedies for diſorders of the head.

CEPHALIC *vein*, in anatomy. See p. 241.

CEPHALONIA, the capital of an iſland of the ſame name, ſituated in the Mediterranean, near the coaſt of Epirus, and ſubject to the Venetians: E. long. 21°, and N. lat. 38° 30′.

CEPHALOPHARYNGÆI, in anatomy. See p. 302.

CEPHALUS, in ichthyology, the trivial name of a ſpecies of mugil. See MUGIL.

CEPHEUS, in aſtronomy, a conſtellation of the northern hemiſphere.

CEPHUS, in ornithology, a ſynonime of a ſpecies of larus. See LARUS.

CERAM, an iſland in the Indian ocean, between the Molucca iſlands on the north, and thoſe of Amboyna and Banda on the ſouth, lying between 126° and 129° E. long. and in 3° S. lat.

It is about one hundred and fifty miles long, and ſixty broad; and here the Dutch have a fortreſs, which keeps the natives in ſubjection.

CERAMBYX, in zoology, a genus of inſects of the beetle kind, belonging to the order of inſecta coleoptera. The antennæ are long and ſmall; the breaſt is ſpinous or gibbous; and the elytra are linear. There are no leſs than 83 ſpecies enumerated by Linnæus, principally diſtinguiſhed by the figure of the breaſt.

CERASTES, in zoology, the trivial name of a ſpecies of coluber; it is likewiſe the trivial name of a ſpecies of anguis. See ANGUIS, and COLUBER.

CERASTIUM, in botany, a genus of the decandria pentagynia claſs. The calix has five leaves; the petals are bifid; and the capſule is unilocular, and opens at the top. There are ſixteen ſpecies, ſeven of which are natives of Britain, *viz.* the vulgatum, or narrow-leaved mouſe-ear chickweed; the viſcoſum, or broad-leaved mouſe-ear chickweed; the ſemidecandrium, or leaſt mouſe-ear chickweed; the arvenſe, or corn mouſe-ear chickweed; the alpinum, or mountain mouſe-ear chickweed; the tomentoſum, or wooly mouſe-ear chickweed; and the aquaticum, or marſh mouſe-ear chickweed.

CERASUS, in botany, the trivial name of a ſpecies of prunus. See PRUNUS.

CERATE, in pharmacy, a kind of ointment applied to ulcerations, excoriations, *&c.* There are four kinds of cerate, *viz.* the *white cerate*, which is compoſed of a quarter of a pint of olive oil, four ounces of white wax, and half an ounce of ſpermaceti, liquified together and ſharred till the cerate be cold. The *yellow cerate* is compoſed of half a pound of yellow baſilicum ointment, and an ounce of yellow wax, melted together. The *ceratum epuloticum*, is compoſed of one pint of olive-oil, and of yellow wax and calamine prepared each half a pound. Liquify the wax with the oil, and, as ſoon as the mixture begins to grow ſtiff, ſprinkle in the calamine, keeping them conſtantly ſtirring till the cerate is quite cold. The *mercurial cerate* is compoſed of yellow wax, hogs lard dried, each half a pound; three ounces of quick-ſilver; and one dram of ſimple balſam of ſulphur. Melt the wax with the lard, then gradually add this mixture to the quick-ſilver and balſam of ſulphur previouſly ground together.

CERATION, the name given by the ancients to the ſmall ſeeds of the ceratonia, uſed by the Arabian phyſicians, as a weight to adjuſt the doſes of medicines; as the grain weight with us took its riſe from a grain of barley.

CERATION, or CERATIUM, was alſo a ſilver coin, equal to one third of an obolus.

CERATOCARPUS, in botany, a genus of the monœcia monandria claſs. The calix of the male is divided into two parts; it has no corolla; and the filament is long: The calix of the female conſiſts of two leaves connected to the germen; it has no corolla; the ſtyli are two; and the ſeeds are bicorned and compreſſed. There is but one ſpecies, *viz.* the arenarius, a native of Tartary.

CERATOCEPHALOIDES, in botany. See VERBESINA.

CERATOCEPHALUS, in botany. See BIDENS.

CERATOIDES, in botany. See URTICA.

CERATONIA, in botany, a genus of the polygamia polyœcia claſs. It is a native of Sicily, Crete, and other eaſtern countries.

CERATOPHYLLUM, in botany, a genus of the monœcia polyandria claſs. The calix of the male is divided into many ſegments; it has no corolla; and the ſtamina are from 16 to 20. The calix and corolla of the female are the ſame with thoſe of the male; it has one piſtil, no ſtylus, and one naked ſeed. There are two ſpecies, one of which, *viz.* the demerſum or horned pondweed, is a native of Britain.

CERATUM, in pharmacy. See CERATE.

CERBERA, in botany, a genus of the pentandria monogynia claſs. The fruit is a drupa containing one ſeed. There are three ſpecies, all of them natives of the Indies.

CERCELE, in heraldry. A croſs cercele is a croſs which opening at the ends, turns round both ways, like a ram's horn. See CROSS.

CERCIS, in botany, a genus of the decandria monogynia claſs. The calix is five-teethed, and gibbous below; the corolla is papilionaceous, with a ſhort vexillum under the wings; the capſule is a legumen. There are two ſpecies, none of them natives of Britain.

CEREBELLUM, in anatomy. See p. 286.

CEREBRUM, in anatomy. See p. 285.

CEREMONY, an aſſemblage of ſeveral actions, forms, and circumſtances, ſerving to render a thing more magnificent and ſolemn; particularly uſed to denote the external rites of religious worſhip, the formalities of introducing ambaſſadors to audiences, *&c.*

Maſter of the CEREMONIES, an officer inſtituted by king James I. for the more honourable reception of ambaſſadors and ſtrangers of quality: he wears about his neck a chain of gold, with a medal under the crown of Great Britain, having on one ſide an emblem of peace, with this motto, *beati pacifici*; and on the other, an emblem of war, with *dieu et mon droit*: his ſalary is three hundred pounds *per annum*.

Aſſiſtant maſter of the CEREMONIES is to execute the employment in all points, whenſoever the maſter of the ceremonies is abſent. His ſalary is one hundred and forty-one pounds thirteen ſhillings and fourpence *per annum*.

Marſhal of the Ceremonies is their officer, being ſubordinate to them both. His ſalary is one hundred pounds *per annum*.

CEREUS, in botany. See Cactus.

CERIGO, or Cytherea, in geography, an iſland of the Archipelago, on the eaſtern coaſt of the Morea, and fifty miles north of the iſland of Candia. It is a mountainous country, between forty and fifty miles in circumference, and ſituated in E. long. 23° 40′, and N. lat. 36°.

CERINTHE, in botany, a genus of the pentandria monogynia claſs. The limbus of the corolla is tubular and ventricoſe, opening at the faux; the ſeeds are often four, and ſometimes two. There are only two ſpecies, none of them natives of Britain.

CERINTHIANS, in church-hiſtory, Chriſtian heretics, followers of Cerinthus, who lived and publiſhed his hereſy in the time of the apoſtles themſelves. They did not allow that God was the author of the creatures, but ſaid that the world was created by an inferior power: they attributed to this creator an only ſon, but born in time, and different from the world: they admitted ſeveral angels and inferior powers: they maintained that the law and the prophets came not from God, but from the angels; and that the God of the Jews was only an angel: they diſtinguiſhed between Jeſus and Chriſt; and ſaid, that Jeſus was a mere man, born, like other men, of Joſeph and Mary; but that he excelled all other men in prudence and wiſdom; that Jeſus being baptized, the Chriſt of the ſupreme God, that is, the Holy Ghoſt, deſcended upon him; and that by the aſſiſtance of this Chriſt, Jeſus performed his miracles. It was partly to refute this ſect that St John wrote his goſpel.

CERINTHOIDES, in botany. See Cerinthe.

CEROPEGIA, in botany, a genus of the pentandria monogynia claſs. The limbus of the corolla is connivent; and the ſeeds are plumoſe. There are two ſpecies, both natives of India.

CERRUS, in botany. See Ægilops.

CERTHIA, in ornithology, a genus belonging to the order of picæ. The beak of this genus is arched, ſlender, ſharp, and triangular; the tongue is ſharp at the point; and the feet are of the walking kind, *i. e.* having the toes open and unconnected. There are 25 ſpecies, *viz.* 1. The familiaris, or creeper, is grey above and white underneath, with brown wings, and ten white ſpots on the ten prime feathers. It is a native of Europe, creeps up trees, lays about 20 eggs, and feeds upon caterpillars and the eggs of inſects. 2. The muraria, or wall-creeper, is aſh-coloured, with yellow ſpots on the wings. It frequents towers and old walls, in the holes of which it builds its neſt. 3. The puſilla, is grey above, and white below; the eye-brows are white; the prime feathers of the wings are brown, and white on the outer edge. It is a native of India. 4. The capenſis, is grey, with blackiſh wings, the outermoſt prime feathers of which are edged with white: It is a native of the Cape of Good-Hope. 5. The olivacea, is olive-coloured above, and grey below, with the orbits of the eyes white. It is found in Madagaſcar. 6. The currucaria is likewiſe olive above, but yellowiſh below; and the prime wing-feathers are equal. It is a native of Ceylon. 7. The jugularis is greyiſh above, and yellowiſh below; the throat is of a violet colour; and the two outmoſt prime feathers of the wings are yellow at the points. It is found in the Philippine Iſles. 8. The cærulea has a blue belt round the eyes; and the throat, and prime wing and tail feathers are black: The bill is very long. It is a native of Surinam. 9. The cayana is of a green ſhining colour above, and ſtreaked with white below. It is a native of Cayenne. 10. The chalybeata is green and ſhining above; the breaſt is red, and on the fore-part of it there is an iron-coloured belt. 11. The afra is green above; the breaſt is red; the belly is white; and it has a ſhort blue tail. The above two ſpecies are found at the Cape of Good-Hope. 12. The ſpiza is green, with the head and prime wing-feathers black. It is a native of Braſil. 13. The ſperata is purple above, and red below; the head, throat, and tail, are violet. It is found in the Philippine Iſles. 14. The ſenegalenſis is of a blackiſh violet colour; the top of the head and throat are greeniſh, and the breaſt is red. It is a native of Senegal. 15. The gutturalis is greeniſh; the throat is a ſhining green, and the breaſt is purple. It is a native of Braſil. 16. The pinus is yellow below, and olive above; the wings are blue, with two white belts. It is a native of North America. 17. The cruenta is blackiſh above, and white below; the top of the head, the neck, and tail, are red. It is a native of Bengal. 18. The flaveola is black above, and yellow below; the eye-brows, and the tops of the outermoſt prime wing-feathers, are white. It is a native of America. 19. The pulchella has a green ſhining body, and a red breaſt; the two intermediate prime wing-feathers are very long. It is a native of Senegal. 20. The famoſa has the two intermediate prime wing-feathers very long; the body is of a ſhining green; and the axillæ of the wings are yellow. It is found at the Cape of Good-Hope. 21. The philippina has the two intermediate wing-feathers very long, a greeniſh grey body, and yellowiſh underneath. It is a native of the Philippine Iſles. 22. The violacea has the two intermediate prime wing-feathers very long, a ſhining violet-coloured body, and the breaſt and belly are yellow. 23 The zeylonica has a green head, an iron-coloured back, a yellow belly, and the throat and tail are azure. It is a native of Ceylon. 24. The cyanea is blue, with a black belt round the eyes; the ſhoulders, wings, and tail are black, and the feet are red. It is a native of Braſil and Cayenne. 25. The lotentia is blue, with a red belt over the breaſt. It is a native of Ceylon.

CERTIORARI, a writ which iſſues out of the chancery, directed to an inferior court, to call up the records of a cauſe there depending, in order that juſtice may be done. And this writ is obtained upon complaint, that the party who ſeeks it has received hard uſage, or is not like to have an impartial trial in the inferior court. A certiorari is made returnable either in the king's bench, common pleas, or in chancery.

It is not only iſſued out of the court of chancery, but likewiſe out of the king's bench, in which laſt mentioned court it lies where the king would be certified of a record. Indictments from inferior courts, and proceedings of the quarter-ſeſſions of the peace, may alſo be removed into the king's bench by a certiorari; and here the very record muſt be returned, and not a tranſcript of it; though uſually in chancery, if a certiorari be returnable there, it removes only a tenor of the record.

CERTITUDE, conſidered in the things or ideas which are the objects of our underſtanding, is a neceſſary agreement or diſagreement of one part of our knowledge with another: as applied to the mind, it is the perception of ſuch agreement or diſagreement; or ſuch a firm well-grounded aſſent, as excludes not only all manner of doubt, but all conceivable poſſibility of a miſtake.

There are three ſorts of certitude, or aſſurance, according to the different natures and circumſtances of things.

1. A phyſical or natural certitude, which depends upon the evidence of ſenſe; as that I ſee ſuch or ſuch a colour, or hear ſuch or ſuch a ſound: no body queſtions the truth of this, where the organs, the medium, and the object are rightly diſpoſed. 2. Mathematical certitude is that ariſing from mathematical evidence; ſuch is, that the three angles of a triangle are equal to two right ones. 3. Moral certitude is that founded on moral evidence, and is frequently equivalent to a mathematical one; as that there was formerly ſuch an emperor as Julius Cæſar, and that he wrote the Commentaries which paſs under his name; becauſe the hiſtorians of theſe times have recorded it, and no man has ever diſproved it ſince: this affords a moral certitude, in common ſenſe ſo great, that one would be thought a fool or a madman for denying it.

CERVIA, in geography, a city and port-town of Romania, in Italy, ſituated on the gulph of Venice, about ten miles ſouth-eaſt of Ravenna, and ſubject to the pope: E. long. 13°, and N. lat. 44° 30′.

CERVICAL *nerves*, in anatomy. See p. 251.

CERVIX, in anatomy. See p. 166.

CERVIX *of the uterus*. See p. 274.

CERUMEN, EAR-WAX. See p. 296.

CERUSE, or CERUSS, *white lead*, a ſort of calx of lead, made by expoſing plates of that metal to the vapour of vinegar.

The beſt way of preparing it is the following: A glaſs-cucurbit is to be cut off in ſuch a manner as to leave it a very long mouth; an alembic head of glaſs is to be fitted to this; ſome vinegar is to be put into the body, and a number of thin plates of lead are to be placed in the head in ſuch a manner that they may ſtand ſomewhat erect: when the head is fitted on, the body is to be ſet in a gentle ſand-heat for twelve hours; then unluting the veſſels, the receiver, which had been fitted to the noſe of the head, will contain a ſweet and ſtyptic liquor, nauſeous and turbid, called the vinegar of lead, or the ſolution of lead; and the plates of lead, taken out of the head, will be found covered with a white duſty matter; this is ceruſs; and if the operation be repeated, the whole lead will be in fine reduced to this ſtate of ceruſs.

Ceruſs is uſed externally either mixed in ointments, or by ſprinkling it on old gleeting and watery ulcers, and in many diſeaſes of the ſkin. If, when it is reduced into a fine powder, it is received in with the breath in inſpiration, and carried down into the lungs, it cauſes terrible aſthmas, that are almoſt incurable, and at laſt generally prove fatal: ſad inſtances of the very pernicious effects of this metal are too often ſeen among thoſe perſons who work lead in any form, but particularly among the workers in white-lead.

The painters uſe it in great quantities, and, that it may be afforded cheap to them, it is generally adulterated with common whiting: the Engliſh and Dutch ceruſs are very bad in this reſpect: the Venetian ought always to be uſed by apothecaries.

CERUSS *of antimony*, a medicine prepared by diſtilling powdered regulus of antimony with ſpirit of nitre, till no more fumes ariſe; what remains in the retort being pulveriſed and waſhed, makes the ceruſs of antimony, which is eſteemed a powerful diuretic.

CERVUS, or DEER, in zoology, a genus of quadrupeds belonging to the order of pecora. The horns are ſolid, brittle, covered with a hairy ſkin, and growing from the top; they likewiſe fall off, and are renewed annually. There are eight fore-teeth in the under jaw, and they have no dog-teeth. The ſpecies of this genus are ſeven, *viz.* 1. The camelopardalis, with ſimple or unbranched horns, and the fore-feet remarkably longer than the hind feet. This is an uncommon animal, few of them having ever been ſeen in Europe. It is a native of Æthiopia, and is very mild and gentle: The head is like that of a ſtag; its horns are blunt and about ſix inches long. The neck reſembles that of a camel, but much longer, being ſometimes ſeven feet in length. The body is ſmall, covered with white hair, and ſpotted with red. He is eighteen feet in length from the tail to the top of the head; and when he holds up his head, it is ſixteen feet from the ground. He feeds principally on the leaves of trees.

2. The alces, or elk, has palmated horns, without any proper ſtem, and a fleſhy protuberance on the throat. This is the largeſt animal of the deer kind. At the fair of St Germain at Paris, in the year 1752, a female elk was exhibited as a ſhow. It was caught in the year 1749, in a foreſt of Red Ruſſia, belonging to a Khan of Tartary. The height was ſix feet ſeven inches, the length ten feet, and the thickneſs eight. The hair was long, like that of a wild boar. The ſkin is ſaid to reſiſt the force of a gun bullet. The elk is a very ſwift animal; and he feeds upon leaves of alder, birch, willow, *&c.* When tamed, he devours large quantities of hay or bread. This animal is found in the northern woods of Europe, Aſia, and America.

3. The elaphus, is a kind of elk, with cylindrical ramified horns, bent backwards. It is a native of the northern parts of Europe and Aſia.

4. The tarandus, or rein-deer, is a native of Lapland, and the northern parts of Europe, Aſia, and America. The horns are large, cylindrical, branched, and palmated at the tops. Two of the branches hang over the face. He is about the ſize of a buck, of a dirty whitiſh colour; the hairs of his ſkin are thick and ſtrong. Theſe animals are of great uſe to the Laplanders; they feed upon their fleſh; they employ their ſinews in ſewing the boards of ſledges together, and their milk affords them good cheeſe: They likewiſe make garments of their ſkins. The rein-deer are always employed in drawing ſledges along the ſnowy mountains, where horſes cannot travel. In a beaten track, they will drag a ſledge twenty-five miles a day. When the animal is tired, his maſter looſes him from the ſledge, and he immediately ſcrapes the ſnow from the ground with his feet, and feeds upon a ſpecies of liver-wort, called rein-deer liver-wort, which is very plentiful in theſe countries. This is the only nouriſhment they require.

5. The dama, or buck and doe, a well known animal, kept tame in parks; the horns are branched, compreſſed, and palmated at the top. It is a native of Europe. Their fleſh, which goes by the name of veniſon, is in high repute with the luxurious. See Plate LXIII.

6. The capreolus, has erect, cylindrical, branched horns, and forked at the top. It is called by ſome authors the Braſilian goat, and is a native of Europe and Aſia.

7. The Guineenſis, is of a greyiſh colour, and black underneath. It is a native of Guinea, and the ſize and figure of its horns have not been hitherto deſcribed with any preciſion.

CERVUS *volans*, in zoology, a ſynonime of a ſpecies of lucanus. See LUCANUS.

CESARE, among logicians, one of the modes of the ſecond figure of ſyllogiſms; the minor propoſition of which is an univerſal affirmative, and the other two univerſal negatives: Thus,

Ce No immoral books ought to be read:
sa But every obſcene book is immoral:
re Therefore no obſcene book ought to be read.

CESSIO *bonorum*, in Scots law. The name of that action by which an inſolvent debtor may apply for liberation from priſon, upon making over his whole real and perſonal eſtate to his creditors. See SCOTS LAW, title, *Sentences and their execution*.

CESTRUM, in botany, a genus of the pentandria monogynia claſs. The corolla is tunnel-ſhaped; and the berry is unilocular. There are two ſpecies, both natives of America.

CESTUS, among ancient poets, a fine embroidered girdle ſaid to be worn by Venus, to which Homer aſcribes the faculty of charming and conciliating love.

CETACEOUS, an appellation given to fiſhes of the whale kind.

CETE, the name of Linnæus's ſeventh order of mammalia, comprehending the MONODON, BALÆNA, PHYSETER, and DELPHINUS; ſee theſe articles.

CETERACH, in botany, the trivial name of a ſpecies of aſplenium. See ASPLENIUM.

CETTE, a port-town of Languedoc, in France, ſituated on a bay of the Mediterranean, in E. long. 3° 16′, and N. lat. 43° 25′.

CETUS, in aſtronomy, a conſtellation of the ſouthern hemiſphere, comprehending twenty-two ſtars in Ptolemy's catalogue, twenty-one in Tycho's, and in the Britannic catalogue ſeventy-eight.

CEUTA, a city of the kingdom of Fez, in Africa, ſituated on the ſouth ſide of the ſtreights of Gibraltar, almoſt oppoſite to it: W. long. 6° 30′, and N. lat. 35° 50′. It is a ſtrong fortreſs, in the poſſeſſion of the Spaniards.

CEYLON, an iſland in the Indian ocean, ſituated between 78° and 82° E. long. and between 6° and 10° N. lat. It is about two hundred and fifty miles long, and two hundred broad. The Dutch, who are in poſſeſſion of all the ſea-coaſt, monopolize all the cinnamon produced in the iſland, the king being obliged to keep in the centre of the iſland, in his capital of Candy.

CHABLAIS, a country of Savoy, with the title of duchy.

CHACO, a large country of South America, ſituated between 19° and 27° S. lat.

CHÆROPHYLLUM, or CHERVIL, in botany, a genus of the pentandria digynia claſs. The involucrum is concave and reflected; the petals are cordated; and the fruit is ſmooth and oblong. The ſpecies are ſeven, only two of which are natives of Britain, *viz.* the ſylveſtre, or wild cicely, or cow-weed; and the tumulum, or wild chervil. The leaves of the chervil are gently aperient and diuretic, and at the ſame time grateful to the palate and ſtomach.

CHÆTODON, in ichthyology, a genus of fiſhes belonging to the order of thoraci. The teeth are very numerous, thick, ſetaceous, and flexile: The rays of the gills are ſix. The back-fin and the fin at the anus are fleſhy and ſquamous. There are twenty-three ſpecies, diſtinguiſhed from each other principally by the figure of the tail, and the number of ſpines in the back fin.

CHAFF-FINCH, in ornithology, the Engliſh name of a ſpecies of fringilla. See FRINGILLA.

CHAGRE, a fort at the mouth of a river of the ſame name, a little ſouth of Porto Bello: W. long. 82°, and N. lat. 9° 50′.

CHAIN, a long piece of metal compoſed of ſeveral links or rings, engaged the one in the other. They are made of divers metals, ſome round, ſome flat, others ſquare; ſome ſingle, ſome double; and ſerve to ſo many uſes, that it would be tedious to give a particular account of them all.

CHAIN is alſo a kind of meaſure in France, in the trade of wood for fuel: There are chains for wood by tale, for wood by the rope, for faggots, for cleft wood, and for round ſticks. There are alſo chains meaſuring the ſheaves of all ſorts of corn, particularly with regard to the payment of tythes; for meaſuring pottles of hay, and for meaſuring horſes. All theſe are divided into feet, inches, hands, *&c.* according to the uſe they are deſigned for.

CHAIN-*ſhot*, two bullets with a chain between them. They are uſed at ſea to ſhoot down yards or maſts, and to cut the ſhrouds or rigging of a ſhip.

CHAIN, in ſurveying, a meaſure of length, made of a certain number of links of iron-wire, ſerving to take the diſtance between two or more places.

Gunter's chain of 100 ſuch links, each meaſuring $7\frac{92}{100}$ inches, and conſequently equal to 66 feet, or four poles. See SURVEYING.

CHAISE, a ſort of light, open chariot, or calaſh. See CHARIOT.

CHALAZA, among naturaliſts, a white knotty ſort of ſtring at each end of an egg, formed of a plexus of the fibres of the membranes, whereby the yolk and white are connected together. See EGG.

CHALCEDONY, in natural hiſtory, a genus of ſemi-pellucid gems, of an even and regular not tabulated texture, of a ſemi-opaque cryſtaline baſis, and variegated with different colours, diſperſed in form of miſts and clouds, and, if nicely examined, found to be owing to an admixture of various kinds of earths, but imperfectly blended in the maſs, and often viſible in diſtinct moleculæ.

Of this genus there are a great many ſpecies, as the bluiſh-white chalcedony; the browniſh-black chalcedony, or ſmoaky jaſper or capnitis of the ancients; and the yellow and red chalcedony.

All the chalcedonies give fire readily with ſteel, and make no efferveſcence with aqua-fortis.

CHALCIDES, in zoology, the trivial name of a ſpecies lacerta. See LACERTA.

CHALDEA, or BABYLONIA, the ancient name of a country of Aſia, now called Eyrac Arabic.

CHALDEE, or CHALDAIC *language*, that ſpoken by the Chaldeans, or people of Chaldea: It is a dialect of the Hebrew. See HEBREW.

CHALDRON, a dry Engliſh meaſure, conſiſting of thirty-ſix buſhels, heaped up according to the ſealed buſhel kept at Guild-hall, London: but on ſhip-board, twenty-one chaldron of coals are allowed to the ſcore. The chaldron ſhould weigh two thouſand pounds.

CHALK, in natural-hiſtory, the Engliſh name of the white, dry marle, with a duſty ſurface, found in hard maſſes, and called by authors *creta*, and *terra creta*.

Chalk thrown into water, raiſes a great number of bubbles, with a hiſſing noiſe, and ſlowly diffuſes itſelf into an impalpable powder. It ferments more ſtrongly with acids than any other earth, and burns to lime.

As a medicine, chalk deſerves, perhaps, the higheſt place among the alkaline abſorbents; nor is it leſs uſeful in many of the ordinary affairs of life. Its uſe in cleaning various utenſils is well known; and it is in no ſmall repute as a manure, eſpecially for cold ſour lands; in which intention the ſoft unctuous chalk is moſt proper, as the dry, hard, and ſtrong chalk is for lime. It is a great improver of lands, and will even change the very nature of them. However, it is moſt adviſeable to mix one load of chalk, with two or three of dung, mud, or freſh mould, whereby it will become a laſting advantage to the ground: The common allowance is fourteen loads of chalk to every acre.

Black CHALK, among painters, denotes a kind of ochreous earth, of a cloſe ſtructure, and fine black colour, uſed in drawing upon blue paper.

Red CHALK, an indurated clayey ochre, common in the colour-ſhops, and much uſed by painters and artificers.

CHALLONS *on the Marne*, the capital of the Challonois, in the province of Champaign in France, ſituated eighty-two miles eaſt of Paris, and thirty ſouth-eaſt of Reims: E. long. 4° 35′, N. lat. 48° 55′. It is a biſhop's ſee.

CHALLONS *on the Soan*, a city of Burgundy in France, thirty-two miles ſouth of Dijon: E. long. 5°, N. lat. 46° 40′. It is the ſee of a biſhop.

CHALYBEAT, in medicine, an appellation given to any liquid, as wine or water, impregnated with particles of iron or ſteel.

Dr Monro, profeſſor of anatomy at Edinburgh, by pouring a tincture of galls into common water, and diſſolving therein a ſmall quantity of ſal martis, adding ſome filings of iron, and oil of vitrol, procured a water exactly like the natural chalybeat water; and he is of opinion, that where theſe are not to be had, the artificial water may be made to anſwer all their intentions, according to its being more or leſs cloſely kept, or expoſed in the air or heat, *&c.*

CHAM, or KHAN, a word of much the ſame import with *king* in Engliſh: It is the title of the ſovereign princes of Tartary, and is likewiſe applied to the principal noblemen in Perſia.

CHAM, in geography, a town of the Bavarian palatinate, ſituated on a river of the ſame name, about twenty-five miles north-eaſt of Ratiſbon; E. long. 13°, N. lat. 49° 15′.

CHAMA, in zoology, a genus of ſhell-fiſh belonging to the order of vermes teſtacea. The ſhell is thick, and has two valves; it is an animal of the oyſter kind. Linnæus enumerates 14 ſpecies, principally diſtinguiſhed by the figure of their ſhells.

CHAMÆBATOS, in botany. See RUBUS.

CHAMÆBUXUS, in botany. See POLYGALA.

CHAMÆCERASUS, in botany. See LONICERA.

CHAMÆCLEMA, in botany. See HEDERA.

CHAMÆCRISTA, in botany. See CASSIA.

CHAMÆDAPHNE, in botany. See KALMIA.

CHAMÆDRYS, in botany. See VERONICA.

CHAMÆLEA, in botany. See CENORUM.

CHAMÆLEON, in zoology, the trivial name of a ſpecies of lacerta. See LACERTA.

CHAMÆLINUM, in botany. See LINUM.

CHAMÆMILUM, in botany. See MATRICARIA.

CHAMÆNERION, in botany. See EPILOBIUM.

CHAMÆPITYS, in botany. See TEUCRIUM.

CHAMÆRHODODENDROS, in botany. See AZALEA.

CHAMÆROPS, or HUMBLE PALM, in botany, a genus ranged under the palmæ flabellifoliæ of Linnæus. It is a native of Spain.

Privy-**Chamber.** Gentlemen of the privy-chamber, are ſervants of the king, who are to wait and attend on him and the queen at court, in their diverſions, &c. Their number is forty-eight under the lord-chamberlain, twelve of whom are in quarterly waiting, and two of theſe lie in the privy-chamber.

In the abſence of the lord-chamberlain, or vice-chamberlain, they execute the king's orders: at coronations, two of them perſonate the dukes of Aquitain and Normandy: and ſix of them, appointed by the lord-chamberlain, attend ambaſſadors from crowned heads to their audiences, and in public entries. The gentlemen of the privy-chamber were inſtituted by Henry VII.

Chamber, in policy, the place where certain aſſemblies are held, alſo the aſſemblies themſelves. Of theſe, ſome are eſtabliſhed for the adminiſtration of juſtice, others for commercial affairs.

Of the firſt kind are, 1. Star-chamber, ſo called, becauſe the roof was painted with ſtars; the authority, power, and juriſdiction of which are abſolutely aboliſhed by the ſtatute 17 Car. I. 2. Imperial chamber of Spire, the ſupreme court of judicatory in the empire, erected by Maximilian I. This chamber has a right of judging by appeal, and is the laſt reſort of all civil affairs of the ſtates and ſubjects of the empire, in the ſame manner as the aulic council of Vienna. Nevertheleſs it is reſtrained in ſeveral caſes; it takes no notice of matrimonial cauſes, theſe being left to the pope; nor of criminal cauſes, which either belong to particular princes or towns in their reſpective territories, or are cognizable by all the ſtates of the empire in a diet. By the treaty of Oſnaburg, in 1648, fifty aſſeſſors were appointed for this chamber, whereof twenty-four were to be Proteſtants, and twenty-ſix Catholics; beſides five preſidents, two of them Proteſtants, and the reſt Catholics. 3. Chamber of accounts, a ſovereign court in France, where accounts are rendered of all the king's revenues, inventories, and avowels thereof regiſtered; oaths of fidelity taken, and other things relating to the finances tranſacted. There are nine in France, that of Paris is the chief; it regiſters proclamations, treaties of peace, naturalizations, titles of nobility, &c. All the members wear long black gowns of velvet, of ſattin, or damaſk, according to their places. 4. Eccleſiaſtical chambers in France, which judge by appeal of differences about collecting the tythes. 5. Chamber of audience, or grand chamber, a juriſdiction in each parliament of France, the counſellors of which are called *jugeurs*, or judges, as thoſe of the chamber of inqueſts are called *rapporteurs*, reporters of proceſſes by writing. 6. Chamber of the edict, or miparty, a court eſtabliſhed by virtue of the edict of pacification, in favour of thoſe of the reformed religion. This chamber is now ſuppreſſed. 7. Apoſtolical chamber of Rome, that wherein affairs relating to the revenues of the church and the pope are tranſacted. This council conſiſts of the cardinal-camerlingo, the governor of the rota, a treaſurer, an auditor, a preſident, one advocate-general, a ſolicitor-general, a commiſſary, and twelve clerks. 8. Chamber of London, an apartment in Guildhall, where the city-money is depoſited.

Of the laſt ſort are, 1. The chambers of commerce. 2. The chambers of aſſurance. And, 3. The royal or ſyndical chamber of bookſellers in France.

The chamber of commerce is an aſſembly of merchants and traders, where the affairs relating to trade are treated of. There are ſeveral eſtabliſhed in moſt of the chief cities of France; and in our own country, we have lately ſeen chambers of this kind erected for carrying on the Britiſh herring-fiſhery. Chamber of aſſurance in France, denotes a ſociety of merchants and others for carrying on the buſineſs of inſuring; but in Holland, it ſignifies a court of juſtice, where cauſes relating to inſurances are tried. Chamber of bookſellers in Paris, an aſſembly conſiſting of a ſyndic and aſſiſtants, elected by four delegates from the printers, and twelve from the bookſellers, to viſit the books imported from abroad, and to ſearch the houſes of ſellers of marbled paper, printſellers, and dealers in printed paper for hangings, who are prohibited from keeping any letters proper for printing books. In the viſitation of books, which ought to be performed by three perſons, at leaſt from among the ſyndic and aſſiſtants, all libels againſt the honour of God and the welfare of the ſtate, and all books printed either within or without the kingdom in breach of their regulations and privileges, are ſtopt, even with the merchandiſes that may happen to be in the bales with ſuch libels, or other prohibited books. The days appointed for this chamber to meet, are Tueſdays and Fridays, at two o'clock in the afternoon.

CHAMBERLAIN, an officer charged with the management and direction of a chamber. See **Chamber**, *in policy*.

There are almoſt as many kinds of chamberlains as chambers, the principal whereof are as follows.

Lord **Chamberlain** *of Great Britain*, the ſixth great officer of the crown; to whom belongs livery and lodging in the king's court; and there are certain fees due to him from each archbiſhop or biſhop, when they perform their homage to the king; and from all peers at their creation, or doing their homage. At the coronation of every king, he is to have forty ells of crimſon velvet for his own robes. This officer, on the coronation-day, is to bring the king his ſhirt, coif, and wearing cloaths; and after the king is dreſſed, he claims his bed, and all the furniture of his chamber for his fees: he alſo carries at the coronation, the coif, gloves, and linen to be uſed by the king on that occaſion; alſo the ſword and ſcabbard, the gold to be offered by the king, and the robes-royal and crown: he dreſſes and undreſſes the king on that day, waits on him before and after dinner, &c.

To this officer belongs the care of providing all things in the houſe of lords, in the time of parliament; to him alſo belongs the government of the palace of Weſtminſter: he diſpoſes likewiſe of the ſword of ſtate, to be carried before the king, to what lord he pleaſes.

Lord **Chamberlain** *of the houſehold*, an officer who has the overſight and direction of all officers belonging to the king's chambers, except the precinct of the king's bed-chamber.

He has the overſight of the officers of the wardrobe at all his majeſty's houſes, and of the removing wardrobes, or of beds, tents, revels, muſic, comedians, hunting, meſſengers, *&c.* retained in the king's ſervice. He moreover has the overſight and direction of the ſerjeants at arms, of all phyſicians, apothecaries, ſurgeons, barbers, the king's chaplain, *&c* and adminiſters the oath to all officers above ſtairs.

Other chamberlains, are thoſe of the king's court of exchequer, of North Wales, of Cheſter, of the city of London, *&c.* in which caſes this officer is generally the receiver of all rents and revenues belonging to the place whereof he is chamberlain.

In the exchequer there are two chamberlains, who keep a controulment of the pells of receipts and exitus, and have certain keys of the treaſury, records, *&c.*

Chamberlain *of London* keeps the city-money, which is laid up in the chamber of London: he alſo preſides over the affairs of maſters and apprentices, and makes free of the city, *&c.*

His office laſts only a year, but the cuſtom uſually obtains to re-chuſe the ſame perſon, unleſs charged with any miſdemeanor in his office.

CHAMBERRY, the capital of the duchy of Savoy, in Italy, ſituated ninety miles north-weſt of Turin, and forty-five ſouth of Geneva: E. long. 5° 45′, N. lat. 45° 40′.

CHAMOIS, or **Chamois-goat**, in zoology. See **Capra**.

CHAMPAIGN, a province of France, bounded by Picardy on the north, by Lorrain on the eaſt, by Burgundy on the ſouth, and by the iſle of France on the weſt. Its capital is Troyes.

CHAMPAIN, or *point* **Champain**, in heraldry, a mark of diſhonour in the coat of arms of him who kills a priſoner of war after he has cried quarter.

CHAMPION, a perſon who undertakes a combat in the place or quarrel of another; and ſometimes the word is uſed for him who fights in his own cauſe.

It appears that champions, in the juſt ſenſe of the word, were perſons who fought inſtead of thoſe that, by cuſtom, were obliged to accept the duel, but had a juſt excuſe for diſpenſing with it, as being too old, infirm, or being eccleſiaſtics, and the like. Such cauſes as could not be decided by the courſe of common law, were often tried by ſingle combat; and he who had the good fortune to conquer, was always reputed to have juſtice on his ſide. Champions who fought for intereſt only, were held infamous; theſe hired themſelves to the nobility, to fight for them in caſe of need, and did homage for their penſion.

Champion *of the king*, a perſon whoſe office it is, at the coronation of our kings, to ride armed into Weſtminſter-hall, while the king is at dinner there, and, by the proclamation of a herald, make challenge to this effect, *viz*: "That if any man ſhall deny the king's " title to the crown, he is there ready to defend it in " ſingle combat, *&c.*" Which done, the king drinks to him, and ſends him a gilt cup, with a cover, full of wine, which the champion drinks, and has the cup for his fee.

CHANCE, in a general ſenſe, a term applied to events not neceſſarily produced as the natural effects of any proper foreknown cauſe. For the doctrine of chance and its application to games, *&c.* ſee **Gaming**.

Chance-*medley*, in law, is the accidental killing of a man, not altogether without the killer's fault, though without any evil intention; and is where one is doing a lawful act, and a perſon is killed thereby: For, if the act be unlawful, it is felony.

CHANCEL, a particular part of the fabric of a Chriſtian church; or that part of the choir between the altar and the baluſtrade that incloſes it, where the miniſter is placed at the celebration of the communion.

CHANCELLOR, an officer ſuppoſed originally to have been a notary or ſcribe under the emperors, and named *cancellarius*, becauſe he ſat behind a lattice, called in Latin *cancellus*, to avoid being crowded by the people.

According to a late treatiſe, the chancellor originally preſided over a political college of ſecretaries, for the writing of treaties, and other public buſineſs; and the court of equity, under the old conſtitution, was held before the king and his council, in the palace, where one ſupreme court for buſineſs of every kind was kept. At firſt the chancellor became a judge, to hear and determine petitions to the king, which were preferred to him; and in the end, as buſineſs increaſed, the people addreſſed their ſuit to the chancellor, and not to the king; and thus the chancellor's equitable power, by degrees, commenced by preſcription.

Lord high **Chancellor** *of Great Britain*, or *Lord keeper of the great ſeal*, is the higheſt honour of the long robe, being made ſo *per traditionem magni ſigilli, per dominum regem*, and by taking the oaths: He is the firſt perſon of the realm next after the king, and princes of the blood, in all civil affairs; and is the chief adminiſtrator of juſtice, next the ſovereign, being the judge of the court of chancery.

All other juſtices are tied to the ſtrict rules of the law in their judgment: But the chancellor is inveſted with the king's abſolute power, to moderate the written law, governing his judgment purely by the law of nature and conſcience, and ordering all things according to equity and juſtice. In this reſpect Staundford ſays, the chancellor has two powers, one abſolute, the other ordinary: Meaning, that although by his ordinary power, in ſome caſes, he muſt obſerve the forms of proceedings, as other inferior judges; yet in his abſolute power, he is not limited by the law, but by conſcience and equity.

The lord chancellor not only keeps the king's great ſeal; but alſo all patents, commiſſions, warrants, *&c.* from the king, are, before they are ſigned, peruſed by him: He has the diſpoſition of all eccleſiaſtical benefices in the gift of the crown under 20l. a year, in the king's books; and he is ſpeaker of the houſe of lords. See PARLIAMENT.

CHANCELLOR *of a cathedral*, an officer that hears leſſons and lectures read in the church, either by himſelf or his vicar; to correct and ſet right the reader when he reads amiſs; to inſpect ſchools; to hear cauſes; apply the ſeal; write and diſpatch the letters of the chapter; keep the books; take care that there be frequent preachings, both in the church and out of it; and aſſign the office of preaching to whom he pleaſes.

CHANCELLOR *of the dutchy of Lancaſter*, an officer appointed chiefly to determine controverſies between the king and his tenants of the dutchy-land, and otherwiſe to direct all the king's affairs belonging to that court. See DUTCHY-*court*.

CHANCELLOR *of the exchequer*, an officer who preſides in that court, and takes care of the intereſt of the crown.

He is always in commiſſion with the lord-treaſurer, for the letting of crown-lands, *&c.* and has power, with others, to compound for forfeitures of lands, upon penal ſtatutes: He has alſo great authority in managing the royal revenues, and in matters relating to the firſt-fruits.

CHANCELLOR *of the order of the garter, and other military orders*, is an officer who ſeals the commiſſions and mandates of the chapter and aſſembly of the knights, keeps the regiſter of their proceedings, and delivers acts thereof under the ſeal of their order.

CHANCELLOR *of an univerſity*, is he who ſeals the diplomas, or letters of degrees, proviſion, *&c.* given in the univerſity.

The chancellor of Oxford is uſually one of the prime nobility, choſen by the ſtudents themſelves in convocation. He is their chief magiſtrate; his office is, *durante vita*, to govern the univerſity, preſerve and defend its rights and privileges, convoke aſſemblies, and do juſtice among the members under his juriſdiction.

Under the chancellor is the vice-chancellor, who is choſen annually, being nominated by the chancellor, and elected by the univerſity in convocation: He is always the head of ſome college, and in holy orders. His proper office is to execute the chancellor's power, to govern the univerſity according to her ſtatutes, to ſee that officers and ſtudents do their duty, that courts be duly called, *&c.* When he enters upon his office, he chuſes four pro-vice-chancellors out of the heads of the colleges, to execute his power in his abſence.

The chancellor of Cambridge is alſo uſually one of the prime nobility, and in moſt reſpects the ſame as that in Oxford; only he does not hold his office *durante vita*, but may be elected every three years. Under the chancellor there is a commiſſary, who holds a court of record for all privileged perſons and ſcholars under the degree of maſter of arts, where all cauſes are tried and determined by the civil and ſtatute law, and by the cuſtom of the univerſity.

The vice-chancellor of Cambridge is choſen annually, by the ſenate, out of two perſons nominated by the heads of the ſeveral colleges and hall.

CHANCERY, the grand court of equity and conſcience, inſtituted to moderate the rigour of the other courts that are bound to the ſtrict letter of the law.

The juriſdiction of this court is of two kinds, ordinary or legal, and extraordinary or abſolute. The ordinary juriſdiction is that wherein the lord-chancellor, who is judge of this court, in his proceeding and judgment, is bound to obſerve the order and method of the common law; in ſuch caſes the proceedings, which were formerly in Latin, but now in Engliſh, are filed or enrolled in the petty-bag-office; and the extraordinary, or unlimited power, is that juriſdiction which the court exerciſes in caſes of equity, wherein relief is to be had by bill and anſwer.

The ordinary court holds plea of recognizances acknowledged in the chancery, writs of *ſcire facias* for repeal of the king's letters-patent. *&c.* alſo of all perſonal actions by or againſt any officer of the court, and of ſeveral offences and cauſes by act of parliament; all original writs, commiſſions of bankrupts, of charitable uſes, of ideots, lunacy, *&c.* are iſſued hence.

The extraordinary court gives relief for and againſt infants, notwithſtanding their minority; for and againſt married women, notwithſtanding their overture. All frauds and deceits, for which there is no redreſs at common law; all breaches of truſt, confidances and accidents, as to relieve obligors, mortgagors, *&c.* againſt penalties and forfeitures, where the intention was to pay the debt, are here remedied. But in all caſes where the plantiff can have his remedy at law, he ought not to be relieved in chancery; and a thing which may be tried by a jury, is not triable in this court.

The court of chancery will not retain a ſuit for any thing under ten pounds value, except in caſes of charity, nor for lands, *&c.* under forty ſhillings *per ann.* In this court all patents, moſt ſorts of commiſſions, deeds between parties touching lands and eſtates, treaties with foreign princes, *&c.* are ſealed and enrolled. Out of it are iſſued writs to convene the parliament and convocation, proclamations and charters, *&c.* For the ſeveral officers belonging to the court of chancery, ſee the articles MASTER *of the rolls*, MASTERS *in chancery*, CLERK, *&c.*

CHANDELIER, in fortification, a kind of moveable parapet, conſiſting of a wooden frame, made of two upright ſtakes, about ſix feet high, with croſs planks between them; ſerving to ſupport faſcines to cover the pioniers.

CHANNEL, in geography, an arm of the ſea, or a narrow ſea between two continents, or between a continent and an iſland. Such are the Britiſh channel, St George's channel, the channel of Conſtantinople, *&c.*

CHANTILLY, a village in France, about ſeven leagues from Paris, where there is a magnificent palace and fine foreſt belonging to the duke of Bourbon.

CHANTOR, a ſinger in the choir of a cathedral. The word is almoſt grown obſolete, *choriſter* or *ſinging-man* being commonly uſed inſtead of it. All great chapters have chantors and chaplains to aſſiſt the canons, and officiate in their abſence.

CHANTOR is uſed by way of excellence for the præcentor or maſter of the choir, which is one of the firſt dignities of the chapter. At St David's in Wales, where there is no dean, he is next in dignity to the biſhop. The ancients called the chantor *primicerius cantorum*. To him belonged the direction of the deacons and other inferior officers.

Chantors in the temple of Jeruſalem, were a number of Levites employed in ſinging the praiſes of God, and playing upon inſtruments before his altar. They had no habits diſtinct from the reſt of the people; yet in the ceremony of removing the ark to Solomon's temple, the chantors appeared dreſſed in tunics of byſſus or fine linen. 2 Chron. v. 12.

CHANTRY, or CHAUNTRY, a church or chappel, endowed with lands, *&c.* for the maintenance of one or more prieſts to ſay maſs for the ſouls of the donors. Hence,

CHANTRY-*rents*, are rents ſtill paid to the crown by the purchaſers of thoſe lands.

CHAOS, that confuſion in which matter lay when newly produced out of nothing at the beginning of the world, before God, by his almighty word, had put it into the order and condition wherein it was after the ſix days creation.

CHAOS, in zoology, a genus of inſects belonging to the order of vermes zoophyta. The body has no ſhell or covering, and is capable of reviving after being dead to appearance for a long time: It has no joints or external organs of ſenſation. There are five ſpecies, moſtly obtained by infuſions of different vegetables in water, and only diſcoverable by the microſcope.

CHAPEAU, in heraldry, an ancient cap of dignity worn by dukes, being ſcarlet-coloured velvet on the outſide, and lined with a fur. It is frequently borne above an helmet inſtead of a wreath, under gentlemen's creſts.

CHAPEL, or CHAPPEL, a place of divine worſhip, ſerved by an incumbent under the denomination of a chaplain.

CHAPEL is alſo a name given to a printer's work-houſe; in which ſenſe they ſay, the laws of the chapel, the ſecrets of the chapel.

Knights of the CHAPEL, called alſo poor knights of Windſor, were inſtituted by Henry VIII. in his teſtament. Their number was at firſt thirteen, but has been ſince augmented to twenty-ſix. They aſſiſt in the funeral ſervices of the kings of England: They are ſubject to the office of the canons of Windſor, and live on penſions aſſigned them by the order of the garter. They bear a blue or red cloke, with the arms of St George on the left ſhoulder.

CHAPELET, in the menage, a couple of ſtirrup leathers, mounted each of them with a ſtirrup, and joined at top in a ſort of leather buckle, called the head of the chapelet, by which they are made faſt to the pummel of the ſaddle, after being adjuſted to the rider's length and bore. They are uſed both to avoid the trouble of taking up or letting down the ſtirrups, every time that the gentleman mounts on a different horſe and ſaddle, and to ſupply the place of the academy ſaddles, which have no ſtirrups to them.

CHAPITERS, in architecture, the ſame with capitals.

CHAPITERS, in law, formerly ſignified a ſummary of ſuch matters as were inquired of, or preſented before juſtices in eyre, juſtices of aſſize or of the peace, in their ſeſſions.

Chapiters, at this time, denote ſuch articles as are delivered by the mouth of the juſtice in his charge to the inqueſt.

CHAPLAIN, an eccleſiaſtic who officiates in a chapel. See CHAPEL.

The king of Great Britain hath forty-eight chaplains in ordinary, uſually eminent doctors in divinity, who wait four each month, preach in the chapel, read the ſervice to the family, and to the king in his private oratory, and ſay grace in the abſence of the clerk of the cloſet. Beſides, there are twenty-four chaplains at Whitehall, fellows of Oxford or Cambridge, who preach in their turns, and are allowed 30 l. *per annum* each. According to a ſtatute of Henry VIII. the perſons veſted with a power of retaining chaplains, together with the number each is allowed to qualify, is as follows: An archbiſhop, eight; a duke or biſhop, ſix; marqueſs or earl, five; viſcount, four; baron, knight of the garter, or lord-chancellor, three; a dutcheſs, marchioneſs, counteſs, baroneſs, the treaſurer and comptroller of the king's houſe, clerk of the cloſet, the king's ſecretary, dean of the chapel, almoner, and maſter of the rolls, each of them two; chief juſtice of the king's bench, and warden of the cinque-ports, each one. All theſe chaplains may purchaſe a licence or diſpenſation, and take two benefices with cure of ſouls. A chaplain muſt be retained by letters teſtimonial under hand and ſeal; for it is not ſufficient that he ſerve as chaplain in the family.

CHAPLAIN *of the order of Malta*, otherwiſe called diaco, and clerk conventual, the ſecond claſs of the order of Malta. The knights make the firſt rank.

CHAPLET, a ſtring of beads uſed by the Roman Catholics, to count the number of their prayers. The invention of it is aſcribed to Peter the hermit, who probably learned it of the Turks, as they owe it to the Eaſt-Indians.

Chaplets are ſometimes called pater-noſters, and are made of coral, of diamonds, of wood, *&c.* The common chaplet contains fifty ave-marias, and five pater-noſters. There is alſo a chaplet of our Saviour, conſiſting of thirty-three beads, in honour of his thirty-three years living on earth, inſtituted by father Michael the Camaldulian.

CHAPPE', in heraldry, the dividing an eſcutcheon by lines drawn from the centre of the upper edge to the angles below, into three parts, the ſections on the ſides being of a different metal or colour from the reſt.

CHAPPEL *in frith*, a market town of Derbyſhire, about twenty-ſix miles north-weſt of Derby; W. long. 1° 50′, N. lat. 53° 22′.

CHAPTER, in eccleſiaſtical polity, a ſociety or community of clergymen belonging to the cathedrals and collegiate churches.

It was in the eighth century that the body of canons began to be called a chapter. The chapter of the canons of a cathedral were a ſtanding council to the biſhop, and, during the vacancy of the ſee, had the juriſdiction of the dioceſe. In the earlier ages, the biſhop was head of the chapter; afterwards abbots and other dignitaries, as deans, provoſts, treaſurers, &c. were preferred to this diſtinction. The deans and chapters had the privilege of chuſing the biſhops in England; but Henry VIII. got this power veſted in the crown: and as the ſame prince expelled the monks from the cathedrals, and placed ſecular canons in their room, thoſe he thus regulated were called deans and chapters of the new foundation; ſuch are Canterbury, Wincheſter, Ely, Carliſle, &c.

CHAPTER, in matters of literature, a diviſion in a book for keeping the ſubject treated of more clear and diſtinct.

CHARA, in botany, a genus of the cryptogamia algæ claſs. The calix conſiſts of two leaves; the antheræ are globular and ſeſſile; there are three ſtigmata, and one round ſeed. The ſpecies are four, three of which are natives of Britain, *viz.* the tomentoſa, or brittle chara; the vulgaris, or common chara; the hiſpida, or rough chara; and the flexilis, or ſmooth chara.

CHARABON, a ſea-port town on the northern coaſt of the iſland of Java, in the Indian ocean, ſituated 130 miles eaſt of Batavia; E. long. 108°, ſouth lat. 6°.

CHARACTER, in a general ſenſe, denotes any mark whatever, ſerving to repreſent either things or ideas: thus letters are characters, types, or marks of certain ſounds; words, of ideas, &c.

Literal characters may be divided, with reſpect to the nations among whom they have been invented, into Greek characters, Roman characters, Hebrew characters, &c. The Latin character now uſed through all Europe was formed from the Greek, as the Greek was from the Phœnician; and the Phœnician, as well as the Chaldee, Syriac, and Arabic characters, were formed from the ancient Hebrew, which ſubſiſted till the Babyloniſh captivity; for, after that event, the character of the Aſſyrians, which is the ſquare Hebrew now in uſe, prevailed, the ancient being only found on ſome Hebrew medals, commonly called Samaritan medals. It was in 1091 that the Gothic characters, invented by Ulfilas, were aboliſhed, and the Latin ones eſtabliſhed in their room.

Medalliſts obſerve, that the Greek character, conſiſting only of majuſcule letters, has preſerved its uniformity on all medals, as low as the time of Gallienus; from that time it appears ſomewhat weaker and rounder: from the time of Conſtantine to Michael we find only Latin characters; and after Michael the Greek characters recommence; but from that time they begin to alter with the language, which was a mixture of Greek and Latin. The Latin medals preſerve both their character and language as low as the tranſlation of the ſeat of the empire to Conſtantinople: towards the time of Decius the character began to loſe its roundneſs and beauty; ſome time after, it retrieved, and ſubſiſted tolerably till the time of Juſtin, when it degenerated gradually into the Gothic. The rounder, then, and better formed a character is upon a medal, the fairer pretence it has to antiquity.

CHARACTER is alſo uſed, in ſeveral of the arts, for a ſymbol, contrived for the more conciſe and immediate conveyance of the knowledge of things. For the

CHARACTERS *uſed in algebra*, ſee p. 79, 80.

CHARACTERS *uſed in aſtronomy*, viz.

Of the planets. See plate XXXIX.
Of the ſigns. See plate XXXIX.

Of the aſpects.

☌ or S Conjunction
SS Semiſextile
✻ Sextile
Q Quintile
□ Quartile
Td Tredecile

△ Trine
Bq Biquintile
Vc Quincunx
☍ Oppoſition
☊ Dragon's head
☋ Dragon's tail

Of time.

A. M. *ante meridiem*, before the ſun comes upon the meridian.
O. or N. noon.
P. M. *poſt meridiem*, when the ſun is paſt the meridian.

CHARACTERS *in commerce.*

$\mathrm{D^o}$ *ditto*, the ſame
$\mathrm{N^o}$ *numero*, or number
$\mathrm{F^o}$ *folio*, or page
C or ⊕ hundred weight, or 112 pounds
$\mathrm{q^{rs}}$ quarters
S or *s* ſhillings
d pence or deniers
℔ pound weight.

$\mathrm{R^o}$ *recto* }
$\mathrm{V^o}$ *vero* } *folio*
£. or *l.* pounds ſterling
⅌, *per*, or by, as ⅌ *ann.* by the year, ⅌ *cent.*
$\mathrm{R^x}$ rixdollar
$\mathrm{D^t}$ ducat
P. S. poſtſcript, &c.

CHARACTERS *in chemiſtry.* See CHEMISTRY.

CHARACTERS *in geometry and trigonometry.*

∥ the character of paralleliſm
△ triangle
□ ſquare
▯ ▭ rectangle
⊙ circle

$\overset{V}{=}$ equiangulr, or ſimilar
$\underline{\perp}$ equilateral
∠ an angle
L right angle
⊥ perpendicular

° denotes a degree; thus 45° implies 45 degrees. ′ a minute; thus, 50°, is 50 minutes. ″, ‴, ⁗, denote ſeconds, thirds, and fourths: and the ſame characters are uſed where the progreſſions are by tens, as it is here by ſixties.

CHARACTERS *in grammar, rhetoric, poetry*, &c.

( ) parentheſis
[ ] crotchet
- hyphen
’ apoſtrophe
′ emphaſis or accent
˘ breve
¨ dialyſis
‸ caret and circumflex

SS. T. D. doctor in divinity
V. D. M. miniſter of the word of God
LL. D. doctor of laws
J. V. D. doctor of civil and canon law

" quotation
† ‡ and * references
§ ſection or diviſion
¶ paragraph
M. D. doctor in phyſic
A. M. maſter of arts
A. B. bachelor of arts
F. R. S. fellow of the royal ſociety.

For the other characters uſed in grammar, ſee COMMA, COLON, SEMICOLON, *&c.*

CHARACTERS *among the ancient lawyers, and in ancient inſcriptions.*

§ paragraphs
ff digeſts
Scto ſenatus conſulto
E. extra
S. P. Q. R. ſenatus populuſque Romanus
P. P. pater patriæ
C. code
C. C. conſules
T. titulus
P. P. D. D. propria pecunia dedicavit
D. D. M. dono dedit monumentum

CHARACTERS *in medicine and pharmacy.*

℞ recipe
á, *áá*, or ana, of each alike
℔ a pound or a pint
℥ an ounce
ʒ a drachm
℈ a ſcruple
gr. grains
ß or *ſs*, half of any thing
cong. congius, a gallon
coch. cochleare, a ſpoonful
M. manipulus, a handful
P. a pugil
P. Æ. equal quantities
S. A. according to art
q. s. a ſufficient quantity
q. pl. as much as you pleaſe
P. P. pulvis patrum, the Jeſuit's bark.

CHARACTERS *uſed in muſic.* See MUSIC.

Numeral CHARACTERS uſed to expreſs numbers, are either letters or figures. The Arabic character, called alſo the common one, becauſe it is uſed almoſt throughout Europe in all ſorts of calculations, conſiſts of theſe ten digits, 1, 2, 3, 4, 5. 6, 7, 8, 9, 0.

The Roman numeral character conſiſts of ſeven majuſcule letters of the Roman alphabet, *viz.* I, V, X, L, C, D, M. The I denotes one, V five, X ten, L fifty, C a hundred, D five hundred, and M a thouſand.

The I repeated twice makes two, II; thrice, three, III; four is expreſſed thus IV, as I before V or X takes an unit from the number expreſſed by theſe letters. To expreſs ſix, an I is added to a V, VI; for ſeven, two, VII: and for eight, three, VIII: nine is expreſſed by an I before X, thus IX.

The ſame remark may be made of the X before L or C, except that the diminution is by tens; thus, XL denotes forty, XC ninety, and LX ſixty. The C before D or M diminiſhes each by a hundred.

The number five hundred is ſometimes expreſſed by an I before a C inverted, thus, IↃ; and inſtead of M, which ſignifies a thouſand, an I is ſometimes uſed between two C's, the one direct, and the other inverted, thus CIↃ. The addition of C and Ↄ before or after, raiſes CIↃ by tens, thus, CCIↃↃ expreſſes ten thouſand, CCCIↃↃↃ, a hundred thouſand.

The Romans alſo expreſſed any number of thouſands by a line drawn over any numeral leſs than a thouſand; thus, $\overline{\text{V}}$ denotes five thouſand, $\overline{\text{LX}}$ ſixty thouſand: ſo likewiſe $\overline{\text{M}}$ is one million, $\overline{\text{MM}}$ is two millions, *&c.*

Some modern writers have admitted variations in this method of notation; thus we find IIX expreſſing eight, IICIX eighty-nine, Λ or V denoting IↃↃ, and ∞ or ↀ ſtanding for CIↃ; whence ᛉ ten thouſand, Ψ Ψ twenty thouſand.

The Greeks had three ways of expreſſing numbers: firſt, every letter, according to its place in the alphabet, denoted a number, from α, one, to ω, twenty-four. 2. The alphabet was divided into eight units, α one, β two, γ three, *&c.* into eight tens, ι ten, κ twenty, λ thirty, *&c.* and eight hundreds, ρ one hundred, σ two hundred, τ three hundred, *&c.* 3. I ſtood for one, Π five, Δ ten, H a hundred, Χ a thouſand, M ten thouſand; and when the letter Π incloſed any of theſe, except I, it ſhewed the incloſed letter to be five times its value; as 𐅄 fifty, 𐅅 five hundred, 𐅆 five thouſand, 𐅇 fifty thouſand.

French CHARACTERS, uſed in the chamber of accounts, and by perſons concerned in the management of the revenue, is, properly ſpeaking, nothing elſe than the Roman numerals, in letters that are not majuſcule: thus, inſtead of expreſſing fifty-ſix by LVI, they denote it by ſmaller characters lvj.

CHARACTERS *upon tomb-ſtones.*

S. V. Siſte viator, *i. e.* Stop traveller.
M. S. Memoriæ ſacrum, *i. e.* Sacred to the memory.
D. M. Diis manibus.
I H S. Jeſus.
X. P. a character found in the catacombs, about the meaning of which authors are not agreed.

CHARACTER, in epic and dramatic poetry, that which is peculiar in the manners of any perſon, and diſtinguiſhes him from all others. See EPIC, *and dramatic compoſitions.*

CHARADRIUS, in ornithology, a genus belonging to the order of grallæ. The beak is cylindrical and blunt; the noſtrils are linear, and the feet have three toes. There are 12 ſpecies, *viz.* 1. The hiaticula, or ſea-lark of Ray, has a black breaſt, a white ſtreak along the front; the top of the head is brown; and the legs and beak are reddiſh. It is found on the ſhores of Europe and America. 2. The alexandrinus, or oriental dotterell, is of a browniſh colour, with the fore-head, collar, and belly white; the prime tail-feathers on both ſides are white; and the legs are black. It is a native of Egypt, and is much valued for its ſinging. It is about the ſize of a crow, and lives upon mice, rats, *&c.* 3. The vociferus, or noiſy plover of Cateſby, has black ſtreaks on the breaſt, neck, fore-head, and cheeks; and the feet are yellow. It is a native of North America. 4. The ægyptius, has a black ſtreak on the breaſt, white eye-brows, the prime tail-feathers ſtreaked with black at the points, and bluiſh legs. It is found in the plains of Egypt, and feeds on inſects. 5. The morinellus has an iron-coloured breaſt, a ſmall white ſtreak on the breaſt and eye-brows, and black legs. It is the dotterell of Ray, and a native of Europe. 6. The apricarius has a black belly; the body is brown, and variegated with white and yellow ſpots; and the legs are aſh coloured. It is the ſpotted plover of Edwards, and a native of Canada. 7. The pluvialis, is black above, with green ſpots, white underneath, and the feet are aſh-coloured. It is the green plover of Ray, and is a native of Europe. 8. The torquatus, has a black breaſt, and a white front; the top of the head and the collar is black; and the beak and feet are bluiſh. It is a native of St Domingo. 9. The calidris, has black feet and a black bill; the rump is greyiſh; and the body is pure white below. It frequents the ſhores of Europe. 10. The œdicnemus, or ſtone curlew of Ray, is of a grey colour, with two of the prime wing-feathers black, but white in the middle; it has a ſharp bill, and aſh-coloured feet. It is a native of Britain. 11. The luinantopus, is white below, with a black back, and a long black bill; the feet are red and very long. It is the autumnal dotterell of Engliſh authors, and frequents the ſea-ſhores of Europe. 12. Spinoſus, armed dotterell, or lap-wing, has a black breaſt, legs, and wings; it has a creſt on the hinder part of the head. It is of the ſize of a pidgeon; the French call it dominicanus, from the reſemblance it has to the dreſs of a dominican monk: It is a native of Egypt.

CHARANTIA, in botany See MOMORDICA.

CHARAX, in ichthyology. See SALMO.

CHARBON, in the menage, that little black ſpot o mark which remains after a large ſpot in the cavity of the corner teeth of a horſe: about the ſeventh or eighth year, when the cavity fills up, the tooth being ſmooth and equal, it is ſaid to be raſed.

CHARCAS, the ſouthern diviſion of Peru, in South America, remarkable for the ſilver-mines of Potoſi.

CHARCOAL, a kind of fuel, conſiſting of half-burnt wood, much uſed by artificers of different profeſſions; and that not only as fuel, but for poliſhing braſs or copper-plates, *&c.*

The beſt charcoal for common uſes is that made of oak; but in the manufacture of gunpowder they commonly uſe charcoal made of alder.

CHARENTE, a river of France, which ariſing in the Limoſin, runs weſtward by Angouleſme and Saintes, falling into the bay of Biſcay, oppoſite to the iſle of Oleron.

CHARENTON, the name of two towns in France, the one upon the Marmaude, in the Bourbonois; the other in the iſle of France, near the confluence of the Marne with the Seine, about three miles ſouth-eaſt of Paris: E. long. 2° 30′, and N. lat. 48° 45′.

CHARGE, in heraldry, is applied to the figures repreſented on the eſcutcheon, by which the bearers are diſtinguiſhed from one another; and it is to be obſerved, that too many charges are not ſo honourable as fewer.

CHARGE *of lead* denotes a quantity of thirty-ſix pigs. See PIG.

CHARGE *to enter heir*, in Scots law, a writing paſſing under the ſignet, obtained at the inſtance of a creditor, either againſt the heir of his debitor, for fixing upon him the debt as repreſenting the debitor, which is called a general charge: Or, againſt the debitor himſelf, or his heir, for the purpoſe of veſting him in the right of any heritable ſubject to which he has made up no title, in order the creditor may attach that ſubject for payment of his debt, in the ſame manner as if his debitor or his heir were legally veſted in it by ſervice or otherwiſe. This laſt kind is called a ſpecial charge. See SCOTS LAW, title, *Appriſings and adjudications.*

CHARGED, in heraldry, a ſhield carrying ſome impreſs or figure, is ſaid to be charged therewith; ſo alſo when one bearing, or charge, has another figure added upon it, it is properly ſaid to be charged.

CHARIOT, a half coach, having only a ſeat behind, with a ſtool, at moſt, before. See COACH.

The chariots of the ancients, chiefly uſed in war, were called by the ſeveral names *bigæ, trigæ*, &c. according to the number of horſes applied to draw them. Every chariot carried two men, who were probably the warrior and the charioteer; and we read of ſeveral men of note and valour employed in driving the chariot. When the warriors came to encounter in cloſe fight, they alighted out of the chariot, and fought on foot; but when they were weary, which often happened, by reaſon of their armour, they retired into their chariot, and thence annoyed their enemies with darts and miſſive weapons. Theſe chariots were made ſo ſtrong, that they laſted for ſeveral generations.

Beſides this ſort, we find frequent mention of the *currus falcâti*, or thoſe chariots armed with hooks, or ſcythes, with which whole ranks of ſoldiers were cut off together, if they had not the art of avoiding the danger; theſe were not only uſed by the Perſians, Syrians, Egyptians, *&c.* but we find them among our Britiſh anceſtors.

Triumphal **CHARIOT** was one of the principal ornaments of the Roman celebration of a victory.

The Roman triumphal chariot was generally made of ivory, round like a tower, or rather of a cylindrical figure; it was ſometimes gilt at the top, and ornamented with crowns; and, to repreſent a victory more naturally, they uſed to ſtain it with blood. It was uſually drawn by four white horſes, but oftentimes by lions, elephants, tygers, bears, leopards, dogs, *&c.*

CHARISTIA, a feſtival of the ancient Romans, celebrated in the month of February, wherein the relations by blood and marriage met, in order to preſerve a good correſpondence; and that, if there happened to be any difference among them, it might be the more eaſily accommodated, by the good humour and mirth of the entertainment.

CHARITY, among divines, one of the three grand theological virtues, conſiſting in the love of God and of our neighbour, or the habit and diſpoſition of loving God with all our heart, and our neighbour as ourſelves.

CHARITY *of St Hippolitus*, a religious congregation founded, about the end of the XIVth century, by one Bernardin Alvarez, a Mexican, in honour of St

Hippolitus the martyr, patron of the city of Mexico; and approved by pope Gregory XIII.

CHARLEMONT, a town of the province of Namur, in the Auſtrian Netherlands, about eighteen miles ſouth of Namur: E. long. 4° 40′, and N. lat. 50° 10′.

Charlemont is alſo the name of a town of Ireland, ſituated on the river Blackwater, in the county of Armagh, and province of Ulſter, about ſix miles ſouth-eaſt of Dungannon: W. long. 6° 50′, and N. lat. 50° 16′.

CHARLEROY, a ſtrong town in the province of Namur, in the Auſtrian Netherlands, ſituated on the river Sambre, about nineteen miles weſt of Namur: E. long. 4° 20′, and N. lat. 50. 30′.

CHARLES's CAPE, a promontory of Virginia, in North America, forming the northern head-land of the ſtreight that enters the bay of Cheaſepeak.

Charles's-fort, a fortreſs in the county of Cork, and province of Munſter in Ireland, ſituated at the mouth of Kinſale harbour: W. long. 8° 20′, and N. lat. 51° 21′.

Charles's-town, the capital of South Carolina, in North America, ſituated on a peninſula formed by Aſhley and Cooper rivers, the former of which is navigable for ſhips twenty miles above the town: W. long. 79°, and N. lat. 32° 30′.

Charles's-wain, in aſtronomy, ſeven ſtars in the conſtellation called *urſa major*. or the great bear.

CHARLETON, an iſland at the bottom of Hudſon's-bay, in North America, ſubject to Great Britain: W. long. 80°, and N. lat. 52° 30′.

CHARLOCK, the Engliſh name of the raphanus. See Raphanus.

CHARM, a term derived from the Latin *carmen*, a verſe; and uſed to denote a magic power, or ſpell, by which, with the aſſiſtance of the devil, ſorcerers and witches were ſuppoſed to do wonderful things, far ſurpaſſing the power of nature.

CHARNEL, or **Charnel-house**, a kind of portico, or gallery, uſually in or near a church-yard, over which were anciently laid the bones of the dead, after the fleſh was wholly conſumed.

Charnel-houſes are now uſually adjoining to the church.

CHARNUB, in botany. See Ceratonia.

CHART, or **Sea-chart**, an hydrographical map, or a projection of ſome parts of the earth's ſuperficies *in plano*, for the uſe of navigators. See Navigation.

CHARTA-*magna*. See Magna *charta*.

CHARTER, in law, a written inſtrument or evidence of things acted between one perſon and another.

Charters of private perſons, are deeds and inſtruments for the conveyance of lands, *&c*. Here the purchaſer of land ſhall have all the charters and deeds, as incident to the ſame, and for the maintenance of his title. But this is underſtood where the feoffer is not bound to a general-warranty of the land.

CHARTER, in Scots law, that writing which contains the grant of a feudal ſubject to the vaſſal. See Scots Law, tit. *Of the conſtitution of heritable rights*.

CHARTOPHYLAX, the name of an officer of the church of Conſtantinople, who attends at the door of the rails when the ſacrament is adminiſtered, and gives notice to the prieſts to come to the holy table. He repreſents the patriarch upon the bench, tries all eccleſiaſtical cauſes, keeps all the marriage regiſters, aſſiſts at the conſecration of biſhops, and preſents the biſhop elect at the ſolemnity, and likewiſe all other ſubordinate clergy. This office reſembles in ſome ſhape that of the bibliothecarius at Rome.

CHARTRES, a large city of France, in the province of Orleanois, ſituated on the river Eure, about forty-two miles ſouth-weſt of Paris: E. long. 1° 32′, N. lat. 48° 27′. It is a biſhop's ſee.

CHARTREUSE, or **Chartreuse-grand**, a celebrated monaſtery, the capital of all the convents of the Carthuſian monks, ſituated on a ſteep rock in the middle of a large foreſt of fir-trees, about ſeven miles north-eaſt of Grenoble, in the province of Dauphine in France: E. long. 5° 5′, N. lat. 45° 20′. See Carthusians.

From this mother-convent, all the others of the ſame order take their name; among which was the Chartreuſe of London, corruptly called the charter-houſe, now converted into an hoſpital, endowed with a revenue of 600 l. *per ann*.

Here are maintained eighty decayed gentlemen, not under fifty years of age: Alſo forty boys are educated and fitted either for the univerſity or trades. Thoſe ſent to the univerſity, have an exhibition of 20 l. a year for eight years; and have an immediate title to nine church-livings in the gift of the governors of the hoſpital, who are ſixteen in number, all perſons of the firſt diſtinction, and take their turns in the nomination of penſioners and ſcholars.

CHARYBDIS, a rock in the ſtrait of Meſſina, between Italy and Sicily, much celebrated in the writings of ancient poets.

Charybdis is alſo an appellation given by Dr Plot to certain openings in the bottom of the ſea, whereby the water is conveyed to the origin or ſources of ſprings, rivers, *&c*. ſuch is Maelſtroom, on the coaſt of Norway, ſuppoſed to be. See Maelstroom.

CHASING *of gold, ſilver*, &c. See Enchasing.

CHASTE-*tree*. See Vitex.

CHATELET, the name of certain courts of juſtice eſtabliſhed in ſeveral cities in France. The grand chatelet at Paris, is the place where the preſidial or ordinary court of juſtice of the provoſt of Paris is kept; conſiſting of a preſidial, a civil chamber, a criminal chamber, and a chamber of policy. The little chatelet is an old fort, now ſerving as a priſon.

CHATHAM, a port-town of Kent, adjoining to Rocheſter, ſituated on the river Medway, thirty miles ſouth-eaſt of London: E. long. 40′, N. lat. 51° 20′.

It is the principal ſtation of the royal navy, furniſhed with timber, rope-yards, and all manner of naval ſtores, ſufficient for the building and fitting out the largeſt fleet.

CHATTEAU-CAMBRESIS, a town of the Cambreſis, in the French Netherlands, ſituated on the river

Selle, thirteen miles ſouth-eaſt of Cambray, E. long. 3° 25′, N. lat. 50° 6′.

Chatteau dauphine, a fortreſs ſituated on the frontiers of Piedmont, in the province of Dauphine, but yielded to the king of Sardinia: E. long. 6° 40′, N. lat. 44° 30′.

CHATTELS, in law, all ſorts of goods moveable and immoveable, except ſuch as are in the nature of freehold.

CHATTIGAN, a port-town of India, in the province of Bengal, ſituated at the mouth of the moſt eaſterly branch of the Ganges, ſubject to the Mogul: E. long. 91°, N. lat. 23°.

CHATTILLON, a town of Burgundy in France, about ſixteen miles ſouth-weſt of Geneva: E. long. 5° 40′, N. lat 46° 16′.

Chattillon is likewiſe the name of ſeveral other towns of France, ſituated upon the Indre, the Loing, the Loire, the Marne, the Saone, &c.

CHAUMONT, the name of two towns in France; the one ſituated in the iſle of France, thirty miles north-weſt of Paris, E. long. 2°, N. lat. 49° 18′; the other ſituated on the river Marne, in the province of Champaign, E. long. 5° 15′, N. lat. 48° 12′.

CHAUSE-TRAPE. See Caltrop.

CHEADLE, a market-town of Staffordſhire, ten miles north-eaſt of Stafford: W. long. 2°, N. lat. 53°.

CHEASPEAK-BAY, a large frith or arm of the ſea, which runs up about three hundred miles into the country between Virginia and Maryland, in North America: It is navigable almoſt all the way for large ſhips; being about twenty miles broad at the entrance between Charles-cape and Cape Henry, and between twenty and thirty miles broad afterwards. See Charles-cape.

CHECAYA, in Turkiſh affairs, the ſecond officer of the janizaries, who commands them under the aga, and is otherwiſe called *protogero*.

There is alſo a checaya of the treaſury, ſtables, kitchen, &c. the word ſignifying as much as lieutenant, or the ſecond in any office.

CHECK, or **Check-roll**, a roll or book, wherein is contained the names of ſuch perſons as are attendants and in pay to the king, or other great perſonages, as their houſehold ſervants.

Clerk of the **Check**, in the king's houſehold, has the check and controulment of the yeomen of the guard, and all the uſhers belonging to the royal family, allowing their abſence or defects in attendance, or diminiſhing their wages for the ſame, &c. He alſo, by himſelf or deputy, takes the view of thoſe that are to watch in the court, and has the ſetting of the watch, &c.

Clerk of the **Check**, in the king's navy at Plymouth, is alſo the name of an officer inveſted with the like power.

Check, in falconry, a term uſed of a hawk when ſhe forſakes her proper game, to flie at pyes, crows, rooks, or the like, that croſs her in her flight.

CHECKY, in heraldry, is when the ſhield, or a part thereof, as a bordure, &c. is chequered, or divided into chequers or ſquares, in the manner of a cheſs-board.

This is one of the moſt noble and moſt ancient figures uſed in armory; and a certain author ſaith, that it ought to be given to none but great warriors, in token of their bravery: For the cheſs-board repreſents a field of battle; and the pawns of men, placed on both ſides, repreſent the ſoldiers of the two armies, which move, attack, advance, or retire, according to the will of the gameſters, who are the generals.

This figure is always compoſed of metal and colour: But ſome authors would have it reckoned among the ſeveral ſorts of furs.

CHEEK, in anatomy, that part of the face ſituated below the eyes, on each ſide. See p. 305.

CHEESE, a ſort of food, prepared of curdled milk, purged from the ſerum or whey, and afterwards dried for uſe.

Phyſicians condemn the too free uſe of cheeſe, by reaſon it loads the ſtomach when new, and heats and inflames when old.

Every country has its places noted for this commodity: Thus Cheſter and Glouceſter-cheeſe are famous in England; and the Parmeſan cheeſe is in no leſs repute abroad, eſpecially in France. This ſort of cheeſe is entirely made of ſweet cow's milk: But at Rochfort in Languedoc, they make cheeſe of ewe's milk; and in other places, it is uſual to add goat or ewe's milk, in a certain proportion, to that of cow's.

There is likewiſe a kind of medicated cheeſe, made by intimately mixing the expreſſed juice of certain herbs, as ſage, baum, mint, &c. with the curd, before it is faſhioned into a cheeſe. The 100 weight of cheeſe pays on importation, 1 s. $3\frac{4}{10}$ d. and draws back, on exportation, 1 s. $1\frac{1}{4}$ d. at the rate of 6 s. 8 d. The cheeſe of Ireland is prohibited to be imported.

Cheese-runnet, in botany. See Gallium.

CHEGFORD, a market-town of Devonſhire, about thirteen miles weſt of Exeter: W. long. 4°, N. lat. 50° 40′.

CHEIRANTHUS, in botany, a genus of the tetradynamia ſiliquoſa claſs. The germen has teeth-like glands on each ſide; the calix is cloſe, and conſiſts of two ſmall leaves, gibbous at the baſe; and the ſeeds are plain. There are thirteen ſpecies, only two of which are natives of Britain, *viz.* the cheiri, wall-flower, or wild cheir; and the tricuſpidatus, or ſea ſtock-gillyflower. The leaves of the wall-flower are ſaid to be cordial, anodyne, aperient, and emmenagogue; but are wholly neglected in practice.

CHEKAO, a kind of paſte prepared by calcination and trituration from a hard ſtony ſubſtance, and afterwards waſhing the powder in large quantities of fair water.

The Chineſe uſe the chekao in drawing the elegant figures we ſee in the wholly white china-ware, which they afterwards varniſh in the common way. See China-ware.

CHEKAIM, a province of China, bounded by that of Nankin on the north, and by the ocean on the eaſt.

CHELÆCANCRORUM, in the materia medica. See Crab's claws.

CHELIDONIUM, in botany, a genus of the polyandria monogynia claſs. The corolla has four petals;

the calix conſiſts of two leaves; and the pod is linear and unilocular. There are four ſpecies, three of which are natives of Britain, *viz.* the majus, or celandine; the glaucium, or yellow horned poppy; and the hybridum, or violet-coloured horned poppy. The leaves and root of the majus, or celandine, are ſtimulating, aperient, diuretic, and ſudorific: It is peculiarly recommended in the ſlow kind of jaundice, where there are no ſymptoms of inflammation, and in dropſies.

CHELIDONIUS *lapis*, in natural-hiſtory, a ſtone ſaid by the ancients to be found in the ſtomachs of young ſwallows, and greatly cried up for its virtues in the falling-ſickneſs; but from their deſcription, it appears to be only a ſpecies of lycodontes, or bufonitæ. See LYCODONTES, and BUFONITÆ.

CHELM, a town of Poland, capital of a palatinate of the ſame name: It is ſituated in the province of Red Ruſſia, 110 miles ſouth-eaſt of Warſaw: E. long. 23° 30′, N. lat. 51° 25′.

CHELMSFORD, the county town of Eſſex, ſituated on the river Chelmer, twenty five miles north-eaſt of London: E. long. 30′, N. lat. 51° 40′. It ſends two members to parliament.

CHELONE, in botany, a genus of the didynamia angioſpermia claſs. The calix is divided into five parts; there are the rudiments of a fifth filament betwixt the two higher ſtamina; and the capſule is bilocular. There are three ſpecies, none of them natives of Britain.

CHELSEA, a fine village ſituated on the northern bank of the river Thames, a mile weſtward of Weſtminſter, remarkable for a magnificent hoſpital of invalids and old decrepit ſoldiers; and a pleaſure-houſe, called Ranelagh, to which a great deal of fine company reſort in ſummer.

CHELTENHAM, or CHILTHENHAM, a market-town of Glouceſterſhire, ſeven miles north-eaſt of Glouceſter: W. long. 2° 10′, N. lat. 51° 50′. It is chiefly remarkable for its mineral waters, of the ſame kind with thoſe of Scarborough. See SCARBOROUGH.

CHEMISE, in fortification, the wall with which a baſtion, or any other bulwark of earth, is lined for its greater ſupport and ſtrength: Or it is the ſolidity of the wall from the talus to the ſtone-row.

Fire-**CHEMISE**, a piece of linen cloth, ſteeped in a compoſition of oil of petrol, camphor, and other combuſtible matters, uſed at ſea, to ſet fire to an enemy's veſſel.

CHEMISTRY.

THE object and chief end of chemiſtry is to ſeparate the different ſubſtances that enter into the compoſition of bodies; to examine each of them apart; to diſcover their properties and relations; to decompoſe thoſe very ſubſtances, if poſſible; to compare them together, and combine them with others; to reunite them again into one body, ſo as to reproduce the original compound with all its properties; or even to produce new compounds that never exiſted among the works of nature, from mixtures of other matters differently combined.

But this analyſis, or decompoſition, of bodies is finite; for we are unable to carry it beyond a certain limit. In whatever way we attempt to go further, we are always ſtopped by ſubſtances in which we can produce no change, and which are incapable of being reſolved into others.

To theſe ſubſtances we may give the title of *principles* or *elements*. Of this kind the principal are earth, water, air, and fire. For though there be reaſon to think, that theſe are not the firſt component parts, or the moſt ſimple elements, of matter; yet, as we know by experience, that our ſenſes cannot poſſibly diſcover the principles of which they are themſelves compoſed, it ſeems more reaſonable to fix upon them, and conſider them as ſimple homogeneous bodies, and the principles of the reſt, than to tire our minds with vain conjectures about the parts or elements of which they may conſiſt.

Before entering upon the examination of compound ſubſtances, it is neceſſary to conſider the moſt ſimple ones, or the four firſt principles, with ſome attention.

PART I. THEORY OF CHEMISTRY.

Of the Principles of Bodies.

Of AIR.

AIR is that fluid which we conſtantly breathe, and which encompaſſes the whole ſurface of the terreſtrial globe. Being heavy, like other bodies, it penetrates into all places that are not either abſolutely inacceſſible, or filled with ſome other body heavier than itſelf. Its principal property is, to be ſuſceptible of condenſation and rarefaction; ſo that the very ſame quantity of air may occupy a much greater, or a much ſmaller ſpace, according to the different ſtate it is in. Heat and cold are the moſt uſual cauſes of its condenſation and rarefaction: For if a certain quantity of air be heated, its bulk enlarges in proportion to the degree of heat applied to it; the conſequence whereof is, that the ſame ſpace now contains fewer particles of air than it did before. Cold again produces juſt the contrary effect.

On this property which air has of being condenſed and dilated by heat, its elaſticity chiefly depends. For if air were forced by condenſation into a leſs compaſs than it took up before, and then expoſed to a very conſiderable degree of cold, it would remain quite inactive, without exerting ſuch an effort as it uſually makes againſt the depreſſing body. On the other hand, the elaſticity of heated air ariſes only from hence, that being rarefied by the action of fire, it requires much more room than it occupied before.

Air enters into the compoſition of many ſubſtances, eſpecially vegetable and animal bodies: For by analyſing moſt of them ſuch a conſiderable quantity thereof is extricated, that ſome naturaliſts have ſuſpected it to be altogether deſtitute of elaſticity when thus combined with the other principles in the compoſition of bodies. According to them, the efficacy of the elaſtic power of the air is ſo prodigious, and its force when compreſſed ſo exceſſive, that it is not poſſible the other component parts of bodies ſhould be able to confine ſo much of it in that ſtate of compreſſion which it muſt needs undergo, if retaining its elaſticity when pent up among them.

However that be, this elaſtic property of the air produces the moſt ſingular and important phenomena obſervable in the reſolution and compoſition of bodies.

Of WATER.

WATER is a thing ſo well known, that it is almoſt needleſs to attempt giving a general idea of it here. Every one knows that it is a tranſparent, inſipid ſubſtance, and uſually fluid. We ſay it is uſually ſo; for being expoſed to a certain degree of cold, it becomes ſolid: Solidity therefore ſeems to be its moſt natural ſtate.

Water expoſed to the fire grows hot; but only to a limited degree, beyond which its heat never riſes, be the force of fire applied to it ever ſo violent: It is known to have acquired this degree of heat by its boiling up with great tumult. Water cannot be made hotter, becauſe it is volatile, and incapable of enduring the heat without being evaporated and entirely diſſipated.

If ſuch a violent and ſudden heat be applied to water as will not allow it time to exhale gently in vapours, as when, for inſtance, a ſmall quantity thereof is thrown upon a metal in fuſion, it is diſſipated at once with vaſt impetuoſity, producing a moſt terrible and dangerous exploſion. This ſurpriſing effect may be deduced from the inſtantaneous dilatation of the parts of the water itſelf, or rather of the air contained in it. Moreover, water enters into the texture of many bodies, both compound and ſecondary principles; but, like air, it ſeems to be excluded from the compoſition of all metals, and moſt minerals. For although an immenſe quantity of water exiſts in the bowels of the earth, moiſtening all its contents, it does not therefore follow, that it is one of the principles of minerals. It is only interpoſed between their parts; for they may be entirely robbed of it, without any ſort of decompoſition: Indeed it is not capable of an intimate connection with them.

Of EARTH.

WE obſerved, that the two principles above treated of are volatile; that is, the action of fire ſeparates them from the bodies they help to compoſe. But earth is fixed, and, when abſolutely pure, reſiſts the utmoſt force of fire. So that, whatever remains of a body, after it hath been expoſed to the power of the fierceſt fire, muſt be conſidered as containing nearly all its earthy principle, and conſiſting chiefly thereof.

Earth therefore is a fixed principle which is permanent in the fire. There is reaſon to think it very difficult, if not impoſſible, to obtain the terrene principle wholly free from every other ſubſtance: For after our utmoſt endeavours to purify them, the earths we obtain from different compounds are found to have different properties, according to the different bodies from which they are procured; or elſe, if thoſe earths be pure, we muſt allow them to be eſſentially different, ſeeing they have different properties.

Earth, in general, with regard to its properties, may be diſtributed into *fuſible* and *unfuſible*; that is, into earth that is capable of melting or becoming fluid in the fire, and earth that conſtantly remains in a ſolid form, never melting in the ſtrongeſt degree of heat to which we can expoſe it.

The former is alſo called *virtifiable*, and the latter *unvitrifiable* earth; becauſe, when earth is melted by the force of fire, it becomes what we call *glaſs*, which is nothing but the parts of earth brought into nearer contact, and more cloſely united by the means of fuſion. Perhaps the earth, which we look upon as uncapable of vitrification, might be fuſed if we could apply to it a ſufficient degree of heat. It is at leaſt certain, that ſome earths, or ſtones, which ſeparately reſiſt the force of fire, ſo that they cannot be melted, become fuſible when mixed together. Experience convinced Mr du Hamel, that lime-ſtone and ſlate are of this kind. It is however undoubtedly true, that one earth differs from another in its degree of fuſibility: And this gives ground to believe, that there may be a ſpecies of earth abſolutely unvitrifiable in its nature, which, being mixed in different proportions with fuſible earths, renders them difficult to melt.

Whatever may be in this, as there are earths which we are abſolutely unable to vitrify, that is a ſufficient reaſon of our diviſion of them. Unvitrifiable earths ſeem to be porous, for they imbibe water; whence they have alſo got the name of *abſorbent earths*.

Of FIRE.

THE matter of the ſun, or of light, the phlogiſton, fire, the ſulphureous principle, the inflammable matter, are all of them names by which the element of fire is uſually denoted. But it ſhould ſeem, that an accurate diſtinction hath not yet been made between the different ſtates in which it exiſts; that is, between the phenomena of fire actually exiſting as a principle in the compoſition of bodies, and thoſe which it exhibits when exiſting ſeparately and in its natural ſtate: nor have proper diſtinct appellations been deſigned to it in thoſe different circumſtances. In the latter ſtate we may properly give it the names of fire, matter of the ſun, of light, and of heat; and may conſider it as a ſubſtance compoſed of infinitely ſmall particles, continually agitated by a moſt rapid motion, and of conſequence eſſentially fluid.

This ſubſtance, of which the ſun may be called the general reſervoir, ſeems to flow inceſſantly from that ſource, diffuſing itſelf over the world, and through all the bodies we know; but not as a principle, or eſſential part of them, ſince they may be deprived thereof, at leaſt in a great meaſure, without ſuffering any decompoſition. The greateſt change produced on them, by its preſence or its abſence, is the rendering them fluid or ſolid: ſo that all other bodies may be deemed naturally ſolid; fire alone eſſentially fluid, and the principle of fluidity in others. This being preſuppoſed, air itſelf might become ſolid, if it could be entirely deprived of the fire it contains; as bodies of moſt difficult fuſion become fluid, when penetrated by a ſufficient quantity of the particles of fire.

One of the chief properties of this pure fire is to penetrate eaſily into all bodies, and to diffuſe itſelf among them with a ſort of uniformity and equality: for if a heated body be contiguous to a cold one, the former communicates to the latter all its exceſs of heat, cooling in exact proportion as the other warms, till both come to have the very ſame degree of heat. Heat, however, is naturally communicable ſooneſt to the upper parts of a body; and conſequently, when a body cools, the under parts become ſooneſt cold. It hath been obſerved, for inſtance, that the lower extremity of a heated body, freely ſuſpended in the air, grows cold ſooner than the upper; and that when a bar of iron is red-hot at one end, and cold at the other, the cold end is much ſooner heated by placing the bar ſo that the hot end may be undermoſt, than when that end is turned uppermoſt. The levity of the matter of fire, and the vicinity of the earth, may poſſibly be the cauſes of this phenomenon.

Another property of fire is to dilate all bodies into which it penetrates. This hath already been ſhewn with regard to air and water; and it produces the ſame effect on earth.

Fire is the moſt powerful agent we can employ to decompoſe bodies; and the greateſt degree of heat producible by man, is that excited by the rays of the ſun collected in the focus of a large burning-glaſs.

Of the PHLOGISTON.

FROM what hath been ſaid concerning the nature of fire, it is evidently impoſſible for us to fix and confine it in any body. Yet the phenomena attending the combuſtion of inflammable bodies ſhew that they really contain the matter of fire as a conſtituent principle. By what mechaniſm then is this fluid, ſo ſubtile, ſo active, ſo difficult to confine, ſo capable of penetrating into every other ſubſtance in nature, ſo fixed as to make a component part of the moſt ſolid bodies? It is no eaſy matter to give a ſatisfactory anſwer to this queſtion. But, without pretending to gueſs the cauſe of the phenomenon, let us reſt contented with the certainty of the fact, the knowledge of which will undoubtedly procure us conſiderable advantages. Let us therefore examine the properties of fire thus fixed and become a principle of bodies. To this ſubſtance, in order to diſtinguiſh it from pure and unfixed fire, the chemiſts have aſſigned the peculiar title of the *Phlogiſton*, which is indeed no other than a Greek word for the inflammable matter; by which latter name, as well as by that of the ſulphureous principle, it is alſo ſometimes called. It differs from elementary fire in the following particulars. 1. When united to a body, it communicates to it neither heat nor light. 2. It produces no change in its ſtate, whether of ſolidity or fluidity; ſo that a ſolid body does not become fluid by the acceſſion of the phlogiſton, and *vice verſa*; the ſolid bodies to which it is joined being only rendered thereby more apt to be fuſed by the force of the culinary fire. 3. We can convey it from the body with which it is joined into another body, ſo that it ſhall enter into the compoſition thereof, and remain fixed in it.

On this occaſion both theſe bodies, that which is deprived of the phlogiſton and that which receives it, undergo very conſiderable alterations; and it is this laſt circumſtance in particular that obliges us to diſtinguiſh the phlogiſton from pure fire, and to conſider it as the element of fire combined with ſome other ſubſtance, which ſerves it as a baſis for conſtituting a kind of ſecondary principle For if there were no difference between them, we ſhould be able to introduce and fix pure fire itſelf where-ever we can introduce and fix the phlogiſton: yet this is what we can by no means do, as will appear from experiments to be afterwards produced.

Hitherto chemiſts have never been able to obtain the phlogiſton quite pure, and free from every other ſubſtance: for there are but two ways of ſeparating it from a body of which it makes a part; to wit, either by applying ſome other body with which it may unite the moment it quits the former; or elſe by calcining and burning the compound from which you deſire to ſever it. In the former caſe, it is evident that we do not get the phlogiſton by itſelf, becauſe it only paſſes from one combination into another; and in the latter, it is entirely diſſipated in the decompoſition, ſo that no part of it can poſſibly be ſecured.

The inflammability of a body is an infallible ſign that it contains a phlogiſton; but from a body's not being inflammable, it cannot be inferred that it contains none; for experiments have demonſtrated, that certain metals abound with it, which yet are by no means inflammable.

We have now delivered what is moſt neceſſary to be known concerning the principles of bodies in general. They have many other properties beſides thoſe abovementioned; but we cannot properly take notice of them here, becauſe they preſuppoſe an acquaintance with ſome other things relating to bodies, of which we have hitherto ſaid nothing, intending to treat of them in the ſequel as occaſion ſhall offer. We ſhall only obſerve in this place, that when animal and vegetable matters are burnt in ſuch a manner as to hinder them from flaming, ſome part of the phlogiſton contained in them unites intimately with their moſt fixed earthy parts, and with them forms a compound that can be conſumed only by making it red-hot in the open air, where it ſparkles and waſtes away, without emitting any flame. This compound is called a *coal*. We ſhall inquire into the properties of this coal under the head of oils: at preſent it ſuffices that we know in general what it is, and that it readily communicates to other bodies the phlogiſton it contains.

A general View of the Affinities or elective Attractions that ſubſiſt between Bodies.

Before we can reduce compound bodies to the firſt principles above pointed out, we obtain, by analyſing them, certain ſubſtances which are indeed more ſimple than the bodies they helped to compoſe, yet are themſelves compoſed of our primary principles. They are therefore at one and the ſame time both principles and compounds; for which reaſon we ſhall call them by the name of ſecondary principles. Saline and oily matters chiefly conſtitute this claſs. But before we enter upon an examination of their properties, it is fit we lay before the reader a general view of what chemiſts underſtand by the relations or affinities of bodies; becauſe it is neceſſary to know theſe, in order to a diſtinct conception of the different combinations we are to treat of.

All the experiments hitherto made concur in proving, that different bodies, whether principles or compounds, have ſuch a mutual conformity, relation, affinity, or attraction, as diſpoſes ſome of them to join and unite together, while they are incapable of contracting any union with others. This effect, whatever be its cauſe, will enable us to account for, and connect together, all the phenomena that chemiſtry produces. The nature of this univerſal affection of matter is laid down in the following propoſitions.

Firſt, If one ſubſtance has any affinity or conformity with another, the two will unite together, and form one compound.

Secondly, All ſimilar ſubſtances have an affinity with each other, and are conſequently diſpoſed to unite; as water with water, earth with earth, *&c.*

Thirdly, Subſtances that unite together loſe ſome of their ſeparate properties; and the compounds reſulting from their union partake of the properties of thoſe ſubſtances which ſerve as their principles.

Fourthly, The ſimpler any ſubſtances are, the more perceptible and conſiderable are their affinities: whence it follows, that the leſs bodies are compounded, the more difficult it is to analyſe them; that is, to ſeparate from each other the principles of which they conſiſt.

Fifthly, If a body conſiſt of two ſubſtances, and to this compound be preſented a third ſubſtance that has no affinity at all with one of the two primary ſubſtances aforeſaid, but has a greater affinity with the other than thoſe two ſubſtances have with each other, there will enſue a decompoſition, and a new union; that is, the third ſubſtance will ſeparate the two compounding ſubſtances from each other, coaleſce with that which has an affinity with it, form therewith a new combination, and diſengage the other, which will then be left at liberty, and ſuch as it was before it had contracted any union.

Sixthly, It happens ſometimes that when a third ſubſtance is preſented to a body conſiſting of two ſubſtances, no decompoſition follows; but the two compounding ſubſtances, without quitting each other, unite with the ſubſtance preſented to them, and form a combination of three principles: and this happens when that third ſubſtance has an equal, or nearly equal, affinity with each of the compounding ſubſtances. The ſame thing may alſo happen even when the third ſubſtance hath no affinity but with one of the compounding ſubſtances only. To produce ſuch an effect, it is ſufficient that one of the two compounding ſubſtances have to the third body a relation equal, or nearly equal, to that which it has to the other compounding ſubſtance with which it is already combined. Hence it follows, that two ſubſtances, which, when apart from all others, are incapable of contracting any union, may be rendered capable of incorporating together in ſome meaſure, and becoming parts of the ſame compound, by combining with a third ſubſtance with which each of them has an equal affinity.

Seventhly, A body, which of itſelf cannot decompoſe a compound conſiſting of two ſubſtances, becauſe they have a greater affinity with each other than it has with either of them, becomes nevertheleſs capable of ſeparating the two by uniting with one of them, when it is itſelf combined with another body having a degree of affinity with that one ſufficient to compenſate its own want thereof. In that caſe there are two affinities, and thence enſues a double decompoſition, and a double combination.

Theſe fundamental truths, from which we ſhall deduce an explanation of all the phenomena in chemiſtry, will be confirmed and illuſtrated by applying them to the ſeveral caſes, of which our deſign in this treatiſe obliges us to give a circumſtantial account.

Of Saline Subſtances in general.

If a particle of water be intimately united with a particle of earth, the reſult will be a new compound, which, according to our third propoſition of affinities, will partake of the properties of earth and of water; and this combination principally forms what is called a *ſaline ſubſtance*. Conſequently every ſaline ſubſtance muſt have an affinity with earth and with water, and be capable of uniting with both or either of them, whether they be ſeparate or mixed together: and accordingly this property characteriſes all ſalts or ſaline ſubſtances in general.

Water being volatile, and earth fixed, ſalts in general are leſs volatile than the former, and leſs fixed than the latter; that is, fire, which cannot volatilize and carry off pure earth, is capable of rarefying and volatilizing a ſaline ſubſtance; but then this requires a greater degree of heat than is neceſſary for producing the ſame effects on pure water.

There are ſeveral ſorts of ſalts, differing from one another in reſpect either of the quantity or the quality of the earth in their compoſition ; or, laſtly, they differ on account of ſome additional principles, which not being combined with them in ſufficient quantity to hinder their ſaline properties from appearing, permit them to retain the name of ſalts, though they render them very different from the ſimpleſt ſaline ſubſtances.

It is eaſy to infer from what has been ſaid of ſalts in general, that ſome of them muſt be more, ſome leſs, fixed or volatile than others, and ſome more, ſome leſs, diſpoſed to unite with water, with earth, or with particular ſorts of earth, according to the nature or the proportion of their principles.

Before we proceed further, it is proper juſt to mention the principal reaſons which induce us to think that every ſaline ſubſtance is actually a combination of earth and water, as we ſuppoſed at our entering on this ſubject. The firſt is, the conformity ſalts have with earth and water, or the properties they poſſeſs in common with both. Of theſe properties we ſhall treat fully, as occaſion offers to conſider them, in examining the ſeveral ſorts of ſalts. The ſecond is, that all ſalts may be actually reſolved into earth and water by ſundry proceſſes ; particularly by repeated diſſolution in water, evaporation, deſiccation, and calcination. Indeed the chemiſts have not yet been able to produce a ſaline ſubſtance by combining earth and water together. This favours a ſuſpicion, that beſides theſe two there is ſome other principle in the compoſition of ſalts which eſcapes our reſearches, becauſe we cannot preſerve it when we decompoſe them : but it is ſufficient to our purpoſe, that water and earth are demonſtrably amongſt the real principles of ſaline ſubſtances, and that no experiment hath ever ſhewn us any other.

Of Acids.

The ſimpleſt ſaline ſubſtance is that called an *acid*, on account of its taſte, which is like that of verjuice, ſorrel, vinegar, and other ſour things, which for the ſame reaſon are alſo called acids. By this peculiar taſte are acids chiefly known. They have moreover the property of turning all the blue and violet colours of vegetables red, which diſtinguiſhes them from all other ſalts.

The form under which acids moſt commonly appear, is that of a tranſparent liquor ; though ſolidity is rather their natural ſtate. This is owing to their affinity with water ; which is ſo great, that, when they contain but juſt as much of it as is neceſſary to conſtitute them ſalts, and conſequently have a ſolid form, they rapidly unite therewith the moment they come into contact with it : and as the air is always loaded with moiſture and aqueous vapours, its contact alone is ſufficient to liquify them ; becauſe they unite with its humidity, imbibe it greedily, and by that means become fluid. We therefore ſay, they attract the moiſture of the air. This change of a ſalt from a ſolid to a fluid ſtate, by the ſole contact of the air, is alſo called *deliquium ;* ſo that when a ſalt changes in this manner from a ſolid into a fluid form, it is ſaid to run *per deliquium.* Acids being the ſimpleſt ſpecies of ſaline bodies, their affinities with different ſubſtances are ſtronger than thoſe of any other ſort of ſalt with the ſame ſubſtances ; which is agreeable to our fourth propoſition concerning affinities.

Acids in general have a great affinity with earths : that with which they moſt readily unite is the unvitrifiable earth to which we gave the name of abſorbent earth. They ſeem not to act at all upon vitrifiable earths, ſuch as ſand ; nor yet upon ſome other kinds of earths, at leaſt while they are in their natural ſtate. Yet the nature of theſe earths may be in ſome meaſure changed, by making them red hot in the fire, and then quenching them ſuddenly in cold water : for by repeating this often they are brought nearer to the nature of abſorbent earths, and rendered capable of uniting with acids.

When an acid liquor is mixed with an abſorbent earth, for inſtance with chalk, theſe two ſubſtances inſtantly ruſh into union with ſo much impetuoſity, that a great ebullition is immediately produced, attended with conſiderable hiſſing, heat, and vapours, which riſe the very inſtant of their conjunction.

From the combination of an acid with an abſorbent earth there ariſes a new compound, which ſome chemiſts have called *ſal ſalſum ;* becauſe the acid by uniting with the earth loſes its ſour taſte, and acquires another not unlike that of the common ſea-ſalt uſed in our kitchens ; yet varying according to the different ſorts of acids and earths combined together. The acid at the ſame time loſes its property of turning blue or violet vegetables red.

If we inquire what is become of its propenſity to unite with water, we ſhall find that the earth, which of itſelf is not ſoluble in water, hath by its union with the acid acquired a facility of diſſolving therein ; ſo that our *ſal ſalſum* is ſoluble in water. But, on the other hand, the acid hath, by its union with the earth, loſt part of the affinity it had with water ; ſo that if a *ſal ſalſum* be dried, and freed of all ſuperfluous humidity, it will remain in that dry ſolid form, inſtead of attracting the moiſture of the air and running *per deliquium,* as the acid would do if it were pure and unmixed with earth

Acids have likewiſe a great affinity with the phlogiſton. When we come to treat of each acid in particular, we ſhall examine the combinations of each with the phlogiſton : they differ ſo widely from one another, and many of them are ſo little known, that we cannot at preſent give any general idea of them.

Of Alkalis.

Alkalis are ſaline combinations in which there is a greater proportion of earth than in acids. The principal arguments that may be adduced to prove this fact are theſe : Firſt, if they be treated in the manner propoſed above for analyſing ſaline ſubſtances, we obtain from them a much greater quantity of earth than we do from acids. Secondly ; by combining certain acids with certain earths we can produce alkalis ; or at leaſt ſuch ſaline compounds as greatly reſemble ahem. Our third and laſt argument is drawn from the properties of thoſe alkalis which, when pure and unadulterated with any other principle, have leſs affinity with water than acids have, and are alſo more fixed, reſiſting the utmoſt force of fire. On this account it is that they have obtained the title of *fixed,* as well as to diſtinguiſh them from another ſpecies of alkali, to be conſidered hereafter, which is impure and volatile.

Though fixed alkalis, when dry, ſuſtain the utmoſt violence of fire without flying off in vapours, it is remarkable that, being boiled with water in an open veſſel, conſiderable quantities of them riſe with the ſteam; an effect which muſt be attributed to the great affinity between theſe two ſubſtances, by means whereof water communicates ſome part of its volatility to the fixed ſalt.

Alkalis freed of their ſuperfluous humidity by calcination attract the moiſture of the air, but not ſo ſtrongly as acids: ſo that it is eaſier to procure and preſerve them in a ſolid form.

They flow in the fire, and are then capable of uniting with vitrifiable earths, and of forming therewith true glaſs; which, however, will partake of their properties, if they be uſed in ſufficient quantity.

As they melt more readily than vitrifiable earth, they facilitate its fuſion; ſo that a weaker fire will reduce it to glaſs when a fixed alkali is joined with it, than will melt it without that addition.

Alkalis are known by their taſte, which is acrid and fiery; and by the properties they poſſeſs of turning blue or violet vegetables green; particularly ſyrup of violets.

Their affinity with acids is greater than that of abſorbent earths; hence, if an alkali be preſented to a combination of an acid wirh an abſorbent earth, the earth will be ſeparated from the acid by the alkali, and a new union between the acid and the alkali will take place. This is both an inſtance and a proof of our fifth propoſition concerning affinities.

If a pure alkali be preſented to a pure acid, they ruſh together with violence, and produce the ſame phenomena as were obſerved in the union of an abſorbent earth with an acid, but in a greater and more remarkable degree.

Fixed alkalis may in general be divided into two ſorts: one of theſe hath all the above recited properties; but the other poſſeſſes ſome that are peculiar to itſelf. We ſhall conſider this latter ſort more particularly under the head of ſea-ſalt.

Of NEUTRAL SALTS.

THE acid and the alkali thus uniting, mutually rob each other of their characteriſtic properties; ſo that the compound reſulting from their union produces no change in the blue colours of vegetables, and has a taſte which is neither ſour nor acrid, but ſaltiſh. A ſaline combination of this kind is for that reaſon named *ſal ſalſum*, *ſal medium*, or a *neutral ſalt*.

It muſt be obſerved, that in order to make theſe ſalts perfectly neutral, it is neceſſary that neither of the two ſaline principles of which they are compounded be predominant over the other; for in that caſe they will have the properties of the prevailing principle. The reaſon is this: neither of theſe ſaline ſubſtances can unite with the other but in a limited proportion beyond which there can be no further coalition between them The action by which this perfect union is accompliſhed is termed *ſaturation*; and the inſtant when ſuch proportions of the two ſaline ſubſtances are mixed together, that the one is incorporated with as much of the other as it can poſſibly take up, is called the *point of ſaturation*.

The point of ſaturation is known to be obtained, when, after repeated affuſions of an acid in ſmall quantities to an alkali, or an abſorbent earth, we find thoſe phenomena ceaſe, which in ſuch caſes conſtantly attend the conflict of union, namely, ebullition, hiſſing, *&c.* and we may be aſſured the ſaturation is complete when the new compound hath neither an acid nor an acrid taſte, nor in the leaſt changes the blue colours of vegetables.

Neutral ſalts have not ſo great an affinity with water as either acids or alkalis have, becauſe they are more compounded; for we obſerved before, that the affinities of the moſt compounded bodies are generally weaker than thoſe of the moſt ſimple. In conſequence hereof few natural ſalts, when dried, attract the moiſture of the air; and thoſe that do, attract it more ſlowly and in leſs quantity than either acids or alkalis do.

All neutral ſalts are ſoluble it water; but more or leſs readily, and in a greater or ſmaller quantity, according to the nature of their component principles.

Water made boiling hot diſſolves a greater quantity of thoſe ſalts which do not attract the moiſture of the air, than when it is cold; and indeed it muſt be boiling hot to take up as much of them as it is capable of diſſolving: but as for thoſe which run in the air, the difference is imperceptible.

Some neutral ſalts have the property of ſhooting into cryſtals, and others have it not.

The nature of cryſtallization is this: Water cannot diſſolve, nor keep in ſolution, more than a determinate quantity of any particular ſalt; when therefore ſuch a quantity of water is evaporated from the ſolution of a ſalt capable of cryſtallization, that the remainder contains juſt as much ſalt as it can diſſolve, then by continuing the evaporation the ſalt gradually recovers its ſolid form, and concretes into ſeveral little tranſparent maſſes called cryſtals. Theſe cryſtals have regular figures, all differing from one another according to the ſpecies of ſalt of which they are formed. Different methods of evaporating ſaline ſolutions have different effects on the figure and regularity of the cryſtals; and each particular ſort of ſalt requires a peculiar method of evaporation to make its cryſtals perfectly regular.

A ſolution of ſalt deſigned for cryſtallization is uſually evaporated by means of fire to a pellicle; that is, till the ſalt begin to concrete; which is perceived by a kind of thin dark ſkin that gathers on the ſurface of the liquor, and is formed of the cryſtallized particles of ſalt. When this pellicle appears, the ſolution is ſuffered to cool, and the cryſtals form therein faſter or ſlower according to the ſort of ſalt in hand. If the evaporation be carried on briſkly to perfect drineſs, no cryſtals will be formed, and only an irregular maſs of ſalt will be obtained.

The reaſons why no cryſtals appear when the evaporation is haſtily performed, and carried on to drineſs, are, firſt, that the particles of ſalt, being always in motion while the ſolution is hot, have not time to exert their mutual affinities, and to unite together as cryſtallization requires: ſecondly, that a certain quantity of water enters into the very compoſition of cryſtals; which is therefore abſolutely neceſſary to their formation, and in a greater or ſmaller proportion according to the nature of the ſalt.

If theſe cryſtalized ſalts be expoſed to the fire, they firſt part with that moiſture which is not neceſſary to a ſaline concretion, and which they retained only by means of their cryſtallization: afterwards they begin to flow, but with different degrees of fuſibility.

It muſt be obſerved, that certain ſalts melt as ſoon as they are expoſed to the fire; namely, thoſe which retain a great deal of water in cryſtallizing. But this fluor which they ſo readily acquire muſt be carefully diſtinguiſhed from actual fuſion; for it is owing only to their ſuperfluous humidity, which heat renders capable of diſſolving and liquifying them; ſo that when it is evaporated, the ſalt ceaſes to be fluid, and requires a much greater degree of fire to bring it into real fuſion.

The neutral ſalts that do not cryſtallize may indeed be dried by evaporating the water which keeps them fluid; but by becoming ſolid they acquire no regular form; they again attract the moiſture of the air, and are thereby melted into a liquor. Theſe may be called *liqueſcent ſalts*.

Moſt of the neutral ſalts, that conſiſt of an acid joined with a fixed alkali, or with an abſorbent earth, are themſelves fixed and reſiſt the force of fire; yet ſeveral of them, if they be diſſolved in water, and the ſolution boiled and evaporated, flie off along with the ſteams.

Of the ſeveral Sorts of Saline Subſtances.

1. *Of the* Universal, *or* Vitriolic Acid.

The univerſal acid is ſo called, becauſe it is in fact the acid which is moſt univerſally diffuſed through all nature, in waters, in the atmoſphere, and in the bowels of the earth. But it is ſeldom pure; being almoſt always combined with ſome other ſubſtance. That from which we obtain it, with moſt eaſe, and in the greateſt quantity, is vitriol; and this is the reaſon why it is called the *vitriolic acid*; the name by which it is beſt known.

When the vitriolic acid contains but little phlegm, yet enough to give it a fluid form, it is called *oil of vitriol*; on account of a certain unctuoſity belonging to it.

If the vitriolic acid contain much water, it is then called *ſpirit of vitriol*. When it does not contain enough to render it fluid, and ſo is in a ſolid form, it is named the *icy oil of vitriol*.

When oil of vitriol, highly concentrated, is mixed with water, they ruſh into union with ſuch an impetuoſity, that, the moment they touch each other, there ariſes a hiſſing noiſe, like that of red-hot iron plunged in cold water, together with a very conſiderable degree of heat proportioned to the degree in which the acid was concentrated.

If inſtead of mixing this concentrated acid with water, you only leave it expoſed to the air for ſome time, it attracts the moiſture thereof, and imbibes it moſt greedily. Both its bulk and its weight are increaſed by this acceſſion; and if it be under an icy form, that is, if it be concreted, the phlegm thus acquired will ſoon reſolve it into fluid.

The addition of water renders the vitriolic acid, and indeed all other acids, weaker in one ſenſe; which is, that when they are very aqueous, they leave on the tongue a much fainter taſte of acidity, and are leſs active in the ſolution of ſome particular bodies: But that occaſions no change in the ſtrength of their affinities, but in ſome caſes rather enables them to diſſolve ſeveral ſubſtances which, when well dephlegmated, they are not capable of attacking.

The vitriolic acid combined to the point of ſaturation with a particular abſorbent earth, well known, forms a neutral ſalt that cryſtallizes. This ſalt is called *alum*, and the figure of its cryſtals is that of an octahedron or ſolid of eight ſides. Theſe octahedra are triangular pyramids, the angles of which are ſo cut off that four of the ſurfaces are hexagons, and the other four triangles.

There are ſeveral ſorts of alum, which differ according to the earths combined with the vitriolic acid. Alum diſſolves eaſily in water, and in cryſtallization retains a conſiderable quantity of it; which is the reaſon that being expoſed to the fire it readily melts, ſwelling and puffing up as its ſuperfluous moiſture exhales. When that is quite evaporated, the remainder is called *burnt alum*, and is very difficult to fuſe. The acid of the alum is partly diſſipated by this calcination. Its taſte is ſaltiſh, with a degree of roughneſs and aſtringency.

The vitriolic acid combined with certain earths forms a kind of neutral ſalt called *ſelenites*, which cryſtallizes in different forms according to the nature of its earth. There are numberleſs ſprings of water infected with diſſolved ſelenites; but when this ſalt is once cryſtallized, it is exceeding difficult to diſſolve it in water a ſecond time. For that purpoſe a very great quantity of water is neceſſary, and moreover it muſt boil; for, as it cools, moſt of the diſſolved ſelenites takes a ſolid form, and falls in a powder to the bottom of the veſſel.

If an alkali be preſented to the ſelenites, or to alum, theſe ſalts will be thereby decompoſed; that is, the acid will quit the earths, and join the alkali, with which it hath a greater affinity. And from this conjunction of the vitriolic acid with a fixed alkali there reſults another ſort of neutral ſalt, which is called *arcanum duplicatum*, *ſal de duobus*, and *vitriolated tartar*, becauſe one of the fixed alcalis moſt in uſe is called *ſalt of tartar*.

Vitriolated tartar is almoſt as hard to diſſolve in water as the ſelenites. It ſhoots into eight-ſided cryſtals, having the apices of the pyramids pretty obtuſe. Its taſte is ſaltiſh, inclining to bitter; and it decrepitates on burning coals. It requires a very great degree of fire to make it flow.

The vitriolic acid is capable of uniting with the phlogiſton, or rather it has a greater affinity with it than with any other body: whence it follows, that all compounds of which it makes a part may be decompoſed by means of the phlogiſton.

From the conjunction of the vitriolic acid with the phlogiſton ariſes a compound called *mineral ſulphur*, becauſe it is found perfectly formed in the bowels of the earth. It is alſo called *ſulphur vivum*, or ſimply *ſulphur*.

Sulphur is abſolutely inſoluble in water, and incapable of contracting any ſort of union with it. It melts with a very moderate degree of heat, and ſublimes in fine light downy tufts called *flowers of ſulphur*. By being thus ſublimed it ſuffers no decompoſition, let the operation be repeated ever ſo often; ſo that ſublimed ſulphur, or flower of ſulphur, hath exactly the ſame properties as ſulphur that has never been ſublimed.

If ſulphur be expoſed to a briſk heat in the open air, in takes fire, burns, and is wholly conſumed. This deflagration of ſulphur is the only means we have of decompoſing it, in order to obtain its acid in purity. The phlogiſton is deſtroyed by the flame, and the acid exhales in vapours; theſe vapours collected have all the properties of the vitriolic acid, and differ from it only as they ſtill retain ſome portion of the phlogiſton; which, however, ſoon quits them of its own accord, if the free acceſs of the common air be not precluded.

The portion of phlogiſton retained by the acid of ſulphur is much more conſiderable when that mineral is burnt gradually and ſlowly: in that caſe the vapours which riſe from it have ſuch a penetrating odour, that they inſtantaneouſly ſuffocate any perſon who draws in a certain quantity of them with his breath. Theſe vapours conſtitute what is called the *volatile ſpirit of ſulphur*. There is reaſon to think this portion of phlogiſton which the acid retains is combined therewith in a manner different from that in which theſe two are united in the ſulphur itſelf; for nothing but actual burning is capable of ſeparating the vitriolic acid and the phlogiſton, which by their union form ſulphur; whereas in the volatile ſpirit of ſulphur they ſeparate ſpontaneouſly when expoſed to the open air; that is, the phlogiſton flies off and leaves the acid, which then becomes in every reſpect ſimilar to the vitriolic acid.

That the volatile ſpirit of ſulphur is a compound, appears evidently from hence, that whenever the vitriolic acid touches any ſubſtance containing the phlogiſton, provided that phlogiſton be diſengaged or opened to a certain degree, a volatile ſpirit of ſulphur is infallibly and immediately generated. This ſpirit hath all the properties of acids, but conſiderably weakened, and of courſe leſs perceptible. It unites with abſorbent earths or fixed alkalis; and with them forms neutral ſalts: but when combined therewith it may be ſeparated from them by the vitriolic acid, and indeed by any of the mineral acids, becauſe its affinities are weaker. Sulphur hath the property of uniting with abſorbent earths, but not near ſo intimately as with fixed alkalis.

If equal parts of ſulphur and an alkali be melted together, they incorporate with each other; and from their conjunction proceeds a compound of a moſt unpleaſant ſmell, much like that of rotten eggs, and of a red colour nearly reſembling that of an animal liver, which has occaſioned it to bear the name of *hepar ſulphuris*, or *liver of ſulphur*.

In this compoſition the fixed alkali communicates to the ſulphur the property of diſſolving in water: and hence it comes that liver of ſulphur may be made as well when the alkali is diſſolved by water into a fluid, as when it is fuſed by the action of fire.

Sulphur has leſs affinity than any acid with the fixed alkalis: and therefore liver of ſulphur may be decompounded by any acid whatever; which will unite with the fixed alkali, form therewith a neutral ſalt, and ſeparate the ſulphur.

If liver of ſulphur be diſſolved in water, and an acid poured thereon, the liquor, which was tranſparent before, inſtantly turns to an opaque white; becauſe the ſulphur, being forced to quit its union with the alkali, loſes at the ſame time the property of diſſolving in water, and appears again in its own opaque form. The liquor thus made white by the ſulphur is called *milk of ſulphur*.

If this liquor be ſuffered to ſtand ſtill for ſome time, the particles of ſulphur, now moſt minutely divided, gradually approach each other, unite, and fall inſenſibly to the bottom of the veſſel; and then the liquor recovers its tranſparency. The ſulphur thus depoſited on the bottom of the veſſel is called the *magiſtery* or *precipitate ſulphur*. The names of magiſtery and precipitate are alſo given to all ſubſtances whatever that are ſeparated from another by this method; which is the reaſon that we uſe the expreſſion of precipitating one ſubſtance by another, to ſignify the ſeparating one of them by means of the other.

3. *Of the* NITROUS ACID.

The nitrous acid combined with certain abſorbent earths, ſuch as chalk, marle, boles, forms neutral ſalts which do not cryſtallize; and which, after being dried, run in the air *per deliquium*.

All thoſe neutral ſalts which conſiſt of the nitrous acid joined to an earth, may be decompoſed by a fixed alkali, with which the acid unites, and deſerts the earth; and from this union of the nitrous acid with a fixed alkali reſults a new neutral ſalt, which is called *nitre*, or *ſalt-petre*. This latter name ſignifies the *ſalt of ſtone*; and in fact, nitre is extracted from the ſtones and plaiſter, in which it forms, by boiling them in water ſaturated with a fixed alkali.

Nitre ſhoots in long cryſtals adhering ſideways to each other; it has a ſaltiſh taſte, which produces a ſenſation of cold on the tongue.

This ſalt eaſily diſſolves in water; which, when it boils, takes up ſtill a greater quantity thereof.

It flows with a pretty moderate degree of heat, and continues fixed therein: but being urged by a briſk fire, and in the open air, it lets go ſome part of its acid, and indeed flies off itſelf in part.

The moſt remarkable property of nitre, and that which characterizes it, is its fulmination or exploſion; the nature of which is as follows:

When nitre touches any ſubſtance containing a phlogiſton, and actually ignited, that is, red hot, it burſts out into a flame, burns, and is decompounded with much noiſe.

In this deflagration the acid is diſſipated, and totally ſeparated from the alkali, which now remains by itſelf.

Indeed the acid, at leaſt the greateſt part of it, is by this means quite deſtroyed. The alkali which is left when nitre is decompounded by deflagration, is called in general *fixed nitre*, and, more particluarly, nitre fixed by ſuch and ſuch a ſubſtance as was uſed in the operation. But if nitre be deflagrated with an inflammable ſubſtance containing the vitriolic acid, as ſulphur, for inſtance, the fixed ſalt produced by the deflagration is not a pure alkali, but retains a good deal of the vitriolic acid, and, by combining therewith, hath now formed a neutral ſalt.

The reaſon why nitre flames, and is decompounded in the manner above mentioned, when it comes in contact with a phlogiſton properly circumſtanced, is, that the nitrous acid, having a greater affinity with the phlogiſton than with the fixed alkali, naturally quits the latter to join with the former, and ſo produces a kind of ſulphur, differing probably from the common ſulphur, formed by the vitriolic acid, in that it is combuſtible to ſuch a degree, as to take fire and be conſumed in the very moment of its production; ſo that it is impoſſible to prevent its being thus deſtroyed, and conſequently impoſſible to ſave it. In ſupport of this opinion let it be conſidered, that the concurrence of the phlogiſton is abſolutely neceſſary to produce this deflagration, and that the matter of pure fire is altogether incapable of effecting it: for though nitre be expoſed to the moſt violent degree of fire, even that in the focus of the moſt powerful burning-glaſs, it will not flame; nor will that effect ever happen till the nitre be brought into contact with a phlogiſton properly ſo called, that is, the matter of fire exiſting as a principle of ſome body; and it is moreover neceſſary that this phlogiſton be actually on fire, and agitated with the igneous motion, or elſe, that the nitre itſelf be red-hot, and ſo penetrated with fire as to kindle any inflammable matter that touches it.

This experiment, among others, helps to ſhew the diſtinction that ought to be made between pure elementary fire, and fire become a principle of bodies to which we have given the name of phlogiſton.

Before we leave this ſubject, we ſhall obſerve, that nitre deflagrates only with ſuch ſubſtances as contain the phlogiſton in its ſimpleſt and pureſt form; ſuch as charcoal, ſulphur, and the metalline ſubſtances; and that, though it will not deflagrate without the addition of ſome combuſtible matter, it is nevertheleſs the only known body that will burn, and make other combuſtibles burn with it, in cloſe veſſels, without the admiſſion of freſh air.

The nitrous acid hath not ſo great an affinity with earths and alkalis as the vitriolic acid hath; whence it follows, that the vitriolic acid decompoſes all neutral ſalts ariſing from a combination of the nitrous acid with an earth or an alkali. The vitriolic acid expells the nitrous acid, unites with the ſubſtance which ſerved it for a baſis, and therewith forms a neutral ſalt, which is an alum, a ſelenites, or a vitriolated tartar, according to the nature of that baſis.

The nitrous acid, when thus ſeparated from its baſis by the vitriolic acid, is named *ſpirit of nitre*, or *aqua fortis*. If it be dephlegmated, or contain but little ſuperfluous water, it exhales in reddiſh vapours; theſe vapours being condenſed and collected, form a liquor of a browniſh yellow, that inceſſantly emits vapours of the ſame colour, and of a pungent diſagreeable ſmell. Theſe characters have procured it the names of *ſmoking ſpirit of nitre*, and *yellow aqua fortis*. This property in the nitrous acid of exhaling in vapours, ſhews it to be leſs fixed than the vitriolic acid; for the latter, though ever ſo thoroughly dephlegmated, never yields any vapours, nor has it any ſmell.

3. *Of the* ACID *of* SEA-SALT.

THE acid of ſea-ſalt is ſo called, becauſe it is in fact obtained from ſuch ſea-ſalt as is uſed in our kitchens. It is not certainly known in what this acid differs from the vitriolic and the nitrous, with regard to its conſtituent parts.

When it is combined with abſorbent earths, ſuch as lime and chalk, it forms a neutral ſalt that does not cryſtallize; and, when dried, attracts the moiſture of the air. If the abſorbent earth be not fully ſaturated with the marine acid, the ſalt thereby formed has the properties of a fixed alkali: And this is what made us ſay, when we were on the ſubject of thoſe ſalts, that they might be imitated by combining an earth with an acid. The marine acid, like the reſt, hath not ſo great an affinity with earths as with fixed alkalis.

When it is combined with the latter, it forms a neutral ſalt which ſhoots into cubical cryſtals. This ſalt is inclined to grow moiſt in the air, and is conſequently one of thoſe which water diſſolves in equal quantities, at leaſt as to ſenſe, whether it be boiling hot or quite cold.

The affinity of this acid with alkalis and abſorbent earths is not ſo great as that of the vitriolic and nitrous acids: Whence it follows, that, when combined therewith, it may be ſeparated from them by either of thoſe acids.

The acid of ſea-ſalt, thus diſengaged from the ſubſtance which ſerved it for a baſis, is called *ſpirit of ſalt*. When it contains but little phlegm, it is of a lemon colour, and continually emits many white, very denſe, and very elaſtic vapours; on which account it is named the *ſmoking or volatile ſpirit of ſalt*. Its ſmell is not diſagreeable, nor much unlike that of ſaffron; but extremely quick and ſuffocating when it ſmokes.

The acid of ſea-ſalt, like the other two, ſeems to have a greater affinity with the phlogiſton, than with fixed alkalis. We are led to this opinion by a very curious operation, which gives ground to think, that ſea-ſalt may be decompoſed by the proper application of a ſubſtance containing the phlogiſton.

From the marine acid, combined with a phlogiſton, reſults a kind of ſulphur, differing from the common ſort in many reſpects; but particularly in this property, that it takes fire of itſelf upon being expoſed to the open air. This combination is called *Engliſh phoſphorus*, *phoſphorus of urine*, becauſe it is generally prepared from urine, or only *phoſphorus*.

This combination of the marine acid with a phlogiſton is not eaſily effected; becauſe it requires a difficult operation in appropriated veſſels. For theſe reaſons it does not always ſucceed; and phoſphorus is ſo ſcarce and dear, that hitherto chemiſts have not been able to make on it the experiments neceſſary to diſcover all its properties. If phoſphorus be ſuffered to burn away in the air, a ſmall quantity of an acid liquor may be obtained from it, which ſeems to be ſpirit of ſalt, but either altered, or combined with ſome adventitious matter; for it has ſeveral properties that are not to be found in the pure marine acid; ſuch as, leaving a fixed fuſible ſubſtance behind it when expoſed to a ſtrong fire, and being eaſily combined with the phlogiſton ſo as to reproduce a phoſphorus.

Phoſphorus reſembles ſulphur in ſeveral of its properties: It is ſoluble in oils; it melts with a gentle heat; it is very combuſtible; it burns without producing ſoot; and its flame is vivid and bluiſh.

From what has been ſaid of the union of the acid of ſea-ſalt with a fixed alkali, and of the neutral ſalt reſulting therefrom, it may be concluded, that this neutral ſalt is no other than the common kitchen-ſalt. But it muſt be obſerved, that the fixed alkali, which is the natural baſis of the common ſalt obtained from ſea-water, is of a ſort ſomewhat differing from fixed alkalis in general, and hath certain properties peculiar to itſelf. For,

1. The baſis of ſea-ſalt differs from other fixed alkalis in this, that it cryſtallizes like a neutral ſalt.

2. It does not grow moiſt in the air: On the contrary, when expoſed to the air, it loſes part of the water that united with it in cryſtallization, by which means its cryſtals loſe their tranſparency, become as it were mealy, and fall into a fine flour.

3. When combined with the vitriolic acid to the point of ſaturation, it forms a neutral ſalt differing from vitriolated tartar, firſt, in the figure of its cryſtals, which are oblong ſix-ſided ſolids; ſecondly, in its quantity of water, which in cryſtallization unites therewith in a much greater proportion than with vitriolated tartar; whence it follows, that this ſalt diſſolves in water more readily than vitriolated tartar; thirdly, in that it flows with a very moderate degree of heat, whereas vitriolated tartar requires a very fierce one.

If the acid of ſea-ſalt be ſeparated from its baſis by means of the vitriolic acid, it is eaſy to ſee, that, when the operation is finiſhed, the ſalt we have been ſpeaking of muſt be the reſult. A famous chemiſt, named Glauber, was the firſt who extracted the ſpirit of ſalt in this manner, examined the neutral ſalt reſulting from his proceſs, and finding it to have ſome ſingular properties, called it his *ſal mirabile*, or wonderful ſalt: On this account it is ſtill called Glauber's *ſal mirabile*, or *Glauber's ſalt*.

4. When the baſis of the ſea-ſalt is combined with the nitrous acid to the point of ſaturation, there reſults a neutral ſalt, or a ſort of nitre, differing from the common nitre, firſt, in that it attracts the moiſture of the air pretty ſtrongly; and this makes it difficult to cryſtallize: ſecondly, in the figure of its cryſtals, which are parallelopipeds; and this has procured it the name of *quadrangular nitre*.

Common ſalt, or the neutral ſalt formed by combining the marine acid with this particular ſort of fixed alkali, has a taſte well known to every body. The figure of its cryſtals is exactly cubical. It grows moiſt in the air, and, when expoſed to the fire, it burſts, before it melts, into many little fragments, with a crackling noiſe; which is called the *decrepitation* of ſea-ſalt.

That neutral ſalt mentioned above, which is formed by combining the marine acid with a common fixed alkali, and called *ſal febrifugum ſylvii*, hath alſo this property.

India furniſhes us with a ſaline ſubſtance, known by the name of *borax*, which flows very eaſily, and then takes the form of glaſs. It is of great uſe in facilitating the fuſion of metallic ſubſtances. It poſſeſſes ſome of the properties of fixed alkalis, which has induced certain chemiſts to repreſent it, through miſtake, as a pure fixed alkali.

By mixing borax with the vitriolic acid, Mr Homberg obtained from it a ſalt, which ſublimes in a certain degree of heat, whenever ſuch a mixture is made. This ſalt has very ſingular properties; but its nature is not yet thoroughly underſtood. It diſſolves in water with great difficulty; it is not volatile, though it riſes by ſublimation from the borax. According to Mr Rouelle's obſervation, it riſes then only by means of the water which carries it up; for when once made, it abides the fierceſt fire, flows and vitrifies juſt as borax does, provided care be taken to free it previouſly from moiſture by drying it properly. Mr Homberg called it *ſedative ſalt*, on account of its medical effects. The ſedative ſalt hath the appearance, and ſome of the properties, of a neutral ſalt; for it ſhoots into cryſtals, and does not change the colour of violets: but it acts the part of an acid with regard to alkalis, uniting with them to the point of ſaturation, and thereby forming a true neutral ſalt. It alſo acts, like the acid of vitriol, on all neutral ſalts; that is, it diſcharges the acid of ſuch as have not the vitriolic acid in their compoſition.

Since Mr Homberg's time it hath been diſcovered, that a ſedative ſalt may be made either with the nitrous or with the marine acid; and that ſublimation is not neceſſary to extract it from the borax, but that it may be obtained by cryſtallization only. For this latter diſcovery we are indebted to Mr Geoffroy, as we are to Mr Lemery for the former.

Since that time M. Baron d'Henouville, an able chemiſt, hath ſhewn that a ſedative ſalt may be obtained by the means of vegetable acids; and hath lately demonſtrated, that the ſedative ſalt exiſts actually and perfectly in the borax, and that it is not produced by mixing acids with that ſaline ſubſtance, as it ſeems all the chemiſts before him imagined. This he proves convincingly from his analyſis of borax, (which thereby appears to be nothing elſe but the ſedative ſalt united with that fixed alkali which is the baſis of ſea-ſalt) and from his regenerating the ſame borax by uniting together that alkali and the ſedative ſalt: a proof the moſt complete that can poſſibly be produced in natural philoſophy, and equivalent to demonſtration itſelf.

In order to finiſh what remains to be ſaid upon the ſeveral ſorts of ſaline ſubſtances, we ſhould now ſpeak of the acids obtained from vegetables and animals, and alſo of the volatile alkalis; but, ſeeing theſe ſaline ſubſtances differ from thoſe of which we have already treated, only as they are variouſly altered by the union they have contracted with certain principles of vegetables and animals, of which nothing has been yet ſaid, it is proper to defer being particular concerning them, till we have explained thoſe principles.

Of LIME.

ANY ſubſtance whatever, that has been roaſted a conſiderable time in a ſtrong fire without melting, is commonly called a *calx*. Stones and metals are the principal ſubjects that have the property of being converted into *calces*. We ſhall treat of metalline *calces* in a ſubſequent chapter, and in this confine ourſelves to the *calx* of *ſtone*, known by the name of *lime*.

In treating of earths in general, we obſerved that they may be divided into two principal kinds; one of which actually and properly flows when expoſed to the action of fire, and turns to glaſs; whence it is called a *fuſible* or *vitrifiable* earth; the other reſiſts the utmoſt force of fire, and is therefore ſaid to be an *unfuſible* or *unvitrifiable* earth. The latter is alſo not uncommonly called *calcinable* earth; though ſundry ſorts of unfuſible earths are incapable of acquiring by the action of fire all the qualities of *calcined* earth, or *lime* properly ſo called: ſuch earths are particularly diſtinguiſhed by the denomination of *refractory* earths.

As the different ſorts of ſtones are nothing more than compounds of different earths, they have the ſame properties with the earths of which they are compoſed, and may, like them, be divided into fuſible or vitrifiable, and unfuſible or calcinable. The fuſible ſtones are generally denoted by the name of *flints*; the calcinable ſtones, again, are the ſeveral ſorts of marbles, cretaceous ſtones, thoſe commonly called free-ſtones, *&c.* ſome of which, as they make the beſt lime, are, by way of eminence, called *lime-ſtones*. Sea-ſhells alſo, and ſtones that abound with foſſile ſhells, are capable of being burnt to lime.

All theſe ſubſtances being expoſed for a longer or ſhorter time to the violent action of fire, are ſaid to be *calcined*. By calcination they loſe a conſiderable part of their weight, acquire a white colour, and become friable, though ever ſo ſolid before; as, for inſtance, the very hardeſt marbles. Theſe ſubſtances, when thus calcined, take the name of *quick-lime*.

Water penetrates quick-lime, and ruſhes into it with vaſt activity. If a lump of newly calcined lime be thrown into water, it inſtantly excites almoſt as great a noiſe, ebullition, and ſmoke, as would be produced by a piece of red-hot iron; with ſuch a degree of heat too, that, if the lime be in due proportion to the water, it will ſet fire to combuſtible bodies; as hath unfortunately happened to veſſels laden with quick-lime, on their ſpringing a ſmall leak.

As ſoon as quick-lime is put into water, it ſwells, and falls aſunder into an infinite number of minute particles: in a word, it is in a manner diſſolved by the water, which forms therewith a ſort of white paſte called *ſlacked lime*.

If the quantity of water be conſiderable enough for the lime to form with it a white liquor, this liquor is called *lac calcis*; which, being left ſome time to ſettle, grows clear and tranſparent, the lime which was ſuſpended therein and occaſioned its opacity ſubſiding to the bottom of the veſſel. Then there forms on the ſurface of the liquor a cryſtalline pellicle, ſomewhat opaque and dark coloured, which being ſkimmed off is reproduced from time to time. This matter is called *cremor calcis*.

Slacked lime gradually grows dry, and takes the form of a ſolid body, but full of cracks and deſtitute of firmneſs. The event is different when you mix it up, while yet a paſte, with a certain quantity of uncalcined ſtony matter, ſuch as ſand for example: then it takes the name of *mortar*, and gradually acquires, as it grows drier and older, a hardneſs equal to that of the beſt ſtones. This is a very ſingular property of lime, nor is it eaſy to account for it; but it is a beneficial one, for every body knows the uſe of mortar in building.

Quick-lime attracts the moiſture of the air in the ſame manner as concentrated acids and dry fixed alkalis, but not in ſuch quantities as to render it fluid; it only falls into extremely ſmall particles, takes the form of a fine powder, and the title of *lime ſlacked in the air*.

Lime once ſlacked, however dry it may afterwards appear, always retains a large portion of the water it had imbibed; which cannot be ſeparated from it again but by means of a violent calcination. Being ſo recalcined, it returns to be quick-lime, recovering all its properties.

Beſides this great affinity of quick-lime with water, which diſcovers a ſaline character, it has ſeveral other ſaline properties, to be afterwards examined, much reſembling thoſe of fixed alkalis. In chemiſtry it acts very nearly as thoſe ſalts do, and may be conſidered as holding the middle rank between a pure abſorbent earth and a fixed alkali; and this hath induced many chemiſts to think that lime contains a true ſalt, to which all the properties it poſſeſſes in common with ſalts may be attributed.

But as the chemical examination of this ſubject hath long been neglected, the exiſtence of a ſaline ſubſtance in lime hath been long doubtful. Mr du Fay was one of the firſt who obtained a ſalt from lime, by lixiviating it with a great deal of water, which he afterwards evaporated. But the quantity of ſalt he obtained by that means was very ſmall; nor was it of an alkaline nature, as one would think it ſhould have been, conſidering the properties of lime. Mr du Fay did not carry his experiments on this ſubject any further, probably for want of time; nor did he determine of what nature the ſalt was.

Mr Malouin had the curioſity to examine this ſalt of lime, and ſoon found that it was nothing elſe but what was above called *cremor calcis*. He found moreover, that, by mixing a fixed alkali with lime-water, a vitriolated tartar was formed; that, by mixing therewith an alkali like the baſis of ſea-ſalt, a Glauber's ſalt was produced; and, laſtly, by combining lime with a ſubſtance abounding in phlogiſton, he obtained a true ſulphur. Theſe very ingenious experiments prove to a demonſtration, that the vitriolic acid conſtitutes the ſalt of lime; for, as hath been ſhewn, no other acid is capable of forming ſuch combinations. On the other hand, Mr Malouin, having forced the vitriolic acid of this ſalt to combine with a phlogiſton, found its baſis to be earthy, and analogous to that of the ſelenites: whence he concluded, that the ſalt of lime is a true neutral ſalt, of the ſame kind as the ſelenites. Mr Malouin tells us he found ſeveral other ſalts in lime. But as none of them was a fixed alkali, and as all the ſaline properties of lime have an affinity with thoſe of that kind of ſalt, there is great reaſon to think that all thoſe ſalts are foreign to lime, and that their union with it is merely accidental.

Lime unites with all acids, and in conjunction with them exhibits various phenomena.

The vitriolic acid poured upon lime diſſolves it with effervеſcence and heat. From this mixture there exhales a great quantity of vapours, in ſmell and colour perfectly like thoſe of ſea-ſalt; from which however they are found to be very different when collected into a liquor. From this combination of the vitriolic acid with lime ariſes a neutral ſalt, which ſhoots into cryſtals, and is of the ſame kind with the ſelenitic ſalt obtained from lime by Mr Malouin.

The nitrous acid poured upon lime diſſolves it in like manner with effervеſcence and heat: but the ſolution is tranſparent, and therein differs from the former, which is opaque. From this mixture there ariſes a neutral ſalt, which does not cryſtallize, and has withal the very ſingular property of being volatile, and riſing wholly by diſtillation in a liquid form. This phenomenon is ſo much the more remarkable, as lime, the baſis of this ſalt, is one of the moſt fixed bodies known in chemiſtry.

With the acid of ſea-ſalt lime forms alſo a ſingular ſort of ſalt, which greedily imbibes the moiſture of the air. We ſhall have occaſion to take further notice of it in another place.

Lime applied to fixed alkalis adds conſiderably to their cauſtic quality, and makes them more penetrating and active. An alkaline lixivium in which lime hath been boiled, being evaporated to drineſs, forms a very cauſtic ſubſtance, which flows in the fire much more eaſily, attracts and retains moiſture much more ſtrongly, than fixed alkalis that have not been ſo treated. An alkali thus acuated by lime is called the *cauſtic ſtone*, or *potential cautery*, becauſe it is employed by ſurgeons to produce eſchars on the ſkin and cauterize it.

Of Metallic Subſtances in general.

Metallic ſubſtances are heavy, glittering, opaque, fuſible bodies. They conſiſt chiefly of a vitrifiable earth united with the phlogiſton.

Several chemiſts inſiſt on a third principle in theſe bodies, and have given it the name of *mercurial earth*; which, according to Becher and Stahl, is the very ſame that being combined with the vitriolic acid forms and characteriſes the acid of ſea-ſalt. The exiſtence of this principle hath not yet been demonſtrated by any deciſive experiment; but we ſhall ſhew that there are pretty ſtrong reaſons for admitting it.

We ſhall begin with mentioning the experiments which prove metallic ſubſtances to conſiſt of a vitrifiable earth united with the phlogiſton. The firſt is this: if they be calcined in ſuch a manner as to have no communication with any inflammable matter, they will be ſpoiled of all their properties, and reduced to an earth or calx, that has neither the ſplendour nor the ductility of a metal, and in a ſtrong fire turns to an actual glaſs, inſtead of flowing like a metal.

The ſecond is, that the calx or the glaſs reſulting from a metal thus decompoſed, recovers all its metalline properties by being fuſed in immediate contact with an inflammable ſubſtance, capable of reſtoring the phlogiſton of which calcination had deprived it.

On this occaſion we muſt obſerve, that chemiſts have not yet been able, by adding the phlogiſton, to give the properties of metals to all ſorts of vitrifiable earths indiſcriminately, but to ſuch only as originally made a part of ſome metallic body. For example, a compound cannot be made with the phlogiſton and ſand that ſhall have the leaſt reſemblance of a metal: and this is what ſeems to point out the reality of a third principle as neceſſary to form the metalline combination. This principle may probably remain united with the vitrifiable earth of a metallic ſubſtance, when reduced to a glaſs; whence it follows, that ſuch vitrified metals require only the addition of a phlogiſton to enable them to appear again in their priſtine form.

It may be inferred from another experiment, that the calx and the glaſs of a metal are not its pure vitrifiable earth, properly ſo called: for by repeated or long continued calcinations, ſuch a calx or glaſs may be rendered incapable of ever reſuming the metalline form, in what ever manner the phlogiſton be afterwards applied to it; ſo that by this means it is brought into the condition of a pure vitrifiable earth, abſolutely free from any mixture.

When by adding the phlogiſton to a metallic glaſs, we reſtore it to the form of a metal, we are ſaid to *reduce*, *reſuſcitate*, or *reviviſy* that metal.

Metallic ſubſtances are of different kinds, and are divided into *metals* and *ſemi-metals*.

Thoſe are called metals, which, beſides their metalline ſplendor and appearance, are alſo malleable; that is, have the property of ſtretching under the hammer.

Thoſe which have only the metalline ſplendor and appearance, without malleability, are called ſemi-metals.

Metals alſo are further ſubdivided into two ſorts; *viz. perfect* and *imperfect* metals.

The perfect metals are thoſe which ſuffer no damage or change whatever by the moſt violent and moſt laſting action of fire.

The imperfect metals are thoſe which by the force of fire may be deprived of their phlogiſton, and conſequently of their metalline form.

When a moderate degree of fire only is employed to deprive a metal of its phlogiſton, the metal is ſaid to be *calcined*; and then it appears in the form of a powdered earth, which is called a *calx*; and this metalline calx being expoſed to a more violent degree of fire, melts and turns to glaſs.

Metallic ſubſtances have an affinity with acids; but not equally with all; that is, every metallic ſubſtance is not capable of uniting and joining with every acid.

When an acid unites with a metallic ſubſtance, there commonly ariſes an ebullition, attended with a kind of hiſſing noiſe and fuming exhalations. By degrees, as the union becomes more perfect, the particles of the metal combining with the acid become inviſible: this is termed *diſſolution*; and when a metalline maſs thus diſappears in an acid, the metal is ſaid to be *diſſolved* by that acid. It is proper to obſerve, that acids act upon metalline ſubſtances, in one reſpect, juſt as they do upon alkalis and abſorbent earths: for an acid cannot take up above ſuch a certain proportion thereof as is ſufficient to ſaturate it, to deſtroy ſeveral of its properties, and weaken others. For example, when an acid is combined with a metal to the point of ſaturation, it loſes its taſte, does not turn the blue colour of a vegetable red, and its affinity with water is conſiderably impaired. On the other hand, metalline ſubſtances, which, when pure, are incapable of uniting with water, by being joined with an acid, acquire the property of diſſolving in water. Theſe combinations of metalline ſubſtances with acids form different ſorts of neutral ſalts; ſome of which have the property of ſhooting into cryſtals, while others have it not: moſt of them, when thoroughly dried, attract the moiſture of the air.

The affinity which metalline ſubſtances have with acids is leſs than that which abſorbent earths and fixed alkalis have with the ſame acids; ſo that all metalline ſalts may be decompounded by one of theſe ſubſtances, which will unite with the acid, and precipitate the metal.

Metalline ſubſtances thus ſeparated from an acid ſolvent are called *magiſteries*, and *precipitates* of metals. None of theſe precipitates, except thoſe of the perfect metals, retain the metalline form: moſt of their phlogiſton hath been deſtroyed by the ſolution and precipitation, and muſt be reſtored before they can recover their properties. In ſhort, they are nearly in the ſame ſtate with metalline ſubſtances deprived of their phlogiſton by calcination; and accordingly ſuch a precipitate is called a *calx*.

A metalline calx prepared in this manner loſes a greater or a leſs portion of its phlogiſton, the more or leſs effectually and thoroughly the metalline ſubſtance of which it made a part was diſſolved by the acid.

Metallic ſubſtances have affinities with each other which differ according to their different kinds; but this is not univerſal, for ſome of them are incapable of any ſort of union with ſome others.

It muſt be obſerved, that metallic ſubſtances will not unite, except they be both in a ſimilar ſtate; that is, both in a metalline form, or both in the form of a glaſs; for a metalline ſubſtance, retaining its phlogiſton, cannot contract an union with any metallic glaſs, even its own.

Of METALS.

THERE are ſix metals, of which two are perfect, and four imperfect. The perfect metals are gold and ſilver; the others are copper, tin, lead, and iron. Some chemiſts admit a ſeventh metal, *viz.* quick-ſilver; but, as it is not malleable, it has been generally conſidered as a metallic body of a particular kind.

The ancient chemiſts, or rather the alchemiſts, who fancied a certain relation or analogy between metals and the heavenly bodies, beſtowed on the ſeven metals, reckoning quick-ſilver one of them, the names of the ſeven planets of the ancients, according to the affinity which they imagined they obſerved between thoſe ſeveral bodies. Thus gold was called *Sol*, ſilver *Luna*, copper *Venus*, tin *Jupiter*, lead *Saturn*, iron *Mars*, and quick-ſilver *Mercury*. Though theſe names were aſſigned for reaſons merely chimerical, yet they ſtill keep their ground; ſo that it is not uncommon to find the metals called by the names, and denoted by the characters, of the planets, in the writings even of the beſt chemiſts. Metals are the heavieſt bodies known in nature.

Of GOLD.

GOLD is the heavieſt of all metals. The arts of wire-drawing and gold-beating ſhew its wonderful ductility. The greateſt violence of fire is not able to produce any alteration in it.

Gold cannot be diſſolved by any pure acid: but if the acid of nitre be mixed with the acid of ſea-ſalt, there reſults a compound acid liquor, with which it has ſo great an affinity, that it is capable of being perfectly diſſolved thereby. The chemiſts have called this ſolvent *aqua regis*, on account of its being the only acid that can diſſolve gold, which they conſider as the king of metals. The ſolution of gold is of a beautiful orange colour.

If gold diſſolved in *aqua regis* be precipitated by an alkali or an abſorbent earth, the precipitate gently dried, and then expoſed to a certain degree of heat, is inſtantly diſperſed into the air, with a moſt violent exploſion and noiſe: gold thus precipitated is therefore called *aurum fulminans*. But if the precipitated gold be carefully waſhed in plenty of water, ſo as to clear it of all the adhering ſaline particles, it will not fulminate; but may be melted in a crucible without any additament, and will then appear in its uſual form. The acid of vitriol being poured on *aurum fulminans* likewiſe deprives it of its fulminating quality.

Gold does not begin to flow till it be red-hot like a live coal. Though it be the moſt malleable and moſt ductile of all metals, it has the ſingular property of loſing its ductility more eaſily than any of them: even the fumes of charcoal are ſufficient to deprive it thereof, if they come to contact with it while it is in fuſion.

The malleability of this metal, and indeed of all the reſt, is alſo conſiderably diminiſhed by expoſing it ſuddenly to cold when it is red-hot; for example, by quenching it in water, or even barely expoſing it to the cold air. The way to reſtore ductility to gold, when loſt by its coming in contact with the vapour of coals, and in general to every other metal rendered leſs malleable by being ſuddenly cooled, is to heat it again, to keep them red hot a conſiderable time, and then to let them cool very ſlowly and gradually: this operation frequently repeated will by degrees much increaſe the malleability of a metal.

Pure ſulphur hath no effect on gold; but being combined with an alkali into a *hepar ſulphuris*, it unites therewith very readily. Nay, ſo intimate is their union, that the gold by means thereof becomes ſoluble in water; and this new compound of gold and liver of ſulphur, being diſſolved in water, will paſs through the pores of brown paper without ſuffering any decompoſition; which does not happen, at leaſt in ſuch a manifeſt degree, to other metallic ſubſtances diſſolved by liver of ſulphur.

Aurum fulminans mixed and melted with flour of ſulphur loſes its fulminating quality: which ariſes from hence, that on this occaſion the ſulphur burns, and its acid, which is the ſame with the vitriolic, being thereby ſet at liberty, becomes capable of acting upon the gold as a vitriolic acid would; which, as was ſaid above, deprives the gold of its fulminating quality.

Of SILVER.

NEXT to gold, ſilver is the moſt perfect metal. Like gold, it reſiſts the utmoſt violence of fire, even that in the focus of a burning-glaſs. However, it holds only the ſecond place among metals; becauſe it is lighter than gold by almoſt one half; is alſo ſomewhat leſs ductile; and laſtly, becauſe it is acted upon by a greater number of ſolvents.

Yet ſilver hath one advantage over gold, namely that of being a little harder; which makes it alſo more ſonorous.

This metal, like gold, begins to flow when it is ſo thoroughly penetrated by the fire as to appear ignited like a live coal.

While this metal is in fuſion, the immediate contact of the vapour of burning coals deprives it almoſt entirely of its malleability, in the ſame manner as we obſerved happens to gold: but both theſe metals eaſily recover that property by being melted with nitre.

The nitrous acid is the true ſolvent of ſilver, and being ſomewhat dephlegmated will very readily and eaſily take up a quantity of ſilver equal in weight to itſelf.

Silver thus combined with the nitrous acid forms a metallic ſalt which ſhoots into cryſtals, called by the name of *lunar cryſtals*, or *cryſtals of ſilver*.

Theſe cryſtals are moſt violently cauſtic: applied to the ſkin, they quickly affect it much as a live coal would; they produce a blackiſh eſchar, corroding and entirely deſtroying the parts they touch. Surgeons uſe them to eat away the proud fungous fleſh of ulcers. As ſilver united with the nitrous acid hath the property of blackening all animal ſubſtances, a ſolution of this metallic ſalt is employed to die hair, or other animal matters, of a beautiful and durable black.

Theſe cryſtals flow with a very moderate heat, and even before they grow red. Being thus melted, they form a blackiſh maſs; and in this form they are uſed by ſurgeons, under the title of *lapis infernalis*, *infernal ſtone*, or *ſilver cauſtic*.

Silver is alſo diſſolved by the vitriolic acid: but then the acid muſt be concentrated, and in quantity double the weight of the ſilver: nor will the ſolution ſucceed without a conſiderable degree of heat.

Spirit of ſalt and *aqua regis*, as well as the other acids, are incapable of diſſolving this metal, at leaſt in the ordinary way.

Though ſilver be not ſoluble in the acid of ſea-ſalt, nor eaſily in the acid of vitriol, as hath juſt been obſerved, it doth not follow, that it hath but a weak affinity with the latter, and none at all with the former: on the contrary, it appears from experiment, that it hath with theſe two acids a much greater affinity than with the acid of nitre: which is ſingular enough, conſidering the facility with which this laſt acid diſſolves it.

The experiment which proves the fact is this. To a ſolution of ſilver in the nitrous acid add the acid either of vitriol or of ſea-ſalt, and the ſilver will inſtantly quit its nitrous ſolvent to join with the ſuperadded acid.

Silver thus united with the vitriolic or the marine acid is leſs ſoluble in water than when combined with the nitrous acid; and for this reaſon it is, that when either of theſe two acids is added to a ſolution of ſilver, the liquor immediately becomes white, and a precipitate is formed, which is no other than the ſilver united with the precipitating acid. If the precipitation be effected by the vitriolic acid, the precipitate will diſappear upon adding a ſufficient quantity of water, becauſe there will then be water enough to diſſolve it. But the caſe is not the ſame when the precipitation is made by the marine acid; for ſilver combined therewith is ſcarce ſoluble in water.

This precipitate of ſilver procured by means of the marine acid is very eaſily fuſed, and when fuſed changes to a ſubſtance in ſome meaſure tranſparent and flexible; which hath occaſioned it to be called by the name of *luna cornea*. If it be propoſed to decompound this *luna cornea*, that is, to ſeparate the marine acid from the ſilver with which it is united, the *luna cornea* muſt be melted along with fatty and abſorbent matters, with which the acid will unite, and leave the metal exceeding pure.

It muſt be obſerved, that if, inſtead of the marine acid, ſea-ſalt in ſubſtance be added to a ſolution of ſilver in the nitrous acid, a precipitate is alſo produced, which by fuſion appears to be a true *luna cornea*. The reaſon is, that the ſea-ſalt is decompoſed by the nitrous acid, which ſeizes its baſis, as having a greater affinity therewith than its own acid hath; and this acid being conſequently diſengaged and ſet at liberty unites with the ſilver, which, as has been ſhewn, has greater affinity with it than with the nitrous acid. This is an inſtance of decompoſition effected by means of one of thoſe double affinities mentioned in the ſeventh propoſition concerning affinities.

From what hath been already ſaid it is clear, that all theſe combinations of ſilver with acids may be decompounded by abſorbent earths and by fixed alkalis; it being a general law with regard to all metallic ſubſtances.

Silver, when ſeparated by theſe means from the acids in which it was diſſolved, requires nothing but ſimple fuſion to reſtore it to its uſual form; becauſe it does not, any more than gold, loſe its phlogiſton by thoſe ſolutions and precipitations.

Silver unites with ſulphur in fuſion. If this metal be only made red-hot in a crucible, and ſulphur be then added,

ded, it immediately flows; the ſulphur acting as a flux to it. Silver thus united with ſulphur forms a maſs that may be cut, is half malleable, and hath nearly the colour and conſiſtence of lead. If this ſulphurated ſilver be kept a long time in fuſion, and in a great degree of heat, the ſulphur flies off and leaves the ſilver pure. But if the ſulphur be evaporated by a violent heat, it carries off with it part of the ſilver.

Silver unites and mixes perfectly with gold in fuſion. The two metals thus mixed form a compound with properties partaking of both.

Metallurgiſts have hitherto ſought in vain for a perfectly good and eaſy method of ſeparating theſe two metals by the *dry way* only: (This term is uſed to ſignify all operations performed by fuſion:) but they are conveniently enough parted by the *moiſt way*, that is, by acid ſolvents. This method is founded on the above-mentioned properties of gold and ſilver with reſpect to acids. It hath been ſhewn, that *aqua regis* only will diſſolve gold; that ſilver, on the contrary, is not ſoluble by *aqua regis*, and that its proper ſolvent is the acid of nitre: Conſequently, when gold and ſilver are mixed together, if the compound maſs be put into *aqua fortis*, this acid will take up all the ſilver, without diſſolving a particle of the gold, which will therefore remain pure; and by this means the deſired ſeparation is effected. This method, which is commonly made uſe of by goldſmiths and in mints, is called the *parting aſſay*.

It is plain, that if *aqua regis* were employed inſtead of *aqua fortis*, the ſeparation would be equally effected; and that the only difference between this proceſs and the former would conſiſt in this, that now the gold would be diſſolved, and the ſilver remain pure. But the operation by *aqua fortis* is preferable; becauſe *aqua regis* does take up a little ſilver, whereas *aqua fortis* hath not the leaſt effect on gold.

It muſt be obſerved, that when gold and ſilver are mixed together in equal parts, they cannot be parted by the means of *aqua fortis*. To enable the *aqua fortis* to act duly on the ſilver, this metal muſt be, at leaſt, in a triple proportion to the gold. If it be in a leſs proportion, you muſt either employ *aqua regis* to make the ſeparation, or, if you prefer the uſe of *aqua fortis*, melt the metalline maſs, and add as much ſilver as is neceſſary to make up the proportion above-mentioned: And hence this proceſs is called *quartation*.

This effect, which is pretty ſingular, probably ariſes from hence, that when the gold exceeds, or even equals the ſilver in quantity, the parts of both being intimately united, the former are capable of coating over the latter, and covering them ſo as to defend them from the action of the *aqua fortis*; which is not the caſe when there is thrice as much ſilver as gold.

There is one thing more to be taken notice of with regard to this proceſs; which is, that perfectly pure *aqua fortis* is rarely to be met with, for two reaſons: Firſt, it is difficult in making it wholly to prevent the riſing of the medium employed to diſengage the nitrous acid; that is, a little of the vitriolic acid will mix with the vapours of the *aqua fortis*: Secondly, unleſs the ſaltpetre be very well purified, it will always hold ſome ſmall portion of ſea-ſalt, the acid of which, we know, is very readily ſet looſe by the vitriolic acid, and conſequently riſes together with the vapours of the *aqua fortis*. It is eaſy to ſee, that *aqua fortis*, mixed either with the one or the other, is not proper for the parting proceſs; becauſe, as has juſt been ſaid, the vitriolic and the marine acid equally precipitate ſilver diſſolved in the nitrous acid; by which means, when they are united with that acid, they weaken its action upon the ſilver, and hinder the diſſolution. Add, that *aqua fortis* adulterated with a mixture of ſpirit of ſalt becomes an *aqua regis*, and conſequently is rendered capable of diſſolving gold, in proportion as its action upon ſilver is diminiſhed.

In order to remedy this inconvenience, and free *aqua fortis* from the vitriolic or marine acid with which it is tainted, ſilver muſt be diſſolved therein: By degrees, as the metal diſſolves, thoſe heterogeneous acids lay hold of it, and precipitate with it in the form of a white powder, as we obſerved before. This precipitate being wholly fallen, the liquor grows clear; after which, if it be found capable of diſſolving more ſilver, without turning milky, it may be depended on as a perfectly pure *aqua fortis*. Then filtre it, diſſolve more ſilver in it, as long as it will take up any, and you will have a ſolution of ſilver in a very pure *aqua fortis*. By means of this ſolution may other *aqua fortis* be purified: For, pour a few drops thereof into a very impure *aqua fortis*, and immediately the vitriolic or marine acid, with which that *aqua fortis* is contaminated, will join the ſilver and fall therewith to the bottom. When the ſolution of ſilver prepared as above does not in the leaſt affect the tranſparency of the *aqua fortis*, it is then very pure, and fit for the purpoſes of quartation.

This operation of purifying *aqua fortis* by a ſolution of ſilver is called the *precipitation of aqua fortis*; and *aqua fortis* thus purified is called *precipitated aqua fortis*.

When ſilver is diſſolved in *aqua fortis* it may be ſeparated therefrom, as has been ſhewn, by abſorbent earths and fixed alkalis.

Of COPPER.

Of all the imperfect metals, copper comes the neareſt to gold and ſilver. Its natural colour is a deep-red yellow. It reſiſts a very violent degree of fire for a conſiderable time; but loſing its phlogiſton at laſt, it changes its metalline form for that of a calx, or a pure reddiſh earth. This calx is hardly, if at all, reducible to glaſs, without the addition of ſomething to promote its fuſion; all that the fierceſt heat can do being only to render it ſoft. Copper, even while it retains its metalline form, and is very pure, requires a conſiderable degree of fire to melt it, and does not begin to flow till long after it is red-hot. When in fuſion, it communicates a greeniſh colour to the flame of the coals.

This metal is inferior to ſilver in point of gravity; nor is its ductility ſo great, though it be pretty conſiderable: But, on the other hand, it exceeds that metal in hardneſs. It unites readily with gold and ſilver; nor does it greatly leſſen their beauty when added to them in a ſmall quantity: Nay, it even procures them ſome advantages;

vantages; ſuch as making them harder, and leſs ſubject to loſe their ductility. This may probably ariſe from hence, that the ductility of copper has the peculiarity of reſiſting moſt of thoſe cauſes which rob the perfect metals of theirs.

The property which other metalline ſubſtances have in common with copper, of loſing the phlogiſton, by calcining and then vitrifying, furniſhes us with a method of ſeparating them from gold and ſilver, when they are combined therewith. Nothing more is required than to expoſe the maſs, compounded of the perfect metals and other metalline ſubſtances, to a degree of heat ſufficient to calcine whatever is not either gold or ſilver. It is evident that by this means theſe two metals will be obtained as pure as is poſſible; for, as hath already been ſaid, no metalline calx or glaſs is capable of uniting with metals poſſeſſed of their phlogiſton. On this principle is formed the whole buſineſs of refining gold and ſilver.

When the perfect metals have no other alloy but copper, as this metal is not to be calcined or vitrified without great difficulty, which is increaſed by its union with the unvitrifiable metals, it is eaſy to ſee that it is almoſt impoſſible to ſeparate them without adding ſomething to facilitate the vitrification of the copper. Such metals as have the property of turning eaſily to glaſs are very fit for this purpoſe; and it is neceſſary to add a certain quantity thereof, when gold or ſilver is to be purified from the alloy of copper. We ſhall have occaſion to be more particular on this ſubject when we come to treat of lead.

Copper is ſoluble in all the acids, to which it communicates a green colour, and ſometimes a blue. Even the neutral ſalts, and water itſelf, act upon this metal. With regard to water indeed, as the procuring it abſolutely pure and free from any ſaline mixture is next to an impoſſibility, it remains a queſtion, whether the effect it produces on copper be not owing to certain ſaline particles contained in it. It is this great facility of being diſſolved that renders copper ſo ſubject to ruſt; which is nothing elſe but ſome parts of its ſurface corroded by ſaline particles contained in the ſurrounding air and water.

The ruſt of copper is always green or blue, or of a colour between theſe two. Internally uſed it is very noxious, being a real poiſon, as are all the ſolutions of this metal made by any acid whatever. The blue colour, which copper conſtantly aſſumes, when corroded by any ſaline ſubſtance, is a ſure ſign by which it may be diſcovered where-ever it exiſts, even in a very ſmall quantity.

Copper diſſolved in the vitriolic acid forms a kind of metalline ſalt, which ſhoots into rhomboidal cryſtals of a moſt beautiful blue colour. Theſe cryſtals are called *blue vitriol*, or *vitriol of copper*. They are ſometimes found ready formed in the bowels of the earth; and may be artificially made by diſſolving copper in the vitriolic acid; but the ſolution will not ſucceed unleſs the acid be well dephlegmated. The taſte of this vitriol is ſaltiſh and aſtringent. It retains a conſiderable quantity of water in cryſtallizing, on which account it is eaſily rendered fluid by fire.

It muſt be obſerved, that when it is expoſed to a certain degree of heat in order to free it of its humidity, a great part of its acid flies off at the ſame time: And hence it is that, after calcination, there remains only a kind of earth, or metalline calx, of a red colour, which contains but very little acid. This earth cannot be brought to flow but with the greateſt difficulty.

A ſolution of copper in the nitrous acid forms a ſalt which does not cryſtallize, but, when dried, powerfully attracts the moiſture of the air. The ſame thing happens when it is diſſolved in the ſpirit of ſalt, or in *aqua regis*.

If the copper, thus diſſolved by any of theſe acids, be precipitated by an earth or an alkali, it retains nearly the colour it had in the ſolution. But theſe precipitates are ſcarce any thing more than the earth of copper, or copper deprived of moſt of its phlogiſton; ſo that if they were expoſed to a violent fire, without any additament, a great part of them would be converted into an earth that could never be reduced to a metalline form. Therefore, when we intend to reduce theſe precipitates to copper, it is neceſſary to add a certain quantity of a ſubſtance capable of reſtoring to them the phlogiſton they have loſt.

The ſubſtance which hath been found fitteſt for ſuch reductions is charcoal duſt; becauſe charcoal is nothing but a phlogiſton cloſely combined with an earth, which renders it exceedingly fixed, and capable of reſiſting a violent force of fire. But as charcoal will not melt, and conſequently is capable of preventing rather than forwarding the flux of a metalline calx or glaſs, which nevertheleſs is eſſentially neceſſary to complete the reduction, it hath been contrived to mix it, or any other ſubſtance containing the phlogiſton, with ſuch fixed alkalis as eaſily flow, and are fit to promote the flux of other bodies. Theſe mixtures are called *reducing fluxes*; becauſe the general name of fluxes is given to all ſalts, or mixtures of ſalts, which facilitate fuſion.

If ſulphur be applied to copper made perfectly red-hot, the metal immediately runs; and theſe two ſubſtances uniting, form a new compound much more fuſible than pure copper.

This compound is deſtroyed by the ſole force of fire, for two reaſons: The firſt is, that, ſulphur being volatile, the fire is capable of ſubliming a great part of it, eſpecially when it is in a great proportion to the copper with which it is joined; the ſecond is, that the portion of ſulphur which remains, being more intimately united with the copper, though it be rendered leſs combuſtible by that union, is nevertheleſs burnt and conſumed in time. Copper being combined with ſulphur, and together with it expoſed to the force of fire, is found to be partly changed into a blue vitriol; becauſe the vitriolic acid, being diſengaged by burning the ſulphur, is by that means qualified to diſſolve the copper. The affinity of copper with ſulphur is geater than that of ſilver.

This metal, as well as the other imperfect metals and the ſemi-metals, being mingled with nitre and expoſed to the fire, is decompoſed and calcined much ſooner than by itſelf; becauſe the phlogiſton which it contains occaſions the deflagration of the nitre, and conſequently the two ſubſtances mutually decompoſe each other. There are certain metalline ſubſtances whoſe phlogiſton is ſo abundant,

dant, and ſo weakly connected with their earth, that, when they are thus treated with nitre, there ariſes immediately a detonation, accompanied with flame, and as violent as if ſulphur or charcoal duſt had been employed; ſo that in a moment the metalline ſubſtance loſes its phlogiſton, and is calcined. The nitre, after theſe detonations, always aſſumes an alkaline character.

Of IRON.

IRON is lighter and leſs ductile than copper; but it is much harder, and of more difficult fuſion.

It is the only body that has the property of being attracted by the magnet, which therefore ſerves to diſcover it where-ever it is. But it muſt be obſerved, that it hath this property only when in its metalline ſtate, and loſes it when converted to an earth or calx. Hence very few iron-ores are attracted by the loadſtone; becauſe, for the moſt part, they are only ſorts of earths, which require a phlogiſton to be added before they can be brought to the form of true iron.

When iron hath undergone no other preparation but the fuſion which is neceſſary to ſmelt it from its ore, it is uſually quite brittle, and flies to pieces under the hammer: Which ariſes in ſome meaſure from its containing a certain portion of unmetallic earth interpoſed between its parts. This we call *pig-iron*.

By melting this a ſecond time it is rendered purer, and more free from heterogeneous matters: But ſtill, as its proper parts are probably not brought ſufficiently near, or cloſely enough united, till the iron hath undergone ſome further preparation beſides that of fuſion, it ſeldom hath any degree of malleability.

The way to give it this property is to make it juſt red-hot, and then hammer it for ſome time in all directions; to the end that its parts may be properly united, incorporated, and welded together, and that the heterogeneous matters which keep them aſunder may be ſeparated. Iron made by this means as malleable as poſſible, we call *bar-iron*, or *forged iron*.

Bar-iron is ſtill harder to fuſe than pig-iron: To make it flow requires the utmoſt force of fire.

Iron has the property of imbibing a greater quantity of phlogiſton than is neceſſary to give it the metalline form. It may be made to take in this ſuperabundant phlogiſton two ways: The firſt is by fuſing it again with matters that contain the phlogiſton; the ſecond is, by encompaſſing it with a quantity of ſuch matters, charcoal-duſt, for inſtance, and then expoſing it ſo encompaſſed, for a certain time, to a degree of fire barely ſufficient to keep it red-hot. This ſecond method, whereby one ſubſtance is incorporated with another by means of fire, but without fuſing either of them, is in general called *cementation*.

Iron thus impregnated with an additional quantity of phlogiſton is called *ſteel*. The hardneſs of ſteel may be conſiderably augmented by *tempering* it; that is, by making it red-hot, and ſuddenly quenching it in ſome cold liquor. The hotter the metal, and the colder the liquor in which it is quenched, the harder will the ſteel be. By this means tools are made, ſuch as files and ſheers, capable of cutting and dividing the hardeſt bodies, as glaſs, pebbles, and iron itſelf. The colour of ſteel is darker than that of iron, and the facets which appear on breaking it are ſmaller. It is alſo leſs ductile and more brittle, eſpecially when tempered.

As iron may be impregnated with an additional quantity of phlogiſton, and thereby converted into ſteel, ſo may ſteel be again deprived of that ſuperabundant phlogiſton, and brought back to the condition of iron. This is effected by cementing it with poor earths, ſuch as calcined bones and chalk. By the ſame operation ſteel may be *untempered*: nay, it will loſe the hardneſs it had acquired by tempering, if it be but made red-hot, and left to cool gradually. As iron and ſteel differ only in the reſpects we have here taken notice of, their properties being in all other reſpects the ſame, what follows is equally applicable to both.

Iron being expoſed to the action of fire for ſome time, eſpecially when divided into ſmall particles, ſuch as filings, is calcined, and loſes its phlogiſton. By this means it turns to a kind of reddiſh yellow earth, which on account of its colour is called *crocus Martis*, or *ſaffron of Mars*.

This calx of iron has the ſingular property of flowing in the fire with ſomewhat leſs difficulty than iron itſelf; whereas every other metalline calx flows with leſs eaſe than the metal that produced it. It has moreover the remarkable property of uniting with the phlogiſton, and of being reduced to iron without fuſion; requiring for that purpoſe only to be made red-hod.

Iron may be incorporated with ſilver, and even with gold, by means of certain operations. Under the article of lead, we ſhall ſee how it may be ſeparated from theſe metals.

The acids produce on it much the ſame effects as on copper: every one of them acts upon it. Certain neutral ſalts, alkalis, and even water itſelf, are capable of diſſolving it; and hence it is alſo very ſubject to ruſt.

The vitriolic acid diſſolves it with the greateſt eaſe: but the circumſtances which attend the diſſolution thereof are different from thoſe with which the ſame acid diſſolves copper. For, 1. Whereas the vitriolic acid muſt be concentrated to diſſolve copper, it muſt on the contrary be diluted with water to diſſolve iron, which it will not touch when well dephlegmated. 2. The vapours which riſe in this diſſolution are inflammable; ſo that if it be made in a ſmall-necked bottle, and the flame of a candle be applied to the mouth thereof, the vapours in the bottle take fire with ſuch rapidity as to produce a conſiderable exploſion.

This ſolution is of a beautiful green colour; and from this union of the vitriolic acid with iron, there reſults a neutral metalline ſalt, which has the property of ſhooting into cryſtals of a rhomboidal figure, and a green colour. Theſe cryſtals are called *green vitriol*, and *vitriol of Mars*.

Green vitriol hath a ſaltiſh and aſtringent taſte. As it retains a great deal of water in cryſtallizing it quickly flows by the action of fire: but this fluidity is owing to its water only, and is not a real fuſion; for as ſoon as its moiſture is evaporated, it reſumes a ſolid form. Its green tranſparent colour is now changed into an opaque white: and, if the calcination be continued, its acid alſo exhales, and is diſſipated in vapours; and as it loſes that, it turns gradually to a yellow colour, which comes ſo much the nearer to a red the longer the calcination is continued, or the higher the force of the fire is raiſed; which being driven to the utmoſt, what remains is of a very deep red. This remainder is nothing but the body of the iron, which, having loſt its phlogiſton, is now no more than an earth, nearly of the ſame nature with that which is left after calcining the metal itſelf.

Green vitriol diſſolved in water ſpontaneouſly lets fall a yellowiſh earthy ſediment. If this ſolution be defecated by filtration, it ſtill continues to depoſite ſome of the ſame ſubſtance, till the vitriol be wholly decompoſed. This ſediment is nothing but the earth of iron, which is then called *ochre*.

The nitrous acid diſſolves iron with great eaſe. This ſolution is of a yellow colour, inclining more or leſs to a ruſſet, or dark-brown, as it is more or leſs ſaturated with iron. Iron diſſolved by this acid alſo falls ſpontaneouſly into a kind of calx, which is incapable of being diſſolved a ſecond time; for the nitrous acid will not act upon iron that has loſt its phlogiſton. This ſolution does not cryſtallize, and if evaporated to dryneſs attracts the moiſture of the air.

Spirit of ſalt likewiſe diſſoves iron, and this ſolution is green. The vapours which riſe during the diſſolution are inflammable, like thoſe which aſcend when this metal is attacked by the vitriolic acid. *Aqua regis* makes a ſolution of iron, which is of a yellow colour.

Iron hath a greater affinity than either ſilver or copper with the nitrous and vitriolic acids: ſo that if iron be preſented to a ſolution of either, in one of theſe two acids, the diſſolved metal will be precipitated; becauſe the acid quits it for the iron, with which it has a greater affinity.

On this occaſion it muſt be obſerved, that if a ſolution of copper in the vitriolic acid be precipitated by means of iron, the precipitate has the form and ſplendour of a metal, and does not require the addition of a phlogiſton to reduce it to true copper; which is not the caſe, when the precipitation is effected by earths or alkaline ſalts.

The colour of this metalline precipitate hath deceived ſeveral perſons, who being unacquainted with ſuch phenomena, and with the nature of blue vitriol, imagined that iron was tranſmuted into copper, when they ſaw a bit of iron, laid in a ſolution of that vitriol, become, in form and external appearance, exactly like copper: whereas the ſurface only of the iron was cruſted over with the particles of copper contained in the vitriol, which had gradually fallen upon, and adhered to the iron, as they were precipitated out of the ſolution.

Among the ſolvents of iron we mentioned fixed alkalis; and that they have ſuch a power, is proved by the following phenomenon. If a large proportion of alkaline ſalts be ſuddenly mixed with a ſolution of iron in an acid, no precipitation enſues, and the liquor remains clear and pellucid; or if at firſt it look a little turbid, that appearance laſts but a moment, and the liquor preſently recovers its tranſparency. The reaſon is, that quantity of alkali is more than ſufficient to ſaturate all the acid of the ſolution; and the ſuperabundant portion thereof, meeting with the iron already finely divided by the acid, diſſolves it with eaſe as faſt as it falls, and ſo prevents its mudding in liquor. To evince that this is ſo in fact, let the alkali be applied in a quantity that is not ſufficient, or but qarely ſufficient, to ſaturate the acid, and the iron will then precipitate like any other metal.

Water alſo acts upon iron; and therefore iron expoſed to moiſture grows ruſty. If iron-filings be expoſed to the dew, they turn wholly to a ruſt, which is called *crocus Martis aperiens*.

Iron expoſed to the fire, together with nitre, makes it detonate pretty briſkly, ſets it in a flame, and decompoſes it with rapidity.

This metal hath a greater affinity than any other metalline ſubſtance with ſulphur; on which account, it is ſucceſsfully uſed to precipitate, and ſeparate all metalline ſubſtances combined with ſulphur.

Sulphur uniting with iron communicates to it ſuch a degree of fuſibility, that if a maſs of this metal, heated red-hot, be rubbed with a bit of ſulphur, it inceſſantly runs into as perfect a fuſion as a metal expoſed to the focus of a large burning-glaſs.

Of TIN.

TIN is the lighteſt of all metals. Though it yields eaſily to the impreſſion of hard bodies, it has but little ductility. Being bent backwards and forwards it makes a ſmall crackling noiſe. It flows with a very moderate degree of fire, and long before it comes to be red-hot. When it is in fuſion, its ſurface ſoon grows duſky, and there forms upon it a thin dark-coloured duſty pellicle, which is no other than a part of the tin that has loſt its phlogiſton, or a calx of tin. The metal thus calcined eaſily recovers its metalline form, on the addition of a phlogiſton. If the calx of tin be urged by a ſtrong fire it grows white, but the greateſt violence of heat will not fuſe it; which makes ſome chemiſts conſider it as a calcinable or abſorbent earth, rather than a vitrifiable one. Yet it turns to glaſs in ſome ſort, when mixed with any other ſubſtance that vitrifies eaſily. However, it always produces an imperfect glaſs only, which is not at all tranſparent, but of an opaque white. The calx of tin thus vitrified is called *enamel*. Enamels are made of ſeveral colours by the addition of this or that metalline calx.

Tin unites eaſily with all the metals; but it deſtroys the ductility and malleability of every one of them, lead excepted. Nay, it poſſeſſes this property of making metals brittle, in ſuch an eminent degree, that the very vapour of it, when in fuſion, is capable of producing this effect. Moreover, which is very ſingular, the moſt ductile metals, even gold and ſilver, are thoſe on which it works this change with the moſt eaſe, and in the greateſt degree. It has alſo the property of making ſilver, mixed with it, flow over a very ſmall fire.

It adheres to, and in ſome meaſure incorporates with, the ſurface of copper and of iron; whence aroſe the practice of coating over thoſe metals with tin. Tin-plates are no other than thin plates of iron tinned over.

If to twenty parts of tin one part of copper be added, this alloy renders it much more ſolid, and the mixed maſs continues tolerably ductile.

If, on the contrary, to one part of tin ten parts of copper be added, together with a little zinc, a ſemi-metal to be conſidered hereafter, from this combination there reſults a metalline compound, which is hard, brittle, and very ſonorous; ſo that it is uſed for caſting bells: This compoſition is called *bronze* and *bell-metal*.

Tin hath an affinity with the vitriolic, nitrous, and marine acids. All of them attack and corrode it; yet none of them is able to diſſolve it without great difficulty: So that if a clear ſolution thereof be deſired, particular methods muſt be employed for that purpoſe; for the acids do but in a manner calcine it, and convert it to a kind of white calx or precipitate. The ſolvent which has the greateſt power over it is *aqua regis*, which has even a greater affinity therewith than with gold itſelf; whence it follows, that gold diſſolved in *aqua regis* may be precipitated by means of tin; but then the *aqua regis* muſt be weakened. Gold thus precipitated by tin is of a moſt beautiful colour, and is uſed for a red in enamelling and painting on porcelain, as alſo to give a red colour to artificial gems. If the *aqua regis* be not lowered, the precipitate will not have the purple colour.

Tin hath the property of giving a great luſtre to all red colours in general; on which account it is uſed by the dyers for ſtriking a beautiful ſcarlet, and tin-veſſels are employed in making fine ſyrup of violets. Water does not act upon this metal, as it does upon iron and copper; for which reaſon it is not ſubject to ruſt: nevertheleſs, when it is expoſed to the air, its ſurface ſoon loſes its poliſh and ſplendor.

Tin mixed with nitre, and expoſed to the fire, deflagrates with it, makes it detonate, and is immediately converted to a *refractory calx*; for ſo all ſubſtances are called which are incapable of fuſion.

Tin readily unites with ſulphur, and with it becomes a brittle and friable maſs.

Of LEAD.

NEXT to gold and mercury, lead is the heavieſt of all metalline ſubſtances, but in hardneſs is exceeded by every one of them. Of all metals alſo it melts the eaſieſt, except tin. While it is in fuſion there gathers inceſſantly on its ſurface, as on that of tin, a blackiſh, duſty pellicle, which is nothing but a calx of lead.

This calx further calcined by a moderate fire, the flame being reverberated on it, ſoon grows white. If the calcination be continued it becomes yellow, and at laſt of a beautiful red. In this ſtate it is called *minium*, and is uſed as a pigment. *Minium* is not eaſily made, and the operation ſucceeds well in large manufactures only.

To convert lead into *litharge*, which is the metal in a manner half vitrified, you need only keep it melted by a pretty ſtrong fire; for then, as its ſurface gradually calcines, it tends more and more to fuſion and vitrification.

All theſe preparations of lead are greatly diſpoſed to perfect fuſion and vitrification, and for that purpoſe require but a moderate degree of fire; the calx or earth of lead being of all metalline earths that which vitrifies the moſt eaſily.

Lead hath not only the property of turning into glaſs with the greateſt facility, but it hath alſo that of promoting greatly the vitrification of all the other imperfect metals; and, when it is actually vitrified, procures the ready fuſion of all earths and ſtones in general, even thoſe which are refractory, that is, which could not be fuſed without its help.

Glaſs of lead, beſides its great fuſibility, hath alſo the ſingular property of being ſo ſubtile and active as to corrode and penetrate the crucibles in which it is melted, unleſs they be of an earth that is exceeding hard, compact, and withal very refractory: for glaſs of lead being one of the moſt powerful fluxes that we know, if the earth of the crucible in which it is melted be in the ſmalleſt degree fuſible, it will be immediately vitrified; eſpecially if there be any metallic matter in its compoſition.

The great activity of glaſs of lead may be weakened by joining it with other vitrifiable matters; but unleſs theſe be added in a very great proportion, it will ſtill remain powerful enough to penetrate common earths, and carry off the matters combined with it.

On theſe properties of lead, and of the glaſs of lead, depends the whole buſineſs of refining gold and ſilver. It hath been ſhewn, that as theſe two metals are indeſtructible by fire, and the only ones which have that advantage, they may be ſeparated from the imperfect metals, when mixed therewith, by expoſing the compound to a degree of fire ſufficiently ſtrong to vitrify the latter; which when once converted into glaſs can no longer remain united with any metal that has its metalline form. But it is very difficult to procure this vitrification of the imperfect metals, when united with gold and ſilver; nay, it is in a manner impoſſible to vitrify them entirely, for two reaſons: firſt, becauſe moſt of them are naturally very difficult to vitrify: ſecondly, becauſe the union they have contracted with the perfect metals defends them, in a manner, from the action of the fire, and that ſo much the more effectually as the proportion of the perfect metals is greater; which being indeſtructible, and in ſome ſort coating over thoſe with which they are alloyed, ſerve them as a preſervative and impenetrable ſhield againſt the utmoſt violence of fire.

It is therefore clear, that a great deal of labour may be ſaved, and that gold and ſilver may be refined to a much greater degree of purity than can otherwiſe be obtained, if to a mixture of theſe metals with copper, for inſtance, or any other imperfect metal, be added a certain quantity of lead. For the lead, by its known property, will infallibly produce the deſired vitrification; and as it likewiſe increaſes the proportion of the imperfect metals, and ſo leſſens that of the perfect metals, in the maſs, it evidently deprives the former of a part of their guard, and ſo effects a more complete vitrification. As the glaſs of lead hath the property of running through the crucible, and carrying with it the matters which it has vitrified, it follows, that when the vitrification of the imperfect metals is effected by its means, all thoſe vitrified matters together penetrate the veſſel containing the fuſed metalline maſs, diſappear, and leave only the gold and ſilver perfectly pure, and freed, as far as is poſſible, from all admixture of heterogeneous parts.

The better to promote the ſeparation of ſuch parts, it is uſual to employ in this proceſs a particular ſort of ſmall crucibles, made of the aſhes of calcined bones, which are exceedingly porous and eaſily pervaded. They are called *cupels*, on account of their figure, which is that of a wide-mouthed cup: and from hence the operation takes its name; for when we refine gold and ſilver in this manner, we are ſaid to *cupel* thoſe metals. It is eaſy to perceive, that the more lead is added, the more accurately will the gold and ſilver be refined; and that ſo much the more lead ought to be added as the perfect metals are alloyed with a greater proportion of the imperfect. This is the moſt ſevere trial to which a perfect metal can be put, and conſequently any metal that ſtands it may be fairly conſidered as ſuch.

In order to denote the fineneſs of gold, it is ſuppoſed to be divided into twenty-four parts called *carats*; and gold, which is quite pure and free from all alloy, is ſaid to be twenty-four carats fine; that which contains $\frac{1}{24}$ part of alloy is called gold of twenty-three carats; that which contains $\frac{2}{24}$ of alloy is but twenty-two carats; and ſo on. Silver again is ſuppoſed to be divided into twelve parts only, which are called *penny-weights*; ſo that when abſolutely pure it is ſaid to be twelve penny-weights fine; when it contains $\frac{1}{12}$ of alloy, it is then called eleven penny-weights fine; when it contains $\frac{2}{12}$ of alloy, it is called ten penny-weights fine; and ſo on.

In treating of copper, we promiſed to ſhew under the article of lead how to ſeparate it from iron. The proceſs is founded on that property of lead which renders it incapable of mixing and uniting with iron, though it readily diſſolves all other metalline ſubſtances. Therefore if you have a maſs compounded of copper and iron, it muſt be fuſed with a certain quantity of lead, and then the copper, having a greater affinity with lead than with iron, will deſert the latter and join the former, which being incapable of any union with iron, as was ſaid, will wholly exclude it from the new compound. The next point is, to ſeparate the lead from the copper; which is done by expoſing the maſs compounded of theſe two metals to a degree of fire ſtrong enough to deprive the lead of its metalline form, but too weak to have the ſame effect on the copper: and this may be done, ſince of all the imperfect metals lead is, next to tin, the eaſieſt to be calcined, and copper, on the contrary, reſiſts the greateſt force of fire longeſt, without loſing its metalline form. Now what we gain by this exchange, *viz.* by ſeparating copper from iron, and uniting it with lead, conſiſts in this, that as lead is calcined with leſs fire than iron, the copper is leſs expoſed to be deſtroyed: for it muſt be obſerved, that, however moderate the fire be, it is hardly poſſible to prevent a certain quantity thereof from being calcined in the operation.

Lead melted with a third part of tin forms a compound, which being expoſed to a fire capable of making it thoroughly red hot, ſwells, puffs up, ſeems in ſome ſort to take fire, and is preſently calcined. Theſe two metals mixed together are much ſooner calcined than either of them ſeparately.

Both lead and tin are in ſome meaſure affected by water, and by a moiſt air; but they are both much leſs ſubject than iron or copper to be corroded by theſe ſolvents, and of courſe are much leſs liable to ruſt.

The vitriolic acid acts upon and diſſolves lead much in the ſame manner as it doth ſilver.

The nitrous acid diſſolves this metal with much eaſe, and in great quantities; and from this ſolution a ſmall portion of mercury may be obtained.

When this ſolution of lead is diluted with a good deal of water, the lead precipitates in the form of a white powder; which happens becauſe the acid is rendered too weak to keep the lead diſſolved.

If this ſolution of lead be evaporated to a certain degree, it ſhoots into cryſtals formed like regular pyramids with ſquare baſes. Theſe cryſtals are of a yellowiſh colour, and of a ſaccharine taſte: they do not eaſily diſſolve in water. This nitrous metalline ſalt has the ſingular property of detonating in a crucible, without any additament, or the contact of any other inflammable ſubſtance. This property it derives from the great quantity of phlogiſton contained in, and but looſely connected with the lead, which is one of its principles.

If ſpirit of ſalt, or even ſea-ſalt in ſubſtance, be added to a ſolution of lead in the nitrous acid, a white precipitate immediately falls; which is no other than the lead united with the marine acid. This precipitate is extremely like the precipitate of ſilver made in the ſame manner; and that being called *luna cornea*, hath occaſioned this to be named *plumbum corneum*. Like the *luna cornea*, it is very fuſible, and, being melted, hardens like it into a kind of horny ſubſtance: it is volatile, and may be reduced by means of inflammable matters combined with alkalis. But it differs from the *luna cornea* in this chiefly, that it diſſolves eaſily in water; whereas the *luna cornea*, on the contrary, diſſolves therein with great difficulty, and in a very ſmall quantity.

As this precipitation of lead from its ſolution in ſpirit of nitre is procured by the marine acid, lead is thereby proved to have a greater affinity with the latter acid than with the former. Yet, if you attempt to diſſolve lead directly by the acid of ſea-ſalt, the ſolution is not ſo eaſily effected as by the ſpirit of nitre, and it is always imperfect; for it wants one of the conditions eſſential to every ſolution in a liquor, namely tranſparency.

If lead be boiled for a long time in a lixivium of fixed alkali, part of it will be diſſolved.

Sulphur renders this metal refractory and ſcarce fuſible; and the maſs they form when united together is friable. Hence it appears that ſulphur acts upon lead much in the ſame manner as upon tin; that is, it renders both theſe metals leſs fuſible, which are naturally the moſt fuſible of any, while it exceedingly facilitates the fuſion of ſilver, copper, and iron, metals which of themſelves flow with the greateſt difficulty.

Of QUICK-SILVER.

WE treat of quick-ſilver in a chapter apart, becauſe this metallic ſubſtance cannot be claſſed with the metals properly ſo called, and yet has ſome properties which will not allow us to confound it with the ſemi metals. The reaſon why quick-ſilver, by the chemiſts commonly called mercury, is not reputed a metal, is, that it wants one of the eſſential properties thereof, *viz.* malleability. When it is pure and unadulterated with any mixture, it is always fluid, and of courſe unmalleable. But as, on the other hand, it eminently poſſeſſes the opacity, the ſplendor, and above all the gravity of a metal, being, next to gold, the heavieſt of all bodies, it may be conſidered as a true metal, differing from the reſt no otherwiſe than by being conſtantly in fuſion; which we may ſuppoſe ariſes from its aptneſs to flow with ſuch a ſmall degree of heat, that be there ever ſo little warmth on earth, there is ſtill more than enough to keep mercury in fuſion; which would become ſolid and malleable if it were poſſible to apply to it a degree of cold conſiderable enough for that purpoſe. Theſe properties will not allow us to confound it with the ſemi-metals. Add, that we are not yet aſſured by any undoubted experiment that it can be wholly deprived of its phlogiſton, as the imperfect metals may. Indeed we cannot apply the force of fire to it as could be wiſhed: for it is ſo volatile, that it flies off and exhales in vapours with a much leſs degree of fire than is neceſſary to make it red-hot. The vapours of mercury thus raiſed by the action of fire, being collected and united in a certain quantity, appear to be no other than true mercury retaining every one of its properties; and no experiment hath ever been able to ſhew the leaſt change thus produced in its nature.

If mercury be expoſed to the greateſt heat that it can bear without ſublimation, and continued in it for ſeveral months, or even a whole year together, it turns to a red powder, which the chemiſts call *mercurius præcipitatus per ſe.* But to ſucceed in this operation, it is abſolutely neceſſary that the heat be ſuch as is above ſpecified; for this metallic ſubſtance may remain expoſed to a weaker heat for a conſiderable number of years, without undergoing any ſenſible alteration.

Some chemiſts fancied that by this operation they had fixed mercury, and changed its nature; but without any reaſon; for if the mercury thus ſeemingly tranſmuted be expoſed to a ſomewhat ſtronger degree of fire, it ſublimes and exhales in vapours as uſual; and thoſe vapours collected are nothing elſe but running mercury, which has recovered all its properties without the help of any additament.

Mercury has the property of diſſolving all the metals, iron only excepted. But it is a condition abſolutely neceſſary to the ſucceſs of ſuch diſſolution, that the metalline ſubſtances be poſſeſſed of their phlogiſton; for if they be calcined, mercury cannot touch them: and hence it follows, that mercury doth not unite with ſubſtances that are purely earthy. Such a combination of a metal with mercury is called an *amalgam.* Trituration alone is ſufficient to effect it; however, a proper degree of heat alſo is of uſe.

Mercury amalgamated with a metal gives it a conſiſtence more or leſs ſoft, and even fluid, according to the greater or ſmaller proportion of mercury employed. All amalgams are ſoftened by heat, and hardened by cold.

Mercury is very volatile; vaſtly more ſo than the moſt unfixed metals: moreover, the union it contracts with any metal is not ſufficiently intimate to entitle the new compound reſulting from that union to all the properties of the two ſubſtances united; at leaſt with regard to their degree of fixity and volatility. From all which it follows, that the beſt and ſureſt method of ſeparating it from metals diſſolved by it, is to expoſe the amalgam to a degree of heat ſufficient to make all the quick-ſilver riſe and evaporate; after which the metal remains in the form of a powder, and being fuſed recovers its malleability. If it be thought proper to ſave the quick-ſilver, the operation muſt be performed in cloſe veſſels, which will confine and collect the mercurial vapours. This operation is moſt frequently employed to ſeparate gold and ſilver from the ſeveral ſorts of earths and ſands with which they are mixed in the ore; becauſe theſe two metals, gold eſpecially, are of ſufficient value to compenſate the loſs of mercury, which is inevitable in this proceſs: beſides, as they very readily amalgamate with it, this way of ſeparating them from every thing unmetallic is very commodious.

Mercury is diſſolved by acids; but with circumſtances peculiar to each particular acid.

The vitriolic acid concentrated and made boiling hot ſeizes on it, and preſently reduces it to a kind of white powder, which turns yellow by the affuſion of water, but does not diſſolve in it: it is called *turbith mineral.* However, the vitriolic acid on this occaſion unites with a great part of the mercury in ſuch a manner that the compound is ſoluble in water. For if to the water which was uſed to waſh the turbith a fixed alkali be added, there falls inſtantly a ruſſet-coloured precipitate, which is no other than mercury ſeparated from the vitriolic acid by the intervention of the alkali.

This diſſolution of mercury by the vitriolic acid is accompanied with a very remarkable phenomenon; which is, that the acid contracts a ſtrong ſmell of volatile ſpirit of ſulphur: a notable proof that part of the phlogiſton of the mercury hath united therewith. And yet, if the mercury be ſeparated by means of a fixed alkali, it does not appear to have ſuffered any alteration. Turbith mineral is not ſo volatile as pure mercury.

The nitrous acid diſſolves mercury with eaſe. The ſolution is limpid and tranſparent, and as it grows cold ſhoots into cryſtals, which are a nitrous mercurial ſalt.

If this ſolution be evaporated to drineſs, the mercury remains impregnated with a little of the acid, under the form of a red powder, which hath obtained the names of *red precipitate*, and *arcanum corallinum.* This precipitate, as well as turbith, is leſs volatile than pure mercury.

If this ſolution of mercury be mixed with a ſolution of copper made likewiſe in the nitrous acid, and the mixture evaporated to drineſs, there will remain a green powder called *green precipitate.* Theſe precipitates are cauſtic and corroſive; and are uſed as ſuch in ſurgery.

Though mercury be diſſolved more eaſily and completely by the nitrous acid than by the vitriolic, yet it has a greater affinity with the latter than with the former; for if a vitriolic acid be poured into a ſolution of mercury in ſpirit of nitre, the mercury will quit the latter acid in which it was diſſolved, and join the other which was added. The ſame thing happens when the marine acid is employed inſtead of the vitriolic.

Mercury combined with ſpirit of ſalt forms a ſingular body; a metalline ſalt which ſhoots into long cryſtals, pointed like daggers. This ſalt is volatile, and ſublimes eaſily without decompoſition. It is moreover the moſt violent of all the corroſives hitherto diſcovered by chemiſtry. It is called *corroſive ſublimate*, becauſe it muſt abſolutely be ſublimed to make the combination perfect. There are ſeveral ways of doing this: but the operation will never fail, if the mercury be rarefied into vapours and meet with the marine acid in a ſimilar ſtate.

Corroſive ſublimate is diſſoved by water, but in very ſmall quantities only. It is decompounded by fixed alkalis, which precipitate the mercury in a reddiſh yellow powder, called, on account of its colour, *yellow precipitate*.

If corroſive ſublimate be mixed with tin, and the compound diſtilled, a liquor comes over, which continually emits abundance of denſe fumes, and from the name of its inventor is called the *ſmoking liquor of Libavius*. This liquor is no other than the tin combined with the marine acid of the corroſive ſublimate, which therefore it hath actually decompounded: whence it follows, that this acid hath a greater affinity with tin than with mercury.

The marine acid in corroſive ſublimate is not quite ſaturated with mercury; but is capable of taking up a much greater quantity thereof. For if corroſive ſublimate be mixed with freſh mercury, and ſublimed a ſecond time, another compound will be produced containing much more mercury, and leſs acrimonious; for which reaſon it is named *ſweet ſublimate of mercury, mercurius dulcis, aquila alba*. This compound may be taken internally, and is purgative or emetic according to the doſe adminiſtered. It may be rendered ſtill more gentle by repeated ſublimations, and then it takes the title of *panacæa mercurialis*. No way hath hitherto been found to diſſolve mercury in *aqua regis* without great difficulty, and even then it is but imperfectly diſſolved.

Mercury unites eaſily and intimately with ſulphur. If theſe two ſubſtances be only rubbed together in a gentle heat, or even without any heat, they will contract an union, though but an incomplete one. This combination takes the form of a black powder, which has procured it the name of *Æthiops mineral*

If a more intimate and perfect union be deſired, this compound muſt be expoſed to a ſtronger heat; and then a red ponderous ſubſtance will be ſublimed, appearing like a maſs of ſhining needles: this is the combination deſired, and is called *cinabar* In this form chiefly is mercury found in the bowels of the earth. Cinabar finely levigated acquires a much brighter red colour, and is known to painters by the name of *vermilion*.

Cinabar riſes wholly by ſublimation, without ſuffering any decompoſition; becauſe the two ſubſtances of which it conſiſts, *viz.* mercury and ſulphur, are both volatile.

Though mercury unites and combines very well with ſulphur, as hath been ſaid, yet it hath leſs affinity with that mineral than any other metal, gold only excepted: whence it follows, that any of the other metals will decompound cinabar, by uniting with its ſulphur, and ſo ſetting the mercury at liberty to appear in its uſual form. Mercury thus ſeparated from ſulphur, is eſteemed the pureſt, and bears the name of *mercury revivified from cinabar*.

Iron is generally uſed in this operation preferably to the other metals, becauſe among them all it has the greateſt affinity with ſulphur, and is the only one that has none with mercury.

Cinabar may alſo be decompounded by means of fixed alkalis; the affinity of theſe ſalts with ſulphur being generally greater than that of any metalline ſubſtance whatever.

Of the SEMI-METALS.

Of REGULUS *of* ANTIMONY.

REGULUS of antimony is a metallic ſubſtance of a pretty bright white colour. It has the ſplendor, opacity, and gravity of a metal; but it is quite unmalleable, and crumbles to duſt, inſtead of yielding or ſtretching under the hammer; on which account it is claſſed with the ſemi-metals.

It begins to flow as ſoon as it is moderately red; but, like the other ſemi-metals, it cannot ſtand a violent degree of fire; being thereby diſſipated into ſmoke and white vapours, which adhere to ſuch cold bodies as they meet with, and ſo are collected into a kind of *farina* called *flowers of antimony*.

If regulus of antimony, inſtead of being expoſed to a ſtrong fire, be only heated ſo moderately that it ſhall not even melt, it will calcine, loſe its phlogiſton, and take the form of a greyiſh powder deſtitute of all ſplendor: this powder is called *calx of antimony*.

This calx is not volatile like the regulus, but will endure a very violent fire; and being expoſed thereto will flow, and turn to a glaſs of the yellowiſh colour of a hyacinth.

It is to be obſerved, that the more the regulus is deprived of its phlogiſton by continued calcination, the more refractory is the calx obtained from it. The glaſs thereof has alſo ſo much the leſs colour, and comes the nearer to common glaſs.

The calx and the glaſs of antimony will recover their metalline form, like every other calx and glaſs of a metal, if reduced by reſtoring to them their loſt phlogiſton. Yet, if the calcination be carried too far, their reduction will become much more difficult, and a much ſmaller quantity of regulus will be reſuſcitated.

Regulus of antimony is capable of diſſolving the metals; but its affinities with them are various, and differ according to the following order. It affects iron the moſt powerfully, next copper, then tin, lead, and ſilver. It promotes the fuſion of metals, but makes them all brittle and unmalleable.

It will not amalgamate with mercury; and though, by certain proceſſes, particularly the addition of water and continued trituration, a ſort of union between theſe two ſubſtances may be produced, yet it is but apparent and momentary; for being left to themſelves, and undiſturbed, they quickly diſunite and ſeparate.

The vitriolic acid, aſſiſted by heat, and even by diſtillation, diſſolves regulus of antimony. The nitrous acid likewiſe attacks it; but the ſolution can by no art be made clear and limpid; ſo that the regulus is only calcined, in a manner, by this acid.

The marine acid diſſolves it well enough; but then it muſt be exceedingly concentrated, and applied in a peculiar manner, and eſpecially by diſtillation. One of the beſt methods of procuring a perfect union between the acid of ſea-ſalt and regulus of antimony, is to pulverize the latter, mix it with corroſive ſublimate, and diſtil the whole. There riſes in the operation a white matter, thick, and ſcarce fluid, which is no other than the regulus of antimony united and combined with the acid of ſea-ſalt. This compound is extremely corroſive, and is called *butter of antimony*.

It is plain, that the corroſive ſublimate is here decompounded; that the mercury is revivified; and that the acid which was combined therewith hath quitted it to join the regulus of antimony, with which its affinity is greater. This butter of antimony, by repeated diſtillations, acquires a conſiderable degree of fluidity and limpidneſs.

If the acid of nitre be mixed with butter of antimony, and the whole diſtilled, there riſes an acid liquor, or a ſort of *aqua regis*, which ſtill retains ſome of the diſſolved regulus, and is called *bezoardic ſpirit of nitre*. After the diſtillation there remains a white matter, from which freſh ſpirit of nitre is again abſtracted, and which being then waſhed with water, is called *bezoar mineral*. This bezoar mineral is neither ſo volatile, nor ſo cauſtic, as butter of antimony; becauſe the nitrous acid hath not the property of volatilizing metallic ſubſtances, as the marine acid does, and becauſe it remains much more intimately combined with the reguline part.

If butter of antimony be mixed with water, the liquor immediately becomes turbid and milky, and a precipitate falls, which is nothing but the metallic matter partly ſeparated from its acid, which is too much weakened by the addition of water to keep it diſſolved. Yet this precipitate ſtill retains a good deal of acid; for which reaſon it continues to be a violent emetic, and in ſome degree corroſive. It hath therefore been very improperly called *mercurius vitæ*.

The proper ſolvent of regulus of antimony is *aqua regis*; by means whereof a clear and limpid ſolution of this ſemi-metal may be obtained.

Regulus of antimony mixed with nitre, and projected into a red-hot crucible, ſets the nitre in a flame, and makes it detonate. As it produces this effect by means of its phlogiſton, it muſt needs, at the ſame time, be calcined, and loſe its metallic properties, which accordingly happens: and when the nitre is in a triple proportion to the regulus, the latter is ſo perfectly calcined as to leave only a white powder, which is fuſed with great difficulty, and then turns to a faintly coloured glaſs, not very different from common glaſs, and which is not reducible to a regulus by the addition of inflammable matter; at leaſt it yields but a very ſmall quantity thereof. If leſs nitre be uſed, the calx is not ſo white; the glaſs it produces is more like a metalline glaſs, and is more eaſily reduced. The calx of the regulus thus prepared by nitre is called, on account of the medicinal virtue aſcribed to it, *diaphoretic antimony*, or *diaphoretic mineral*.

Nitre always becomes an alkali by deflagration, and in the preſent caſe retains part of the calx, which it even renders ſoluble in water. This calx may be ſeparated from the alkali, if an acid be employed to precipitate it; and then it is called *materia perlata*. This pearly matter is a calx of antimony, ſo completely deprived of its phlogiſton as to be altogether incapable of reduction to a regulus.

Regulus of antimony readily joins and unites with ſulphur, forming therewith a compound which has a very faint metallic ſplendor. This compound appears like a maſs of long needles adhering together laterally; and under this form it is uſually found in the ore, or at leaſt when only ſeparated by fuſion from the ſtones and earthy matters with which the ore is mixed. It is called *crude antimony*.

Antimony flows with a moderate heat, and becomes even more fluid than other metallic ſubſtances. The action of fire diſſipates or conſumes the ſulphur it contains, and its phlogiſton alſo, ſo as to convert it into a calx and a glaſs, as it does the regulus.

Aqua regis, which we obſerved to be the proper ſolvent of the regulus, being poured on antimony, attacks and diſſolves the reguline part, but touches not the ſulphur; in conſequence whereof it decompoſes the antimony, and ſeparates its ſulphur from its regulus.

There are ſeveral other ways of effecting this decompoſition, and obtaining the reguline part of antimony by itſelf: They conſiſt either in deſtroying the ſulphureous part of the antimony by combuſtion, or in melting the antimony with ſome ſubſtance which has a greater affinity than its reguline part with ſulphur. Moſt metals are very fit for this latter purpoſe; For though the regulus has a conſiderable affinity with ſulphur, yet all the metals, except gold and mercury, have a greater.

If therefore iron, copper, lead, ſilver, or tin, be melted with antimony, the metal employed will unite with the ſulphur, and ſeparate it from the regulus.

It muſt be obſerved, that, as theſe metals have ſome affinity with the regulus of antimony, the regulus will be joined in the operation by ſome of the metal employed as a precipitant, (ſo thoſe ſubſtances are called which ſerve as the means of ſeparating two bodies from each other;) and therefore the regulus procured in this manner will not be abſolutely pure: On this account care is taken to diſtinguiſh each by adding the name of the metal employed in its precipitation; and thence come theſe titles, *martial regulus of antimony*, or only *martial regulus*, *regulus veneris*; and ſo of the reſt.

Antimony is employed with advantage to ſeparate gold from all other metals with which it may be alloyed. It has been ſhewn, that all the metals have a greater affinity, than the reguline part of antimony, with ſulphur, gold only excepted; which is incapable of contracting any union therewith: And therefore, if a maſs compounded of gold and ſeveral other metals be melted with antimony, every thing in that maſs which is not gold will unite with the ſulphur of the antimony. This union occaſions two ſeparations, to wit, that of the ſulphur of the antimony from its reguline part, and that of the gold from the metals with which it was adulterated; and from the whole two new compounds ariſe; namely, a combination of the metals with the ſulphur, which being lighteſt riſes to the ſurface in fuſion; and a metalline maſs formed of the gold and the reguline part of the antimony united together, which being much the heavieſt ſinks to the bottom. There is no difficulty in parting the gold from the regulus of antimony with which it is alloyed: For the metalline maſs need only be expoſed to a degree of fire capable of diſſipating into vapours all the ſemi-metal it contains; which being very volatile, the operation is much eaſier, and more expeditiouſly finiſhed, than if the metals with which the gold was debaſed were to be vitrified on the cupel; without taking into the account that if ſilver were one of them, recourſe muſt needs be had to the proceſs of quartation after that of the cupel.

If equal parts of nitre and antimony be mixed together, and the mixture expoſed to the action of fire, a violent detonation enſues; the nitre deflagrating conſumes the ſulphur of the antimony, and even a part of its phlogiſton. After the detonation there remains a greyiſh matter which contains fixed nitre, vitriolated tartar, and the reguline part of the antimony in ſome meaſure deprived of its phlogiſton, and half vitrified by the action of the fire, which is conſiderably increaſed by the deflagration. This matter is called *liver of antimony*.

If inſtead of equal parts of nitre and antimony, two parts of the former be uſed to one of the latter, then the reguline part loſes much more of its phlogiſton, and remains in the form of a yellowiſh powder.

Again, if three parts of nitre be taken to one of antimony, the regulus is thereby entirely robbed of its phlogiſton, and converted to a white calx which bears the name of *diaphoretic antimony*, or *diaphoretic mineral*. The pearly matter may be precipitated by pouring an acid on the ſaline ſubſtances which here remain after the detonation, in the ſame manner as we ſhewed above was to be done with regard to the regulus.

In the laſt two operations, where the nitre is in a double or triple proportion to the antimony, the reguline part is found after the detonation to be converted into a calx, and not into a half vitrified matter, which we have ſeen is the effect when equal parts only of nitre and antimony are uſed. The reaſon of this difference is, that in theſe two caſes the reguline part, being wholly, or almoſt wholly, deprived of its phlogiſton, becomes, as was obſerved, more difficult to fuſe, and conſequently cannot begin to vitrify in the ſame degree of heat as that which hath not loſt ſo much of its phlogiſton. If, inſtead of performing the operation with equal parts of nitre and antimony alone, a portion of ſome ſubſtance which abounds with phlogiſton be added, in that caſe the ſulphur only of the antimony will be conſumed, and the regulus will remain united with its phlogiſton, and ſeparated from its ſulphur.

The regulus prepared in this manner is abſolutely pure, becauſe no metalline ſubſtance being employed, none can mix with it and adulterate it. It is called *regulus of antimony per ſe*, or only *regulus of antimony*.

It is true indeed, that in this operation, much of the reguline part unavoidably loſes its phlogiſton and is calcined, and conſequently a much ſmaller quantity of regulus is obtained than when metalline precipitants are employed: But this loſs is eaſily repaired, if it be thought proper, by reſtoring to the calcined part its loſt phlogiſton.

Antimony melted with two parts of fixed alkali yields no regulus, but is entirely diſſolved by the ſalt, and forms with it a maſs of a reddiſh yellow colour.

The reaſon why no precipitate is produced on this occaſion is, that the alkali uniting with the ſulphur of the antimony forms therewith the combination called *liver of ſulphur*, which by its nature is qualified to keep the reguline part diſſolved. This maſs, formed by the union of the antimony with the alkali, is ſoluble in water. If any acid whatever be dropt into this ſolution, there falls a precipitate of a reddiſh yellow colour; becauſe the acid unites with the alkali, and forces it to quit the matters with which it is combined. This precipitate is called *golden ſulphur of antimony*.

As in the operation for preparing regulus of antimony *per ſe*, ſome of the nitre is, by the inflammable matters added thereto, turned to an alkali; this alkali ſeizes on part of the antimony, and therewith forms a compound like that juſt deſcribed. Hence it comes, that if the ſcoria formed in this proceſs be diſſolved in water, and an acid dropped into the ſolution, a true golden ſulphur of antimony is thereby ſeparated.

This union of antimony with an alkali may alſo be brought about by the humid way; that is, by making uſe of an alkali reſolved into a liquor, and boiling the mineral in it. The alkaline liquor, in proportion as it acts upon the antimony, gradually becomes reddiſh and turbid. If left to ſettle and cool, when well ſaturated therewith, it gradually depoſites the antimony it had taken up, which precipitates in the form of a red powder: And this precipitate is the celebrated remedy known by the name of *kermes mineral*. It is plain, that the kermes is nearly the ſame thing with the golden ſulphur: Yet it differs from it in ſome reſpects; and eſpecially in this, that being taken inwardly it operates much more gently than the golden ſulphur, which is a violent emetic. Nitre, fixed by charcoal, and reſolved into a liquor, is the only alkali employed in preparing the kermes.

It was ſhewn above, that regulus of antimony, mixed and diſtilled with corroſive ſublimate, decompounds it, diſengages the mercury, and joining itſelf to the marine acid forms therewith a new combination, called *butter of antimony*. If the ſame operation be performed with crude antimony inſtead of its regulus, the ſame effects are produced; but then the antimony itſelf is alſo decompoſed; that is, the reguline part is ſeparated from the ſulphur, which being ſet free unites with the mercury, now alſo at liberty, and theſe two together form a true cinabar, called *cinabar of antimony*.

Of BISMUTH.

BISMUTH, known alſo by the name *tin-glaſs*, is a ſemi-metal, having almoſt the ſame appearance as regulus of antimony; yet it has a more duſky caſt, inclining ſomewhat to red, and even preſents ſome changeable ſtreaks, eſpecially after lying long in the air.

When expoſed to the fire it melts long before it is red, and conſequently with leſs heat than regulus of antimony, which does not flow, as was ſhewn above, till it begin to be red hot. It becomes volatile, like all the other ſemi-metals, when acted on by a violent fire: Being kept in fuſion by a proper degree of heat it loſes its phlogiſton with its metallic form, and turns to powder or a calx; and that again is converted into glaſs by the continued action of fire. The calx and glaſs of biſmuth may be reduced, like any other metallic calx, by reſtoring their phlogiſton.

Biſmuth mixes with all the metals in fuſion, and even facilitates the fuſion of ſuch as do not otherwiſe flow readily. It whitens them by its union, and deſtroys their malleability.

It amalgamates with mercury, if they be rubbed together with the addition of water: Yet after ſome time theſe two metalline ſubſtances deſert each other, and the biſmuth appears again in the form of a powder. Hence it is plain that the union it contracts with mercury is not perfect; and yet it has the ſingular property of attenuating lead, and altering it in ſuch a manner that it afterwards amalgamates with mercury much more perfectly, ſo as even to paſs with it through ſhamoy leather without any ſeparation. The biſmuth employed in making this amalgama afterwards ſeparates from it ſpontaneouſly, as uſual; but the lead ſtill continues united with the mercury, and always retains the property thus acquired.

The vitriolic acid does not diſſolve biſmuth: Its proper ſolvent is the nitrous acid, which diſſolves it with violence, and abundance of fumes.

Biſmuth diſſolved in the nitrous acid is precipitated not only by alkalis, but even by the bare addition of water. This precipitate is extremely white, and known by the name of *magiſtery of biſmuth*.

The acid of ſea-ſalt and *aqua regis* likewiſe act upon biſmuth, but with leſs violence.

This ſemi-metal does not ſenſibly deflagrate with nitre: yet it is quickly deprived of its phlogiſton, and turned into a vitrifiable calx, when expoſed with it to the action of fire.

It readily unites with ſulphur in fuſion, and forms therewith a compound which appears to conſiſt of needles adhering laterally to each other.

It may be ſeparated from the ſulphur with which it is combined, by only expoſing it to the fire, without any additament; for the ſulphur is either conſumed or ſublimed, and leaves the biſmuth behind.

Of ZINC.

ZINC to appearance differs but little from biſmuth, and has even been confounded with it by ſeveral authors. Nevertheleſs, beſides that it has ſomething of a bluiſh caſt, and is harder than biſmuth, it differs from it eſſentially in its properties, as will preſently be ſhewn. Theſe two metallic ſubſtances ſcarce reſemble each other in any thing, but the qualities common to all ſemi-metals.

Zinc melts the moment it grows red in the fire, and then alſo begins to turn to a calx, which, like any other metallic calx, may be reduced by means of the phlogiſton: But if the fire be conſiderably increaſed, it ſublimes, flames, and burns like an oily matter; which is a proof of the great quantity of phlogiſton in its compoſition. At the ſame time abundance of flowers riſe from it in the form of white flakes, flying about in the air like very light bodies; and into this form may the whole ſubſtance of the zinc be converted. Several names have been given to theſe flowers, ſuch as *pompholix*, *philoſophic wool*. They are ſuppoſed to be no other than the zinc itſelf deprived of its phlogiſton; yet no body has hitherto been able to reſuſcitate them in the form of zinc, by reſtoring their phlogiſton according to the methods uſed in the reduction of metals. Though they riſe in the air with very great eaſe while the zinc is calcining, yet when once formed they are very fixed; for they withſtand the utmoſt violence of fire, and are capable of being vitrified, eſpecially if joined with a fixed alkali. They are ſoluble in acids.

Zinc unites with all metalline ſubſtances, except biſmuth. It has this ſingular property, that being mixed with copper, even in a conſiderable quantity, ſuch as a fourth part, it does not greatly leſſen the ductility thereof, and at the ſame time communicates to it a very beautiful colour not unlike that of gold: On which account the compoſition is frequently made, and produces what is called *braſs*. This metal melts much more eaſily than copper alone, becauſe of the zinc with which it is alloyed. If it be expoſed to a great degree of heat, the zinc which it contains takes fire, and ſublimes in white flowers, juſt as when it is pure.

It is to be obſerved, that braſs is ductile only while it is cold, and not then unleſs the zinc uſed in making it was very pure; otherwiſe the compoſition will prove but *tombac*, or *prince's metal*, having very little malleability.

Zinc is very volatile, and carries off with it any metallic ſubſtance with which it is fuſed, making a kind of ſublimate thereof. In the furnaces where they ſmelt ores containing zinc, the matter thus ſublimed is called *cadmia fornacum*, to diſtinguiſh it from the native cadmia called alſo *calamine*, or *lapis calaminaris*; which, properly ſpeaking, is an ore of zinc, containing a great deal of that ſemi-metal, together with ſome iron, and a ſtony ſubſtance. The name of *cadmia fornacum* is not appropriated ſolely to the metallic ſublimates procured by means of zinc, but is given in general to all the metallic ſublimates found in ſmelting-houſes.

If a violent and ſudden heat be applied to zinc, it ſublimes in its metalline form; there not being time for it to burn and be reſolved into flowers.

This ſemi-metal is ſoluble in all the acids, but eſpecially in ſpirit of nitre, which attacks and diſſolves it with very great violence.

Zinc has a greater affinity than iron or copper with the vitriolic acid; and therefore it decompounds the green and blue vitriols, precipitating thoſe two metals by uniting with the vitriolic acid, with which it forms a metallic ſalt or vitriol called *white vitriol*, or *vitriol of zinc*.

Nitre mixed with zinc, and projected into a red hot crucible, detonates with violence; and during the detonation there ariſes a great quantity of white flowers, like thoſe which appear when it is calcined by itſelf.

Sulphur has no power over zinc. Even liver of ſulphur, which diſſolves all other metallic ſubſtances, contracts no union with this ſemi-metal.

Of REGULUS *of* ARSENIC.

REGULUS of arſenic is the moſt volatile of all the ſemi-metals. A very moderate heat makes it wholly evaporate, and fly off in fumes; on which account it cannot be brought to fuſion, nor can any conſiderable maſſes thereof be obtained. It has a metallic colour, ſomewhat reſembling lead; but ſoon loſes its ſplendor when expoſed to the air.

It unites readily enough with metallic ſubſtances, having the ſame affinities with them as regulus of antimony hath. It makes them brittle, and unmalleable It hath alſo the property of rendering them volatile, and greatly facilitates their ſcorification.

It very eaſily parts with its phologiſton and metallic form. When expoſed to the fire it riſes in a kind of ſhining cryſtalline calx, which on that account looks more like a ſaline matter than a metallic calx. To this calx or theſe flowers are given the names of *white arſenic*, *cryſtalline arſenic*, and moſt commonly plain *arſenic*.

Arſenic differs from every other metalline calx, firſt, in being volatile; whereas the calxes of all other metallic ſubſtances, not excepting thoſe of the moſt volatile ſemi-metals, ſuch as regulus of antimony and zinc, are exceedingly fixed; and ſecondly, in having a ſaline character, which is not found in any other metalline calx.

The ſaline character of arſenic appears, firſt, from its being ſoluble in water; ſecondly, from its corroſive quality, which makes it none of the moſt violent poiſons: a quality from which the other metallic ſubſtances are free, when they are not combined with ſome ſaline matter. Regulus of antimony muſt however be excepted: but then the beſt chemiſts agree, that this ſemi-metal is either nearly of the ſame nature with arſenic, or contains a portion thereof in its compoſition: beſides, its noxious qualities never diſcover themſelves ſo plainly as when it is combined with ſome acid. Laſtly, arſenic acts juſt like the vitriolic acid upon nitre; that is, it decompounds that neutral ſalt, by expelling its acid from its alkaline baſis, of which it takes poſſeſſion, and therewith forms a new ſaline compound.

This combination is a ſpecies of ſalt that is perfectly neutral. When the operation is performed in a cloſe veſſel, the ſalt ſhoots into cryſtals in the form of right-angled quadrangular priſms, terminated at each etremity by pyramids that are alſo quadrangular and right-angled; ſome of which, however, inſtead of ending in a point, are obtuſe as if truncated. The conſequence is different when the operation is performed in an open veſſel; for then nothing is obtained but an alkaline ſalt impregnated with arſenic, which cannot be cryſtallized

The cauſe of this different effect is this: When the arſenic is once engaged in the alkaline baſis of the nitre, it can never be ſeparated from it by the utmoſt force of fire, ſo long as it is kept in a cloſe veſſel; whereas, if you expoſe it to the fire without that precaution, it readily ſeparates from it.

This ſalt poſſeſſes many ſingular properties, the chief of which are theſe: Firſt, it cannot be decompounded by the intervention of any acid, even the ſtrongeſt acid of vitriol; and this, joined to its property of expelling the nitrous acid from its baſis, ſhews that it has a very great affinity with fixed alkalis.

Secondly, this very ſalt, on which pure acids have no effect, is decompounded with the greateſt eaſe by acids united with metallic ſubſtances. The reaſon of this phenomenon is curious, and furniſhes us with an inſtance of what we advanced concerning double affinities.

If to a ſolution of any metallic ſubſtance whatever, made by any acid whatever, (except that of mercury by the marine acid, and that of gold by *aqua regis*,) a certain quantity of this ſalt diſſolved in water be added, the metallic ſubſtance is inſtantaneouſly ſeparated from the acid in which it was diſſolved, and falls to the bottom of the liquor.

All metallic precipitates obtained in this manner are found to be a combination of the metal with arſenic; whence it neceſſarily follows that the neutral ſalt is by this means decompounded, its arſenical part uniting with the metallic ſubſtance, and its alkaline baſis with the acid in which that ſubſtance was diſſolved.

The affinities of theſe ſeveral bodies muſt be conſidered as operating on this occaſion in the following manner: The acids which tend to decompound the neutral ſalt of arſenic, by virtue of their affinity with its alkaline baſis, are not able to accompliſh it, becauſe this affinity is powerfully counteracted by that which the arſenic has with the ſame alkaline baſis, and which is equal or even ſuperior to theirs. But if theſe acids happen to be united with a ſubſtance which naturally has a very great affinity with the arſenical part of the neutral ſalt, then, the two parts of which this ſalt conſiſts, being drawn different ways by two ſeveral affinities, tending to ſeparate them from each other, the ſalt will undergo a decompoſition, which could not have been effected without the help of this ſecond affinity. Now, as metallic ſubſtances have a great affinity with arſenic, it is not ſurpriſing that the neutral ſalt of arſenic, which cannot be decompounded by a pure acid, ſhould nevertheleſs yield to an acid combined with a metal. The decompoſition of this ſalt, therefore, and the precipitation which of courſe it produces in metallic ſolutions, are brought about by the means of a double affinity; namely, that of the acid with the alkaline baſis of the neutral ſalt, and that of the metal with the arſenical part of that ſalt.

Arſenic has not the ſame effect on ſea-ſalt as on nitre, and cannot expel its acid: a very ſingular phenomenon, for which it is hard to aſſign a reaſon; for the nitrous acid is known to have a greater affinity than the marine acid with alkalis, and even with the baſis of ſea-ſalt itſelf.

Yet arſenic may be combined with the baſis of ſea-ſalt, and a neutral ſalt thereby obtained, like that which reſults from the decompoſition of nitre by arſenic: but for that purpoſe a quadrangular nitre muſt be firſt prepared, and arſenic applied thereto as to common nitre.

The ſalt produced by uniting arſenic with the baſis of ſea-ſalt very much reſembles the neutral ſalt of arſenic above treated of, as well in the figure of its cryſtals as in its ſeveral properties.

Arſenic preſents another ſingular phenomenon, both with the alkali of nitre and with that of ſea-ſalt; which is, that if it be combined with theſe ſalts in a fluid ſtate, it forms with them a ſaline compound, quite different from the neutral ſalts of arſenic which reſults from the decompoſition of nitrous ſalts.

This ſaline compound, called *liver of arſenic*, takes up a much greater quantity of arſenic than is neceſſary for the perfect ſaturation of the alkali. It has the appearance of a glue, which is ſo much the thicker the more arſenic it contains. Its ſmell is diſagreeable; it attracts the moiſture of the air, and does not cryſtallize; it is eaſily decompounded by any acid whatever, which precipitates the arſenic and unites with the alkali. Laſtly, the effects it produces on metallic ſolutions are different from thoſe of our neutral arſenical ſalts.

Arſenic is eaſily reduced to a regulus. It need only be mixed with any matter containing the phlogiſton, and by the help of a moderate heat a true regulus will ſublime. This regulus is very volatile, and calcines with the greateſt eaſe; which is the reaſon why it cannot be obtained but in ſmall quantities; and alſo why, in order to obtain maſſes of it, ſome have thought of adding thereto ſome metal with which it has a great affinity, ſuch as copper or iron; becauſe, by joining with the metal, it is partly fixed and reſtrained from flying off. But it is plain the regulus obtained by this means is not pure, as it muſt partake conſiderably of the metal employed.

Arſenic readily unites with ſulphur, and riſes with it in a yellow compound called *orpiment*.

Sulphur cannot be ſeparated from arſenic but by the intervention of two bodies only; to wit, a fixed alkali and mercury.

The property which mercury poſſeſſes of ſeparating ſulphur from arſenic is founded on this, that theſe two metallic ſubſtances are incapable of contracting any union; whereas, though moſt of the other metals and ſemimetals have a greater affinity with ſulphur than mercury hath, nevertheleſs they are all unable to decompound orpiment; becauſe ſome of them have as great an affinity with arſenic as with ſulphur; others have no affinity with either; and laſtly, ſulphur hath as great an affinity with arſenic as with any of them.

It muſt be obſerved, that, if fixed alkalis be employed to purify arſenic in this manner, no more muſt be uſed than is neceſſary to abſorb the ſulphur or the phlogiſton, of which alſo it is their nature to deprive arſenic; for otherwiſe, as it has been ſhewn that arſenic readily unites with alkalis, they would abſorb a conſiderable quantity thereof.

Of OIL *in general.*

OIL is an unctuous body, which burns and conſumes with flame and ſmoke, and is not ſoluble in water. It conſiſts of the phlogiſton united with water by means of an acid. There is, moreover, in its compoſition a certain proportion of earth, more or leſs according to each ſeveral ſort of oil.

The inflammability of oil evidently proves that it contains the phlogiſton. That an acid is one of its conſtituent principles many experiments demonſtrate, of which theſe are the chief: If certain oils be long triturated with an alkaline ſalt, and the alkali afterwards diſſolved in water, cryſtals of a true neutral ſalt will be produced: ſome metals, and particularly copper, are corroded and ruſted by oils, juſt as they are by acids: again, acid cryſtals are found in ſome oils that have been long kept. This acid in oil ſerves undoubtedly to unite its phlogiſton with its water; becauſe theſe two ſubſtances having no affinity with each other cannot be united without the intervention of ſuch a medium as an acid, which has an affinity with both. As to the exiſtence of water in oils, it appears plainly when they are decompoſed by repeated diſtillations, eſpecially after mixing them with abſorbent earths. Laſtly, when an oil is deſtroyed by burning, a certain quantity of earth is conſtantly left behind.

Oils expoſed to the fire in cloſe veſſels paſs over almoſt wholly from the containing veſſel into any other applied to receive them. There remains, however, a ſmall quantity of black matter, which is extremely fixed, and continues unalterable as long as it has no communication with the external air, be the force of the fire ever ſo violent. This matter is no other than part of the phloſtiſton of the oil united with its moſt fixed and groſſeſt earth; and this is what we called *charcoal*, or plainly a *coal*.

Of CHARCOAL.

WHEN oil happens to be united to much earth, as it is in vegetable and animal bodies, it leaves a conſiderable quantity of *coal* or charred matter.

This coal, expoſed to the fire in the open air, burns and waſtes, but without blazing like other combuſtible matters: there appears only a ſmall bluiſh flame, but not the leaſt ſmoke. Moſt commonly it only glows and ſparkles, and ſo gradually falls into aſhes, which are nothing but the earth of the body combined with an alkaline ſalt in burning. This alkaline ſalt may be ſeparated from the earth, by lixiviating the aſhes with water, which diſſolves all the ſalt, and leaves the earth quite pure.

Charcoal is unalterable and indeſtructible by any other body but fire; whence it follows, that when it is not actually kindled and ignited, the moſt powerful agents, ſuch as the acids, though ever ſo ſtrong and concentrated, have not the leaſt effect on it.

The caſe is otherwiſe when it is lighted, that is, when its phlogiſton begins to ſeparate from its earth; for then the pure acid of vitriol being joined therewith contracts an inſtantaneous union with its phlogiſton, and evaporates in a volatile ſulphureous ſpirit. If the vitriolic acid, inſtead of being applied quite pure, be firſt clogged with ſome baſis, eſpecially an alkaline one, it quits that baſis, enters into a more intimate union with the phlogiſton of the burning coal, and ſo forms an actual ſulphur, with which the alkali now unites and forms a hepar.

The pure acid ſea-ſalt hath not been obſerved to act in the leaſt upon charcoal, eſpecially when it is not on fire. But when this acid is incorporated with an alkaline or metallic baſis, and combined according to a peculiar proceſs with burning charcoal, it in like manner quits its baſis, unites with the phlogiſton, and therewith forms a phoſphorus.

Nor has the pure nitrous acid any effect on a charred coal, even when ignited: and ſo far is it from being able to kindle a cold one, that when poured on a live one, it extinguiſhes it like water. But when this acid is united with a baſis, it quits it rapidly as ſoon as it touches a burning coal, and ruſhes violently into an union with the phlogiſton thereof. From this union there probably ariſes, as we ſaid before, a kind of ſulphur or phoſphorus, which is ſo inflammable as to be deſtroyed by the fire the very moment it is generated.

The acids of nitre and vitriol act upon oils; but very differently, according to the quantity of phlegm they contain. If they be awakened with much water, they have no effect at all upon oils; if they contain little water, or be dephlegmated to a certain degree, they diſſolve them with heat, and with them form compounds of a thick conſiſtence. Acids thus combined in a conſiderable proportion with oils render them ſoluble in water.

Of Soap.

Alkalis alſo have the ſame property. When an oil is combined with an acid, or an alkali, in ſuch a manner that the compound reſulting from their union is ſoluble in water; ſuch a compound may in general be called *ſoap*. Soap itſelf hath the property of rendering fat bodies in ſome meaſure ſoluble in water; on which account it is very uſeful for ſcouring or cleanſing any thing greaſy.

Oily and ſaline ſubſtances, combined together, obſerve the ſame general rules as all other combinations; that is, they mutually communicate the properties belonging to each: thus oils, which naturally are not ſoluble in water, acquire by their union with ſaline matters the property of diſſolving therein; and ſalts loſe by their conjunction with oils part of their natural tendency to incorporate with water; ſo that while they ſerve to conſtitute ſoap, they do not, as before, attract the moiſture of the air, *&c.* and in like manner, as they are not inflammable, they conſiderably leſſen the inflammability of the oils combined with them.

Acid ſoaps are decompounded by alkalis, as alkaline ſoaps are by acids, according to the general rules of affinities.

The acids of nitre and vitriol, when highly concentrated, diſſolve oils with ſuch violence as to heat them, make them black, burn them, and even ſet them on fire. How ſea-ſealt affects oils is not yet ſufficiently aſcertained.

All oils have the property of diſſolving ſulphur; which is not at all ſurpriſing, ſeeing each of its component principles hath an affinity with oil.

It is alſo a property common to all oils to become more fluid, ſubtile, light, and limpid, the oftener they are diſtilled. On the contrary, by being incorporated with ſaline ſubſtances they acquire a greater conſiſtence, and ſometimes form compounds that are almoſt ſolid.

Of the ſeveral ſorts of Oils.

Oils are diſtinguiſhed by the ſubſtances from which they are drawn: and as oils are extracted from minerals, from vegetables, and from animals, there are of courſe mineral, vegetable, and animal oils.

Of Mineral Oils.

In the bowels of the earth we find but one ſort of oil, called *petroleum*: Its ſmell is ſtrong, and not diſagreeable, and its colour ſometimes more, ſometimes leſs yellow. There are certain mineral ſubſtances which yield by diſtillation a great deal of oil very like petroleum. This ſort of ſubſtance is called a *bitumen*, and is, indeed, nothing but an oil rendered conſiſtent and ſolid by being combined with an acid; as appears from hence, that, by uniting petroleum with the acid of vitriol, we can produce an artificial bitumen very like the native.

Of Vegetable Oils.

Vegetable ſubſtances yield a very great quantity and variety of oils; for there is not a plant, or part of a plant, that does not contain one or more ſorts thereof, generally peculiar to itſelf, and different from all others.

By expreſſion only, that is, by bruiſing and ſqueezing vegetable ſubſtances, particularly certain fruits and ſeeds, a ſort of oil is obtained which has ſcarce any ſmell or taſte. Oils of this ſort are very mild and unctuous; and, becauſe in this reſpect they reſemble animal fat more than the reſt do; they are called *fat oils*.

Theſe oils, being expoſed to the air for ſome time, ſooner or later grow thick, acquire an acrid taſte, and a ſtrong diſagreeable ſmell. Some of them congeal with the ſmalleſt degree of cold. This ſort of oil is well adapted to diſſolve thoſe preparations of lead called litharge and minium, with which they form a thick tenacious ſubſtance, that is uſed for the baſis of almoſt all plaiſters. They alſo diſſolve lead in its metalline form, but not ſo eaſily as the ſorts of calx above-mentioned; probably becauſe its body is not ſo much opened, nor its parts ſo divided.

By expreſſion alone we alſo procure from certain vegetable ſubſtances another ſort of oil, which is thin, limpid, volatile, of a pungent taſte, and retains the ſmell of the vegetable that yielded it; on which account it is called an *eſſential oil*. Of this there are ſeveral ſorts, differing from one another, like the fat oils, according to the ſubjects from which they are obtained.

We muſt obſerve, that it is very difficult, or rather in moſt caſes impoſſible, to force from the greateſt part of vegetables, by expreſſion only, all the eſſential oil they contain. For this purpoſe, therefore, recourſe muſt be had to fire: a gentle heat, not exceeding that of boiling water, will extract all the eſſential oils of a vegetable; and this is the moſt uſual and moſt convenient way of procuring them.

The fat oils cannot be obtained by the ſame method: theſe being much leſs volatile than the eſſential oils, require a much greater degree of heat to raiſe them; which, nevertheleſs, they cannot bear without being much ſpoiled and entirely changed in their nature, as ſhall preſently be ſhewn. All oils, therefore, which riſe with the heat of boiling water, and ſuch alone, ſhould be called eſſential oils.

Eſſential oils, in a longer or ſhorter time, according to the nature of each, loſe the fragrant ſmell they had when newly diſtilled, and acquire another which is ſtrong, rancid, and much leſs agreeable: They alſo loſe their tenuity, becoming thick and viſcid; and in this ſtate they greatly reſemble thoſe ſubſtances abounding in oil which flow from certain trees, and which are called *balſams* or *reſins*, according as they are leſs or more conſiſtent.

Balſams and reſins are not ſoluble in water. But there are other oily compounds which likewiſe run from trees; and, though not unlike reſins, are however ſoluble in water. Theſe are called *gums*; and their property of diſſolving in water ariſes from their containing more water and more ſalt than reſins have; or at leaſt their ſaline parts are leſs clogged and more diſengaged.

Balſams and reſins diſtilled with the heat of boiling water yield great quantities of a limpid, ſubtile, odoriferous, and, in one word, eſſential oil. In the ſtill there remains a ſubſtance thicker and more conſiſtent than the balſam or reſin was before diſtillation. The ſame thing happens to eſſential oils which by length of time have acquired a conſiſtence, and are grown reſinous. If they be rediſtilled, they recover their former tenuity, leaving behind them a remainder thicker and more reſinous than they themſelves were. This ſecond diſtillation is called the *rectification* of an oil.

It muſt be obſerved, that an eſſential oil, combined with an acid ſtrong enough to diſſolve it, immediately becomes as thick and reſinous, in conſequence of this union, as if it had been long expoſed to the air: which proves the conſiſtence an oil acquires by long keeping to be owing to this, that its lighteſt and leſs acid parts being evaporated, the proportion of its acid to the remainder is ſo increaſed, that it produces therein the ſame change as an additional acid mixed with the oil would have wrought before the evaporation.

This alſo ſhews us, that balſams and reſins are only eſſential oils combined with a great proportion of acid, and thereby thickened.

If vegetable ſubſtances, from which no more eſſential oil can be drawn by the heat of boiling water, be expoſed to a ſtronger heat, they yield an additional quantity of oil; but it is thicker and heavier than the eſſential oil. Theſe oils are black, and have a very diſagreeable burnt ſmell, which hath made them be called *fetid*, or *empyreumatic* oils. They are moreover very acrid.

It muſt be obſerved, that if a vegetable ſubſtance be expoſed to a degree of heat greater than that of boiling water, before the fat or the eſſential oil is extracted from it, an empyreumatic oil only will then be obtained; becauſe both the fat and eſſential oils, when expoſed to the force of fire, are thereby burnt, rendered acrid, acquire a ſmell of the fire, and, in a word, become truly empyreumatic. There is ground to think, that an empyreumatic oil is nothing elſe but an eſſential or fat oil burnt and ſpoiled by the fire, and that no other oil beſides theſe two exiſts naturally in vegetables.

Empyreumatic oils, diſtilled and rectified ſeveral times by a gentle heat, acquire by every diſtillation a greater degree of tenuity, lightneſs, and limpidity. By this means alſo they loſe ſomething of their diſagreeable odour; ſo that they gradually come nearer and nearer to the nature of eſſential oils: and if the rectifications be often enough repeated, ten or twelve times for inſtance, they become perfectly like thoſe oils: except that their ſmell will never be ſo agreeable, nor like that of the ſubſtances from which they were obtained.

Fat oils may alſo be brought by the ſame means to reſemble eſſential oils: but neither eſſential nor empyreumatic oils are capable of acquiring the properties of fat oils.

Of ANIMAL OILS.

DISTILLATION procures us conſiderable quantities of oil from all the parts of animal bodies, and eſpecially from their fat. This oil at firſt is not very fluid, and is extremely fetid; but by many rectifications it gradually acquires a great degree of clearneſs and tenuity, and at the ſame time loſes much of its diſagreeable odour.

Of FERMENTATION *in general.*

BY fermentation is meant an inteſtine motion, which, ariſing ſpontaneouſly among the inſenſible parts of a body, produces a new diſpoſition and a different combination of thoſe parts.

To excite a fermentation in a mixt body, it is neceſſary, firſt, that there be in the compoſition of that mixt a certain proportion of watery, ſaline, oily, and earthy parts; but this proportion is not yet ſufficiently aſcertained. Secondly, it is requiſite that the body to be fermented be placed in a certain degree of temperate heat; for much cold obſtructs fermentation, and too much heat decompoſes bodies. Laſtly, the concurrence of the air is alſo neceſſary to fermentation.

All vegetable and animal ſubſtances are ſuſceptible of fermentation, becauſe all of them contain in a due proportion the principles above ſpecified. However, many of them want the proper quantity of water, and cannot ferment while they remain in ſuch a ſtate of drineſs. But it is eaſy to ſupply that defect.

With reſpect to minerals properly ſo called, they are not ſubject to any fermentation, at leaſt that our ſenſes can perceive.

There are three ſorts of fermentation, diſtinguiſhed from one another by their ſeveral productions. The firſt produces wines and ſpiritous liquors; for which reaſon it is called the *vinous* or *ſpirituous fermentation*: The reſult of the ſecond is an acid liquor; and therefore it is called the *acetous fermentation*: and the third generates an alkaline ſalt; which, however, differs from the alkaline ſalts hitherto treated of, in this reſpect chiefly, that, inſtead of being fixed, it is extremely volatile: This laſt ſort takes the name of the *putrid* or *putrefactive fermentation*. We ſhall now conſider theſe three ſorts of fermentation and their effects a little more particularly.

Theſe three ſorts of fermentation may take place ſucceſſively in the ſame ſubject; which proves them to be only three different degrees of fermentation, all proceeding from one and the ſame cauſe. Theſe degrees of fermentation always follow the order in which we have here placed them.

Of the Spirituous, *or* Vinous Fermentation.

The juices of almoſt all fruits, all ſaccharine vegetable matters, all farinaceous ſeeds and grains of every kind, being diluted with a ſufficient quantity of water, are proper ſubjects of ſpirituous fermentation. If ſuch liquors be expoſed, in veſſels ſlightly ſtopped, to a moderate degree of heat, they begin in ſome time to grow turbid; there ariſes inſenſibly a ſmall commotion among their parts, attended with a hiſſing noiſe; this by little and little increaſes, till the groſſer parts appear, like little ſeeds or grains, moving to and fro, agitated among themſelves, and thrown up to the ſurface. At the ſame time ſome air-bubbles riſe, and the liquor acquires a pungent, penetrating ſmell, occaſioned by the very ſubtile vapours which exhale from it.

Theſe vapours have never yet been collected, in order to examine their nature; and they are known only by their noxious effects. They are ſo actively pernicious, that if a man comes raſhly into a cloſe place, where large quantities of liquors are fermenting, he ſuddenly drops down and expires, as if he were knocked on the head.

When theſe ſeveral phenomena begin to go off, it is proper to ſtop the fermentation, if a very ſpirituous liquor be required: for if it be ſuffered to continue longer, the liquor will become acid, and from thence proceed to its laſt ſtage, that is, to putrefaction. This is done by ſtopping the containing veſſels very cloſe, and removing them into a cooler place. Then the impurities precipitate, and ſettling at the bottom leave the liquor clear and tranſparent: And now the palate diſcovers that the ſweet ſaccharine taſte it had before fermentation is changed to an agreeable pungency which is not acid.

Liquors thus fermented are in general called *wines*: For though in common life that word properly ſignifies the fermented juice of grapes only, and particular names are given to the fermented juices of other vegetable ſubſtances, as that obtained from apples, is called *cyder*; that made from malt is called *beer*; yet in chemiſtry it is of uſe to have one general term denoting every liquor that has undergone this firſt degree of fermentation.

By diſtillation we draw from wine an inflammable liquor, of a yellowiſh white colour, light, and of a penetrating pleaſant ſmell. This liquor is the truly ſpirituous part of the wine, and the product of fermentation. That which comes off in the firſt diſtillation is commonly loaded with much phlegm and ſome oily parts, from which it may be afterwards freed. In this ſtate it goes by the name of *brandy*; but, when freed from theſe heterogeneous matters by repeated diſtillations, it becomes ſtill clearer, lighter, more fragrant, and much more inflammable, and then is called *ſpirit of wine*, and *rectified ſpirit of wine* or *ardent ſpirits*, if conſiderably purified. The properties which diſtinguiſh an ardent ſpirit from all other ſubſtances are, its being inflammable; its burning and conſuming entirely, without the leaſt appearance of ſmoke or fuliginoſity; its containing no particles reducible to a coal; and its being perfectly miſcible with water. Ardent ſpirits are lighter and more volatile than any of the principles of the mixts from which they were produced, and conſequently more ſo than the phlegm, the acid, and the oil of which they themſelves conſiſt. This ariſes from a particular diſpoſition of theſe principles, which are in a ſingular manner attenuated by fermentation, and thereby rendered more ſuſceptible of expanſion and rarefaction.

Ardent ſpirits are ſuppoſed to be the natural ſolvents of oils and oily matters. But it is very remarkable, that they diſſolve eſſential oils only, without touching the fat of animals, or the fat oils obtained from vegetables by expreſſion; yet when theſe oils have once undergone the action of fire, they become ſoluble in ſpirit of wine, and even acquire a new degree of ſolubility every time they are diſtilled. It is not ſo with eſſential oils, which can never be rendered more ſoluble in ardent ſpirits than they are at firſt; and are ſo far from acquiring a new degree of ſolubility every time they are diſtilled, that on the contrary they even in ſome meaſure loſe that property by repeated rectifications.

Spirit of wine doth not diſſolve fixed alkalis; or at leaſt it takes up but a very ſmall quantity thereof; and hence ardent ſpirits may be freed from much of their phlegm by means of theſe ſalts thoroughly dried: For as they ſtrongly imbibe moiſture, and have even a greater affinity than ardent ſpirits with water; if a fixed alkali well exſiccated be mixed with ſpirit of wine that is not perfectly dephlegmated, the alkali immediately attracts its ſuperfluous moiſture, and is thereby reſolved into a liquor, which on account of its gravity deſcends to the bottom of the veſſel. The ſpirit of wine, which ſwims a-top, is by this means as much dephlegmated, and as dry, as if it had been rectified by ſeveral diſtillations. As it takes up ſome alkaline particles in this operation, it is thereby qualified to diſſolve oily matters with the greater facility. When rectified in this manner, it is called *tartariſed ſpirit of wine*.

Yet ſpirit of wine, even when rectified to an alcohol, is not capable of diſſolving all oily matters. Thoſe named gums will by no means enter into any ſort of union therewith; but it readily diſſolves moſt of thoſe which are known by the appellation of reſins. When it has diſſolved a certain proportion of reſinous particles, it acquires a greater conſiſtence, and forms what is called a *ſpirit varniſh*, or a *drying varniſh*, becauſe it ſoon dries. This varniſh is ſubject to be damaged by water. Many ſorts thereof are prepared, different from each other according to the different reſins employed, or the proportions contain. For this purpoſe, therefore, recourſe muſt be had to fire: a gentle heat, not exceeding that of boiling water, will extract all the eſſential oils of a vegetable; and this is the moſt uſual and moſt convenient way of procuring them.

The fat oils cannot be obtained by the ſame method: theſe being much leſs volatile than the eſſential oils, require a much greater degree of heat to raiſe them; which, nevertheleſs, they cannot bear without being much ſpoiled and entirely changed in their nature, as ſhall preſently be ſhewn. All oils, therefore, which riſe with the heat of boiling water, and ſuch alone, ſhould be called eſſential oils.

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All vegetable and animal ſubſtances are ſuſceptible of fermentation, becauſe all of them contain in a due proportion the principles above ſpecified. However, many of them want the proper quantity of water, and cannot ferment while they remain in ſuch a ſtate of drineſs. But it is eaſy to ſupply that defect.

With reſpect to minerals properly ſo called, they are not ſubject to any fermentation, at leaſt that our ſenſes can perceive.

There are three ſorts of fermentation, diſtinguiſhed from one another by their ſeveral productions. The firſt produces wines and ſpiritous liquors; for which reaſon it is called the *vinous* or *ſpirituous fermentation*: The reſult of the ſecond is an acid liquor; and therefore it is called the *acetous fermentation:* and the third generates an alkaline ſalt; which, however, differs from the alkaline ſalts hitherto treated of, in this reſpect chiefly, that, inſtead of being fixed, it is extremely volatile: This laſt ſort takes the name of the *putrid* or *putrefactive fermentation*. We ſhall now conſider theſe three ſorts of fermentation and their effects a little more particularly.

Theſe three ſorts of fermentation may take place ſucceſſively in the ſame ſubject; which proves them to be only three different degrees of fermentation, all proceeding from one and the ſame cauſe. Theſe degrees of fermentation always follow the order in which we have here placed them.

Of the SPIRITUOUS, *or* VINOUS FERMENTATION.

THE juices of almoſt all fruits, all ſaccharine vegetable matters, all farinaceous ſeeds and grains of every kind, being diluted with a ſufficient quantity of water, are proper ſubjects of ſpirituous fermentation. If ſuch liquors be expoſed, in veſſels ſlightly ſtopped, to a moderate degree of heat, they begin in ſome time to grow turbid; there ariſes inſenſibly a ſmall commotion among their parts, attended with a hiſſing noiſe; this by little and little increaſes, till the groſſer parts appear, like little ſeeds or grains, moving to and fro, agitated among themſelves, and thrown up to the ſurface. At the ſame time ſome air-bubbles riſe, and the liquor acquires a pungent, penetrating ſmell, occaſioned by the very ſubtile vapours which exhale from it.

Theſe vapours have never yet been collected, in order to examine their nature; and they are known only by their noxious effects. They are ſo actively pernicious, that if a man comes raſhly into a cloſe place, where large quantities of liquors are fermenting, he ſuddenly drops down and expires, as if he were knocked on the head.

When theſe ſeveral phenomena begin to go off, it is proper to ſtop the fermentation, if a very ſpirituous liquor be required: for if it be ſuffered to continue longer, the liquor will become acid, and from thence proceed to its laſt ſtage, that is, to putrefaction. This is done by ſtopping the containing veſſels very cloſe, and removing them into a cooler place. Then the impurities precipitate, and ſettling at the bottom leave the liquor clear and tranſparent: And now the palate diſcovers that the ſweet ſaccharine taſte it had before fermentation is changed to an agreeable pungency which is not acid.

Liquors thus fermented are in general called *wines:* For though in common life that word properly ſignifies the fermented juice of grapes only, and particular names are given to the fermented juices of other vegetable ſubſtances, as that obtained from apples, is called *cyder*; that made from malt is called *beer*; yet in chemiſtry it is of uſe to have one general term denoting every liquor that has undergone this firſt degree of fermentation.

By diſtillation we draw from wine an inflammable liquor, of a yellowiſh white colour, light, and of a penetrating pleaſant ſmell. This liquor is the truly ſpirituous part of the wine, and the product of fermentation. That which comes off in the firſt diſtillation is commonly loaded with much phlegm and ſome oily parts, from which it may be afterwards freed. In this ſtate it goes by the name of *brandy*; but, when freed from theſe heterogeneous matters by repeated diſtillations, it becomes ſtill clearer, lighter, more fragrant, and much more inflammable, and then is called *ſpirit of wine*, and *rectified ſpirit of wine*, or *ardent ſpirits*, if conſiderably purified. The properties which diſtinguiſh an ardent ſpirit from all other ſubſtances are, its being inflammable; its burning and conſuming entirely, without the leaſt appearance of ſmoke or fuliginoſity; its containing no particles reducible to a coal; and its being perfectly miſcible with water. Ardent ſpirits are lighter and more volatile than any of the principles of the mixts from which they were produced, and conſequently more ſo than the phlegm, the acid, and the oil of which they themſelves conſiſt. This ariſes from a particular diſpoſition of theſe principles, which are in a ſingular manner attenuated by fermentation, and thereby rendered more ſuſceptible of expanſion and rarefaction.

Ardent ſpirits are ſuppoſed to be the natural ſolvents of oils and oily matters. But it is very remarkable, that they diſſolve eſſential oils only, without touching the fat of animals, or the fat oils obtained from vegetables by expreſſion; yet when theſe oils have once undergone the action of fire, they become ſoluble in ſpirit of wine, and even acquire a new degree of ſolubility every time they are diſtilled. It is not ſo with eſſential oils, which can never be rendered more ſoluble in ardent ſpirits than they are at firſt; and are ſo far from acquiring a new degree of ſolubility every time they are diſtilled, that on the contrary they even in ſome meaſure loſe that property by repeated rectifications.

Spirit of wine doth not diſſolve fixed alkalis; or at leaſt it takes up but a very ſmall quantity thereof; and hence ardent ſpirits may be freed from much of their phlegm by means of theſe ſalts thoroughly dried: For as they ſtrongly imbibe moiſture, and have even a greater affinity than ardent ſpirits with water; if a fixed alkali well exſiccated be mixed with ſpirit of wine that is not perfectly dephlegmated, the alkali immediately attracts its ſuperfluous moiſture, and is thereby reſolved into a liquor, which on account of its gravity deſcends to the bottom of the veſſel. The ſpirit of wine which ſwims a-top is by this means as much dephlegmated, and as dry, as if it had been rectified by ſeveral diſtillations. As it takes up ſome alkaline particles in this operation, it is thereby qualified to diſſolve oily matters with the greater facility. When rectified in this manner, it is called *tartariſed ſpirit of wine*.

Yet ſpirit of wine, even when rectified to an alcohol, is not capable of diſſolving all oily matters. Thoſe named gums will by no means enter into any ſort of union therewith; but it readily diſſolves moſt of thoſe which are known by the appellation of reſins. When it has diſſolved a certain proportion of reſinous particles, it acquires a greater conſiſtence, and forms what is called a *ſpirit varniſh*, or a *drying varniſh*, becauſe it ſoon dries. This varniſh is ſubject to be damaged by water. Many ſorts thereof are prepared, different from each other according to the different reſins employed, or the proportions

tions in which they are uſed. Moſt of theſe varniſhes are tranſparent and colourleſs.

Such bitumens or reſins as ſpirit of wine will not touch are diſſolved in oils by means of fire, and then form another kind of varniſh which water does not hurt. Theſe varniſhes are uſually coloured, and require much longer time to dry than the ſpirit-varniſhes: They are called *oil-varniſhes*.

Spirit of wine hath a much greater affinity with water than with oily matters; and therefore if a ſolution of any oil or reſin in ſpirit of wine be mixed with water, the liquor immediately grows turbid, and acquires a whitiſh milky colour, owing entirely to the oily parts being ſeparated from the ſpirituous menſtruum by the acceſſion of water, and too finely divided to appear in their natural form. But if the liquor ſtands ſome time quiet, ſeveral of theſe particles unite together, and gradually acquire a bulk ſufficient to render them very perceptible to the eye.

Acids have an affinity with ſpirit of wine, and may be combined with it. By this union they loſe moſt of their acidity, and on that account are ſaid to be *dulcified*.

One part of highly concentrated oil of vitriol being mixed with four parts of well dephlegmated ſpirit of wine, there ariſes immediately a conſiderable ebullition and effervеſcence, attended with great heat, and abundance of vapours, which ſmell pleaſantly, but are hurtful to the lungs. At the ſame time is heard a hiſſing like that produced by a piece of red-hot iron plunged in water. Indeed it is proper to mix the liquors very gradually; for otherwiſe the veſſels in which the operation is performed will be in great danger of breaking.

If two liquors thus mixed be diſtilled with a very gentle heat, there riſes firſt a ſpirit of wine of a moſt penetrating and grateful odour: When about half thereof is come over, what follows has a quicker and more ſulphureous ſmell, and is alſo more loaded with phlegm. When the liquor begins to boil a little, there comes off a phlegm which ſmells very ſtrong of ſulphur, and grows gradually more acid. On this phlegm floats a ſmall quantity of a very light and very limpid oil. In the ſtill there remains a thick, blackiſh ſubſtance, ſomewhat like a reſin or bitumen. From this ſubſtance may be ſeparated a good deal of a vitriolic but ſulphureous acid. When that is extracted, there remains a black maſs like a charred coal, which, being put into a crucible, and expoſed to a violent heat, leaves a ſmall portion of earth, very fixed, and even vitrifiable.

By rectifying the ardent ſpirit, which came over in diſtilling the above-mentioned mixture, a very ſingular liquor is obtained, which differs eſſentially both from oils and from ardent ſpirits, though in certain reſpects it reſembles them both. This liquor is known in chemiſtry by the name of *æther*, and its chief properties are as follows.

Æther is lighter, more volatile, and more inflammable, than the moſt highly rectified ſpirit of wine. It quickly flies off when expoſed to the air, and ſuddenly catches fire when any flame approaches it. It burns like ſpirit of wine without the leaſt ſmoke, and conſumes entirely without leaving the ſmalleſt appearance of a coal or of aſhes. It diſſolves oils and oily matters with great eaſe and rapidity. Theſe properties it has in common with an ardent ſpirit. But it reſembles an oil, in that it is not miſcible with water; and this makes it eſſentially different from ſpirit of wine, the nature of which is to be miſcible with all aqueous liquors.

Another very ſingular property of æther is its great affinity with gold, exceeding even that of *aqua regis*. It does not indeed diſſolve gold when in a maſs, and in its metalline form: But if a ſmall quantity of æther be added to a ſolution of gold in *aqua regis*, and the whole ſhaken together, the gold ſeparates from the *aqua regis*, joins the æther, and remains diſſolved therein.

The reaſon of all the phenomena above-mentioned, reſulting from the mixture of ſpirit of wine with oil of vitriol, is founded on the great affinity between this acid and water. For if the vitriolic acid be weak, and as it were over-doſed with watery parts, neither oil nor æther can be obtained by means thereof: But when highly concentrated, it attracts the aqueous parts very powerfully; and therefore being mixed with ſpirit of wine, lays hold of moſt of the water contained in it, and even robs it of ſome portion of that which is eſſential to its nature, and neceſſary to conſtitute it ſpirit of wine: Whence it comes to paſs, that a certain quantity of the oily particles in its compoſition being ſeparated from the watery particles, and ſo brought nearer to each other, they unite and aſſume their natural form; and thus the oil that ſwims at top of the ſulphureous phlegm is produced.

The vitriolic acid moreover thickens and even burns ſome of this oil; and hence comes the bituminous reſiduum left at the bottom of the ſtill, which looks like the reſult of a vitriolic acid combined with common oil. Laſtly, the vitriolic acid becomes ſulphureous, as it always doth when united with oily matters, and alſo very aqueous, on account of the quantity of phlegm which it attracts from the ſpirit of wine.

Æther may be conſidered as a ſpirit of wine exceedingly dephlegmated, even to ſuch a degree that its nature is thereby changed; ſo that the few aqueous particles left in it are not ſufficient to diſſolve the oily particles and keep them aſunder; which therefore being now much nearer to one another than in common ſpirit of wine, the liquor hath loſt its property of being miſcible with water.

Spirit of nitre, well dephlegmated, and combined with ſpirit of wine, preſents likewiſe ſome very ſingular appearances.

Firſt, in the very inſtant of its mixture with ſpirit of wine, it produces a greater and more violent effervеſcence than the vitriolic acid occaſions.

Secondly, this mixture, without the help of diſtillation, and only by ſtopping the bottle in which the liquors are contained, affords a ſort of æther, produced probably by the vapours which aſcend from, and ſwim atop of the mixture.

Thirdly, ſome authors pretend, that by diſtilling the mixture under conſideration an oil is obtained greatly reſembling that which riſes from ſpirit of wine combined with vitriolic acid.

Fourthly, the two liquors we are ſpeaking of, being intimately mixed by diſtillation, form a liquor ſlightly acid, uſed in medicine, and known by the name of *ſweet* or *dulcified ſpirit of nitre:* a very proper name, ſeeing the nitrous acid, by uniting with the ſpirit of wine, actually loſes almoſt all its acidity and corroſive quality.

Fifthly, when the diſtillation is finiſhed, there remains in the bottom of the veſſel a thick, blackiſh ſubſtance, nearly reſembling that which is found after diſtilling oil of vitriol and ſpirit of wine.

Spirit of ſalt hath likewiſe been combined with ſpirit of wine; but it does not unite therewith ſo eaſily or ſo intimately as the two acids above mentioned. To mix them thoroughly, the ſpirit of ſalt muſt be highly concentrated, and ſmoking; and moreover the aſſiſtance of the ſtill muſt be called in. Some authors pretend, that from this mixture alſo a ſmall quantity of oil may be obtained; which probably happens when the liquors have the qualities above ſpecified. The marine acid likewiſe, by uniting with ſpirit of wine, loſes moſt of its acidity; on which account it is in like manner called *ſweet* or *dulcified ſpirit of ſalt*. A thick reſiduum is alſo found here after diſtillation.

Of the ACETOUS FERMENTATION.

BESIDES an ardent ſpirit, wine affords a great deal of water, oil, earth, and a ſort of acid which ſhall be conſidered preſently. When the ſpirituous part is ſeparated from theſe other matters, they undergo no further change. But if all the conſtituent parts of wine remain combined together, then, after ſome time, ſhorter or longer as the degree of heat in which the wine ſtands is greater or leſs, the fermentation begins afreſh, or rather arrives at its ſecond ſtage. The liquor once more grows turbid, a new inteſtine motion ariſes, and after ſome days it is found changed into an acid; which, however, is very different from thoſe hitherto treated of. The liquor then takes the name of *vinegar*. The acetous fermentation differs from the ſpirituous, not only in its effect, but alſo in ſeveral of its concomitant circumſtances. Moderate motion is of ſervice to this, whereas it obſtructs the ſpirituous; and it is attended with much more warmth than the ſpirituous. The vapours it produces are not noxious, like thoſe of fermenting wine, Laſtly, Vinegar depoſites no tartar, even when the wine employed in this operation is quite new, and hath not had time to diſcharge its tartar: inſtead of tartar, vinegar depoſites a viſcid matter which is very apt to putrify.

Of VINEGAR.

IF wine, which has gone through this ſecond ſtage of fermentation, be diſtilled, inſtead of an ardent ſpirit, only an acid liquor is obtained, which is called *diſtilled vinegar*.

This acid has the ſame properties as the mineral acids; that is, it unites with alkaline ſalts, abſorbent earths, and metallic ſubſtances, and therewith forms neutral ſaline combinations.

Its affinity with theſe ſubſtances obſerves the ſame order as that obſerved by the mineral acids with regard to the ſame ſubſtances; but in general it is weaker; that is, any mineral acid is capable of expelling the acid of vinegar out of all matters with which it is united.

Vinegar hath likewiſe a greater affinity than ſulphur with alkalis: whence it follows, that it is capable of decompounding that combination of ſulphur with an alkali called liver of ſulphur, and of precipitating the ſulphur it contains.

The acid of vinegar is always clogged with a certain proportion of oily parts, which greatly weaken it, and deprive it of much of its activity; and for this reaſon it is not near ſo ſtrong as the mineral acids, which are not entangled with any oil. By diſtillation, indeed, it may be freed from this oil, and at the ſame time from the great quantity of water which in a manner ſuffocates it, and by that means may be brought much nearer to the nature of the mineral acids: but this attempt hath not yet been proſecuted with the aſſiduity it deſerves. Beſides diſtillation, there is another way of freeing vinegar from a good deal of its phlegm; and that is, by expoſing it to a hard froſt, which readily congeals the watery part into ice, while the acid retains its fluidity.

Vinegar, ſaturated with a fixed alkali, forms a neutral oily ſalt, of a dark colour, which is ſemi-volatile, melts with a very gentle heat, flames when thrown upon burning coals, and diſſolves in ſpirit of wine, of which, however, it requires ſix parts to complete the ſolution. This ſolution being evaporated to drineſs leaves a matter in the form of leaves lying on each other; on which account it hath obtained the name of *terra foliata*. The ſame foliated matter will be obtained, though the ſalt be not previouſly diſſolved in ſpirit of wine; but not ſo readily. This ſalt is alſo called *regenerated tartar*. Under the head of tartar we ſhall ſee the reaſon of theſe different appellations. Regenerated tartar is alſo in ſome degree capable of cryſtallizing: for this purpoſe a reſolution thereof in water muſt be ſlowly evaporated to the conſiſtence of a ſyrup, and then ſuffered to ſtand quiet in a cool place; by which means it will ſhoot into cluſters of cryſtals, lying one upon another, not unlike the feathers on a quill.

With vinegar and ſeveral abſorbent earths, ſuch as calcined pearls, coral, ſhells of fiſh, *&c.* are alſo formed neutral ſaline compounds, each of which take the name of the particular earth employed in its compoſition.

Vinegar perfectly diſſolves lead, and converts it to a neutral metallic ſalt, which ſhoots into cryſtals, and has a ſweet ſaccharine taſte. This compound is called *ſugar of lead*, or *ſal Saturni*.

If lead be expoſed to the bare vapour of vinegar, it will be thereby corroded, calcined, and converted into a white matter much uſed in painting, and known by the name of *ceruſe*, or, when it is finer than ordinary, *white-lead*.

Vinegar corrodes copper likewiſe, and converts it into a beautiful green ruſt, which alſo is uſed in painting, and diſtinguiſhed by the name of *verdegris*. However, vinegar is not commonly employed to make verdegris: for this purpoſe they uſe wine, or the rape of wine, from which fire extricates an acid analogous to that of vinegar.

Of TARTAR.

THIS ſubſtance is a ſaline compound, conſiſting of earthy, oily, and eſpecially acid parts. It is found in the form of cruſts, adhering to the inner ſides of veſſels in which wines have ſtood for ſome time, particularly acid wines, ſuch as thoſe of Germany.

Tartar derives its origin from the ſuperabundant quantity of the acid contained in the juice of the grape. This ſuperfluous acid, being more than is requiſite to conſtitute the ardent ſpirit, unites with ſome of the oil and earth contained in the fermented liquor, and forms a kind of ſalt; which for ſome time continues ſuſpended in that liquor, but, when the wine ſtands undiſturbed in a cool place, is depoſited, as hath been ſaid, on the ſides of the caſk.

When it is purified, there appears on the ſurface of the liquor a ſort of white cryſtalline pellicle, which is ſkimmed off as it forms. This matter is called *cream of tartar*. The ſame liquor which produces this cream, and in which the purified tartar is diſſolved, being ſet to cool, yields a great number of white ſemi-tranſparent cryſtals, which are called *cryſtals of tartar*. The cream and the cryſtals of tartar are therefore no other than purified tartar, and differ from each other in their form only.

Though the cryſtals of tartar have every appearance of a neutral ſalt, yet they are far from being ſuch; for they have all the properties of a true acid, which ſcarce differs from that of vinegar, except that it contains leſs water, and more earth and oil; to which it owes its ſolid form, as well as its property of not being ſoluble in water without much difficulty: for a very great quantity of water is requiſite to keep the cryſtals of tartar in ſolution; and it muſt moreover be boiling hot; otherwiſe as ſoon as it cools moſt of the tartar diſſolved in it ſeparates from the liquor, and falls to the bottom in the form of a white powder.

Tartar is decompoſed by calcination in the open fire. All its oily parts are conſumed or diſſipated in ſmoke, together with moſt of its acid. The other part of its acid, uniting intimately with its earth, forms a very ſtrong and very pure fixed alkali, called *ſalt of tartar*.

It will be ſhewn in its proper place, that almoſt every vegetable matter, as well as tartar, leaves a fixed alkali in its aſhes: yet tartar has theſe peculiar properties; firſt, it aſſumes an alkaline character even when burnt or calcined in cloſe veſſels, whereas other ſubſtances acquire it only by being burnt in the open air; ſecondly, the alkali of tartar is ſtronger and more ſaline than almoſt any that is obtained from other matters.

This alkali, when thoroughly calcined, powerfully attracts the moiſture of the air, and melts into an unctuous alkaline liquor, improperly called *oil of tartar per deliquium*. This is the alkali generally uſed in making the *terra foliata*, mentioned under the head of vinegar; for which reaſon this combination is called *terra foliata tartari*.

Cryſtals of tartar combined with alkali of tartar produce a great efferveſcence while they are mixing, as all acids uſually do; and if the combination be brought exactly up to the point of ſaturation, a perfectly neutral ſalt is formed, which ſhoots into cryſtals, and eaſily diſſolves in water; and this hath procured it the name of *ſoluble tartar*. It is alſo called the *vegetable ſalt*, as being obtained from vegetables only; and again *tartariſed tartar*, becauſe it conſiſts of the acid and the alkali of tartar combined together.

Cryſtals of tartar combined with alkalis procured from the aſhes of ſea-weeds, ſuch as ſoda, which alkalis reſemble the baſis of ſea-ſalt, form likewiſe a neutral ſalt, which cryſtallizes well, and diſſolves eaſily in water. This ſalt is another ſort of ſoluble tartar. It is called *Saignette's ſalt*, from the inventor's name.

Tartar likewiſe diſſolves the abſorbent earths, as lime, chalk, *&c.* and with them forms neutral ſalts which are ſoluble in water. It even attacks metallic bodies, and when combined with them becomes ſoluble. A ſoluble tartar for medical uſe is prepared with cryſtals of tartar and iron: the metallic ſalt thereby produced hath the name of *chalybeated ſoluble tartar*. This ſalt attracts the moiſture of the air, and is one of thoſe which do not cryſtallize.

Cryſtallized tartar acts alſo upon ſeveral other metallic ſubſtances: for inſtance, it diſſolves the regulus, liver, and glaſs of antimony, and thence acquires an emetic quality: It is then called *ſtibiated*, or *emetic tartar*. It likewiſe diſſolves lead, and therewith forms a ſalt which, in the figure of its cryſtals, reſembles tartariſed tartar.

It is very extraordinary, that tartar, which of itſelf is not ſoluble in water, ſhould be ſoluble therein when become a neutral ſalt by uniting either with alkalis or with abſorbent earths, or even with metals. All the ſoluble tartars are eaſily decompounded by expoſing them to a certain degree of heat. In diſtillation they yield the ſame principles which are obtained from tartar; and what remains fixed in the fire, after they are thoroughly burnt, is a compound of the alkali which tartar naturally produces, and of the alkaline or metallic ſubſtance with which it was converted into a neutral ſalt.

As cryſtal of tartar is the weakeſt of all acids, on account of the oily and earthy matters with which it is combined, ſoluble tartars are decompounded by all the acids; by any of which cryſtal of tartar may be ſeparated from the ſubſtance that ſerves it for a baſis and renders it a neutral ſalt.

Of the Putrid Fermentation, or Putrefaction.

EVERY body which hath gone through the two ſtages of fermentation above deſcribed, that is, the ſpirituous and the acetous fermentation, being left to itſelf in a due degree of warmth, which varies according to the ſubject, advances to the laſt ſtage of fermentation; that is, to putrefaction.

When a body is in a putrefying ſtate, it is eaſy to diſcover, by the vapours which riſe from it, by the opacity which invades it, if a pellucid liquor, and frequently even by a greater degree of heat than is found in the two other ſorts of fermentation, that an inteſtine motion is begun among its conſtituent parts, which laſts till the whole be entirely putrefied.

The effect of this inteſtine motion is to break the union, and change the diſpoſition, of the particles conſtituting the body in which it is excited, and to produce a new combination.

If we examine a ſubſtance that has undergone putrefaction, we ſhall ſoon perceive that it contains a principle which did not exiſt in it before. If this ſubſtance be diſtilled, there riſes firſt, by means of a very gentle heat, a ſaline matter which is exceedingly volatile, and affects the organ of ſmelling briſkly and diſagreeably. Nor is the aid of diſtillation neceſſary to diſcover the preſence of this product of putrefaction: it readily manifeſts itſelf in moſt ſubſtances where it exiſts, as any one may ſoon be convinced by obſerving the different ſmell of freſh and of putrefied urine; for the latter not only affects the noſe, but even makes the eyes ſmart, and irritates them ſo as to draw tears from them in abundance.

This ſaline principle, which is the product of putrefaction, when ſeparated from the other principles of the body which affords it, and collected by itſelf, appears either in the form of a liquor, or in that of a concrete ſalt, according to the different methods uſed to obtain it. In the former ſtate it is called a *volatile urinous ſpirit*; and in the latter a *volatile urinous ſalt*. The qualification of urinous is given it, becauſe a great deal thereof is generated in putrefied urine, to which it communicates its ſmell. It goes alſo by the general name of a *volatile alkali*, whether in a concrete or in a liquid form. The enumeration of its properties will ſhew why it is called an alkali.

Volatile alkalis, from whatever ſubſtance obtained, are all alike, and have all the ſame properties; differing only according to their degrees of purity. The volatile alkali as well as the fixed, conſiſts of a certain quantity of acid combined with, and entangled by a portion of the earth of the mixt body from which it was obtained; and on that account it has many properties like thoſe of a fixed alkali. But there is moreover in its compoſition a conſiderable quantity of a fat or oily matter, of which there is none in a fixed alkali; and on this account again there is a great difference between them. Thus the volatility of the alkali produced by putrefaction, which is the principal difference between it and the other kind of alkali, whoſe nature it is to be fixed, muſt be attributed to the portion of oil which it contains: for there is a certain method of volatilizing fixed alkalis by means of a fatty ſubſtance.

Volatile alkalis have a great affinity with acids, unite therewith rapidly, and with ebullition, and form with them neutral ſalts, which ſhoot into cryſtals, but differ from one another according to the kind of acid employed in the combination.

The neutral ſalts which have a volatile alkali for their baſis are in general called *ammoniacal ſalts*. That whoſe acid is the acid of ſea-ſalt is called *ſal ammoniac*. As this was the firſt known, it gave name to all the reſt. Great quantities of this ſalt are made in Egypt, and thence brought to us. They ſublime it from the ſoot of cow's-dung, which is the fuel of that country, and contains ſea-ſalt, together with a volatile alkali, or at leaſt the materials proper for forming it; and conſequently all the ingredients that enter into the compoſition of ſal ammoniac.

The neutral ſalts formed by combining the acids of nitre and of vitriol with a volatile alkali, are called, after their acids, *nitrous ſal ammoniac*, and *vitriolic ſal ammoniac*: The latter, from the name of its inventor, is alſo called Glauber's *ſecret ſal ammoniac*.

A volatile alkali, then, has the ſame property as a fixed alkali with regard to acids; yet they differ in this, that the affinity of the former with acids is weaker than that of the latter: and hence it follows, that any ſal ammoniac may be decompounded by a fixed alkali, which will lay hold of the acid, and diſcharge the volatile alkali.

A volatile alkali will decompound any neutal ſalt which has not a fixed alkali for its baſis; that is, all ſuch as conſiſt of an acid combined with an abſorbent earth or a metallic ſubſtance. By joining with the acids in which they are diſſolved, it diſengages the earths or metallic ſubſtances, takes their place, and, in conjunction with their acids, forms ammoniac ſalts.

Hence it might be concluded, that, of all ſubſtances, next to the phlogiſton and the fixed alkalis, volatile alkalis have the greateſt affinity with acids in general. Yet there is ſome difficulty in this matter: for abſorbent earths and ſeveral metallic ſubſtances are alſo capable of decompounding ammoniacal ſalts, diſcharging their volatile alkali, and forming new compounds by uniting with their acids. This might induce us to think that theſe ſubſtances have nearly the ſame affinity with acids.

But it is proper to obſerve, that a volatile alkali decompounds ſuch neutral ſalts as have for their baſis either an abſorbent earth or a metallic ſubſtance, without the aid of fire; whereas abſorbent earths or metallic ſubſtances will not decompound an ammoniacal ſalt, unleſs they be aſſiſted by a certain degree of heat.

Now, as all theſe matters are extremely fixed, at leaſt in compariſon with a volatile alkali, they have the advantage of being able to reſiſt the force of fire, and ſo of acting in conjunction therewith; and fire greatly promotes the natural action of ſubſtances upon one another: whereas the volatile alkali in the ammoniacal ſalt, being unable to abide the force of fire, is compelled to deſert its acid; and that ſo much the more quickly, as its affinity therewith is conſiderably weakened by the preſence of an earthy or metallic ſubſtance, both of which have a great affinity with acids.

Theſe conſiderations oblige us to conclude, that volatile alkalis have a ſomewhat greater affinity, than abſorbent earths and metallic ſubſtances, with acids.

Ammoniacal ſalts projected upon nitre in fuſion make it detonate; and the nitrous ſal ammoniac detonates by itſelf, without the addition of any inflammable matter. This ſingular effect evidently demonſtrates the exiſtence of an oily matter in volatile alkalis; for it is certain that nitre will never deflagrate without the concurrence and even the immediate contact of ſome combuſtible matter.

This oily ſubſtance is often found combined with volatile alkalis in ſuch a large proportion as to diſguiſe it in ſome meaſure, and render it exceeding foul. The ſalt may be freed from its ſuperfluous oil by repeated ſublimations;

tions; and particularly by ſubliming it from abſorbent earths, which readily drink up oils. This is called the *rectification* of a volatile alkali. The ſalt, which before was of a yellowiſh or dirty colour, by being thus rectified, becomes very white, and acquires an odour more pungent and leſs fetid than it had at firſt, that is, when obtained by one ſingle diſtillation from a putrid ſubſtance.

It is proper to obſerve, that the rectification of a volatile alkali muſt not be carried too far, or repeated too often; for by that means it may be entirely decompoſed at length; and particularly if an abſorbent earth, and eſpecially chalk, be employed for that purpoſe, the ſalt may be converted into an oil, an earth, and water.

Volatile alkalis act upon ſeveral metallic ſubſtances, and particularly on copper; of which they make a moſt beautiful blue ſolution. On this property depends a pretty ſingular effect, which happens ſometimes when we attempt by means of a volatile alkali to ſeparate copper from an acid with which it is combined. Inſtead of ſeeing the liquor grow turbid, and the metal fall, both which generally happen when any alkali whatever is mixed with a metallic ſolution, we are ſurpriſed to obſerve the ſolution of copper, upon adding a volatile alkali, retain its limpidity, and let fall no precipitate; or at leaſt if the liquor does grow turbid, it remains ſo but for a moment, and inſtantly recovers its tranſparency. This is occaſioned by adding ſuch a quantity of volatile alkali as is more than ſufficient fully to ſaturate the acid of the ſolution, and conſiderable enough to diſſolve all the copper as faſt as it is ſeparated from the acid. On this occaſion the liquor requires a deeper blue than it had before; which ariſes from the property which volatile alkalis have of giving this metal, when combined with them, a fuller blue than any other ſolvent can: Hence we have a touchſtone to diſcover copper where-ever it is; for, let the quantity of this metal, combined with other metals, be ever ſo ſmall, a volatile alkali never fails to diſcover it, by making it appear of a blue colour.

Though a volatile alkali be conſtantly the reſult of putrefaction, yet it muſt not therefore be imagined, that none can be produced by any other means; on the contrary, moſt of thoſe which contain the ingredients neceſſary to form it, yield no inconſiderable quantity thereof in diſtillation. Tartar, for example, which by being burnt in an open fire is converted, as was ſhewn, into a fixed alkali, yields a volatile alkali when it is decompoſed in cloſe veſſels; that is, when it is diſtilled: Becauſe, in this latter caſe, the oily part is not diſſipated or burnt, as it is by calcination in a naked fire, but has time to unite with ſome of the earth and acid of the mixt, in ſuch a manner as to form a true volatile alkali.

To prove that on this occaſion, as well as on all others, where unputrefied bodies yield a volatile alkali, this ſalt is the product of the fire, we need only obſerve, that in theſe diſtillations it never riſes till after ſome part of the phlegm of the acid, and even of the thick oil of the mixt, is come over; which never is the caſe when it is formed before-hand in the body which is the ſubject of the operation, as it is in thoſe which have undergone putrefaction: For this ſalt, being much lighter and more volatile than thoſe other ſubſtances, riſes of courſe before them in diſtillation.

A General View of Chemical Decompoſition.

THOUGH we have conſidered all the ſubſtances which enter into the compoſition of vegetables, animals, and minerals, whether as primary or as ſecondary principles, it will not be improper to ſhew in what order we obtain theſe principles from the ſeveral mixts; and eſpecially from vegetables and animals, becauſe they are much more complicated than minerals. This is called *analyſing* a compound.

The method moſt commonly taken to decompoſe bodies is by applying to them ſucceſſive degrees of heat, from the gentleſt to the moſt violent, in appropriated veſſels, ſo contrived as to collect what exhales from them. By this means the principles are gradually ſeparated from each other; the moſt volatile riſe firſt, and the reſt follow in order, as they come to be acted on by the proper degree of heat: And this is called *diſtillation*.

But it being obſerved that fire, applied to the decompoſition of bodies, moſt commonly alters their ſecondary principles very ſenſibly, by combining them in a different manner with each other, or even partly decompoſing them, and reducing them to their primitive principles; other means have been uſed to ſeparate thoſe principles without the help of fire.

With this view the mixts to be decompoſed are forcibly compreſſed, in order to ſqueeze out of them all ſuch parts of their ſubſtance as they will by this means part with; or elſe thoſe mixts are for a long time triturated, either along with water, which carries off all their ſaline and ſaponaceous contents; or with ſolvents, ſuch as ardent ſpirits, capable of taking up every thing in them that is of an oily or reſinous nature.

We ſhall here give a ſuccinct account of the effects of theſe different methods, as applied to the principal ſubſtances among vegetables and animals, and likewiſe to ſome minerals.

The ANALYSIS *of* VEGETABLE SUBSTANCES.

A vaſt many vegetable ſubſtances, ſuch as kernels and ſeeds, yield by ſtrong compreſſion great quantities of mild, fat, unctuous oils, which are not ſoluble in ardent ſpirits: Theſe are what we called *expreſſed oils*. They are alſo ſometimes called *fat oils*, on account of their unctuouſneſs, in which they exceed all other ſorts of oil. As theſe oils are obtained without the aid of fire, it is certain that they exiſted in the mixt juſt as we ſee them, and that they are not in the leaſt altered; which could not have been the caſe had they been obtained by diſtillation: For that never produces any oils but ſuch as are acrid and ſoluble in ſpirit of wine.

Some vegetable matters, ſuch as the rind of citrons, lemons, oranges, *&c.* alſo yield, only by being ſqueezed between the fingers, a great deal of oil. This ſpirts out in fine ſmall jets, which being received upon any poliſhed ſurface, ſuch as a looking-glaſs, run together, and form a liquor that is a real oil.

But it muſt be carefully noted, that this ſort of oil, though obtained by expreſſion only, is nevertheleſs very different from the oils mentioned before to which the title of *expreſſed oils* peculiarly belongs: For this is far lighter and thinner; moreover, it retains the perfect odour of the fruit which yields it, and is ſoluble in ſpirit of wine; in a word, it is a true eſſential oil, but abounds ſo in the fruits which produce it, and is lodged therein in ſuch a manner, occupying a vaſt number of little cells provided in the peel for its reception, that a very ſlight preſſure diſcharges it; which is not the caſe with many vegetables that contain an eſſential oil.

Succulent and green plants yield by compreſſion a great deal of liquor or juice, which conſiſts of moſt of the phlegm of the ſalts, and a ſmall portion of the oil and earth of the plant. Theſe juices, being ſet in a cool place for ſome time, depoſit ſaline cryſtals, which are a combination of the acid of the plant with part of its oil and earth, wherein the acid is always predominant. Theſe ſalts, as is evident from the deſcription here given, bear a great reſemblance to the tartar of wine treated of above. They are called *eſſential ſalts*; ſo that tartar might likewiſe be called the *eſſential ſalt of wine*.

Dried plants, and ſuch as are of a ligneous, or acid nature, require to be long triturated with water, before they will yield their eſſential ſalts. Trituration with water is an excellent way to get out of them all their ſaline and ſaponaceous contents.

A vegetable matter that is very oily yields its eſſential ſalt with much difficulty, if at all; becauſe the exceſſive quantity of oil entangles the ſalt ſo that it cannot extricate itſelf or ſhoot into cryſtals. Mr Gerike, in his *Princples of Chemiſtry*, ſays, That if part of the oil of a plant be extracted by ſpirit of wine, its eſſential ſalt may be afterwards obtained with more eaſe and in greater quantity.

Eſſential ſalts are among thoſe ſubſtances which cannot be extracted from mixts by diſtillation; for the firſt impreſſion of fire decompoſes them.

Though the acid which predominates in the eſſential ſalts of plants be moſt commonly analogous to the vegetable acid, properly ſo called, that is, to the acid of vinegar and tartar, which is probably no other than the vitriolic acid diſguiſed; yet it ſometimes differs therefrom, and ſomewhat reſembles the nitrous or the marine acid. This depends on the places where the plants grow which produce theſe ſalts: If they be ſubmarine plants, their acid is a-kin to the acid of ſea-ſalt; if, on the contrary, they grow upon walls, or in nitrous grounds, their acid is like that of nitre. Sometimes one and the ſame plant contains ſalts analogous to all the three mineral acids; which ſhews that the vegetable acids are no other than the mineral acids variouſly changed by circulating through plants.

Liquors containing the eſſential ſalts of plants being evaporated by a gentle heat to the conſiſtence of honey, or even further, are called *extracts*. Hence it is plain, that an extract is nothing but the eſſential ſalt of a plant, combined with ſome particles of its oil and earth, that remained ſuſpended in the liquor, and are now incorporated by evaporation.

Extracts of plants are alſo prepared by boiling them long in water, and then evaporating ſome part of it. But theſe extracts are of inferior virtue; becauſe the fire diſſipates many of the oily and ſaline parts.

EMULSIONS.

Subſtances which abound much in oil, being bruiſed and triturated with water for ſome time, afford a liquor of an opaque dead-white colour like milk. This liquor conſiſts of ſuch juices as the water is capable of diſſolving, together with a portion of the oil, which being naturally indiſſoluble in water, is only divided and diſperſed in the liquor, the limpidity whereof is by that means deſtroyed. This ſort of oily liquor, in which the oil is only divided, not diſſolved, is called an *emulſion*. The oily particles in emulſions ſpontaneouſly ſeparate from the water, when left at reſt, and, uniting into geater maſſes, riſe, on account of their lightneſs, to the ſurface of the liquor, which by that means recovers a degree of tranſparency.

If vegetables, abounding in eſſential oils and reſins, be digeſted in ſpirit of wine, the menſtruum takes up theſe oily matters, as being capable of diſſolving them; and they may afterwards be eaſily ſeparated from it by the affuſion of water. The water, with which ſpirit of wine has a greater affinity than with oily matters, ſeparates them by this means from their ſolvent, agreeable to the common laws of affinities.

Without the help of fire ſcarce any thing, beſides the ſubſtances already mentioned, can be obtained from a plant: But by the means of diſtillation we are enabled to analyſe them more completely. In proſecuting this method of extracting from a plant the ſeveral principles of which it conſiſts, the following order is to be obſerved.

A plant being expoſed to a very gentle heat, in a diſtilling veſſel ſet in the *balneum mariæ*, yields a water which retains the perfect ſmell thereof. Some chemiſts, and particularly the illuſtrious Boerhaave, have called this liquor the *ſpiritus rector*. The nature of this odoriferous part of plants is not yet thoroughly known; becauſe it is ſo very volatile, that it is difficult to ſubject it to the experiments neceſſary for diſcovering all its properties.

If inſtead of diſtilling the plant in the *balneum mariæ*, it be diſtilled over a naked fire, with the precaution of putting a certain quantity of water into the diſtilling veſſel along with it, to prevent its ſuffering a greater heat than that of boiling water, all the eſſential oil contained in that plant will riſe together with that water, and with the ſame degree of heat.

On this occaſion it muſt be obſerved, that no eſſential oil can be obtained from a plant after the *ſpiritus rector* hath been drawn off; which gives ground to think that the volatility of theſe oils is owing to that ſpirit.

The heat of boiling water is alſo ſufficient to ſeparate from vegetable matters the fat oils which they contain: That, however, is to be done by the way of decoction only, and not by diſtillation; becauſe, though theſe oils will ſwim on water, yet they will not riſe in vapours without a greater degree of heat.

When the eſſential oil is come over, if the plant be expoſed to a naked fire, without the addition of water, and the heat be increaſed a little, a phlegm will riſe that gradually grows acid; after which, if the heat be increaſed as occaſion requires, there will come over a thicker and heavier oil; from ſome a volatile alkali; and laſt of all, a very thick, black, empyreumatic oil.

When nothing more riſes with the ſtrongeſt degree of heat, there remains of the plant a mere coal only, called the *caput mortuum*, or *terra damnata*. This coal when burnt falls into aſhes, which being lixiviated with water give a fixed alkali.

It is obſervable, that in the diſtillation of plants which yield an acid and a volatile alkali, theſe two ſalts are often found quite diſtinct and ſeparate in the ſame receiver; which ſeems very extraordinary, conſidering that they are naturally diſpoſed to unite, and have a great affinity with one another. The reaſon of this phenomenon is, that they are both combined with much oil, which embarraſſes them ſo that they cannot unite to form a neutral ſalt, as they would not fail to do were it not for that impediment.

All vegetables, except ſuch as yield a great deal of volatile alkali, being burnt in an open fire, and ſo as to flame, leave in their aſhes a large quantity of an acrid, cauſtic, fixed alkali. But if care be taken to ſmother them, ſo as to prevent their flaming while they burn, by covering them with ſomething that may continually beat down again what exhales, the ſalt obtained from their aſhes will be much leſs acrid and cauſtic; the cauſe whereof is, that ſome part of the acid and oil of the plant being detained in the burning, and ſtopped from being diſſipated by the fire, combines with its alkali. Theſe ſalts cryſtallize, and being much milder than the common fixed alkalis, may be uſed in medicine, and taken internally. They are called *Tachenius's ſalts*, becauſe invented by that chemiſt.

Marine plants yield a fixed alkali analogous to that of ſea-ſalt. As for all other plants or vegetable ſubſtances, the fixed alkalis obtained from them, if rightly prepared and thoroughly calcined, are all perfectly alike, and of the ſame nature.

The laſt obſervation we have to make on the production of a fixed alkali is, that if the plant you intend to work upon be ſteeped or boiled in water before you burn it, a much ſmaller quantity of ſalt will be obtained from it; nay, it will yield none at all, if repeated boilings have robbed it entirely of thoſe ſaline particles which muſt neceſſarily concur with its earth to form a fixed alkali.

The ANALYSIS *of* ANIMAL SUBSTANCES.

SUCCULENT animal ſubſtances, ſuch as new-killed fleſh, yield by expreſſion a juice or liquid, which is no other than the phlegm, replete with all the principles of the animal body, except the earth, of which it contains but little. The hard or dry parts, ſuch as the horns, bones, *&c.* yield a ſimilar juice, by boiling them in water. Theſe juices become thick, like a glue or jelly, when their watery parts are evaporated; and in this ſtate they are true extracts of animal matters. Theſe juices afford no cryſtals of eſſential ſalt, like thoſe obtained from vegetables, and ſhew no ſign either of an acid or an alkali.

Great part of the oil which is in the fleſh of animals may be eaſily ſeparated without the help of fire; for it lies in a manner by itſelf: It is commonly in a concrete form, and is called *fat*. This oil ſomewhat reſembles the fat oils of vegetables; for like them it is mild, unctuous, indiſſoluble in ſpirit of wine, and is ſubtilized and attenuated by the action of fire. But there is not in animals, as in vegetables, any light eſſential oil, which riſes with the heat of boiling water; ſo that, properly ſpeaking, animals contain but one ſort of oil.

Few animal ſubſtances yield a perceptible acid. Ants and bees are almoſt the only ones from which any can be obtained; and indeed the quantity which they yield is very ſmall, as the acid itſelf is extremely weak.

The reaſon thereof is, that as animals do not draw their nouriſhment immediately from the earth, but feed wholly either on vegetables or on the fleſh of other animals, the mineral acids, which have already undergone a great change by the union contracted between them and the oily matters of the vegetable kingdom, enter into a cloſer union and combination with theſe oily parts while they are paſſing through the organs and ſtrainers of animals; whereby their properties are deſtroyed, or at leaſt ſo impaired that they are no longer ſenſible.

Animal matters yield in diſtillation, firſt, a phlegm, and then, on increaſing the fire, a pretty clear oil, which gradually becomes thicker, blacker, more fetid, and empyreumatic. It is accompanied with a great deal of volatile alkali; and if the fire be raiſed and kept up till nothing more comes over, there will remain in the diſtilling veſſel a coal like that of vegetables; except that when it is reduced to aſhes, no fixed alkali, or at leaſt very little, can be obtained from them, as from the aſhes of vegetables. This ariſes from hence, that, as we ſaid before, the ſaline principle in animals being more intimately united with the oil than it is in plants, and being conſequently more attenuated and ſubtilized, is too volatile to enter into the combination of a fixed alkali; on the contrary, it is more diſpoſed to join in forming a volatile alkali, which on this occaſion does not riſe till after the oil, and therefore muſt certainly be the production of the fire.

The chyle, and the milk of animals which feed on plants, ſtill retain ſome likeneſs to vegetables; becauſe the principles of which theſe liquors are compoſed have not gone through all the changes which they muſt ſuffer before they enter into the animal combination.

Urine and ſweat are excrementitious aqueous liquors, loaded chiefly with the ſaline particles which are of no ſervice towards the nouriſhment of the animal, but paſs through its ſtrainers without receiving any alteration; ſuch as the neutral ſalts which have a fixed alkali for their baſis, and particularly the ſea-ſalt which happens to be in the food of animals, whether it exiſt therein naturally, as it does in ſome plants, or whether the animals eat it to pleaſe their palates.

The ſaliva, the pancreatic juice, and eſpecially the bile, are ſaponaceous liquors; that is, they conſiſt of ſaline and oily particles combined together; ſo that being themſelves diſſolved in an aqueous liquor, they are capable of diſſolving likewiſe the oily parts, and of rendering them miſcible with water.

Laſtly, The blood being the receptacle of all theſe liquors, partakes of the nature of each, more or leſs in proportion to the quantity thereof which it contains.

The ANALYSIS *of* MINERAL SUBSTANCES.

MINERALS differ greatly from vegetables, and from animals; they are not near ſo complex as thoſe organized bodies, and their principles are much more ſimple; whence it follows, that theſe principles are much more cloſely connected, and that they cannot be ſeparated without the help of fire; which not having on their parts the ſame action and the ſame power as on organized bodies, hath not the ſame ill effect on them; we mean the effect of changing their principles, or even deſtroying them entirely.

We do not here ſpeak of pure, vitrifiable, or refractory earths; of mere metals and ſemi-metals; of pure acids; or even of their ſimpleſt combinations, ſuch as ſulphur, vitriol, alum, ſea ſalt: Of all theſe we have ſaid enough.

We are now to treat of bodies that are more complex, and therefore more ſuſceptible of decompoſition. Theſe bodies are compound maſſes or combinations of thoſe above-mentioned; that is, metallic ſubſtances as they are found in the bowels of the earth, united with ſeveral ſorts of ſand, ſtones, earths, ſemi-metals, ſulphur, &c. When the metallic matter is combined with other matters in ſuch a proportion to the reſt that it may be ſeparated from them with advantage and profit, theſe compounds are called *ores*: when the caſe is otherwiſe, they are called *pyrites*, and *marcaſites*; eſpecially if ſulphur or arſenic be predominant therein, which often happens.

In order to analyſe an ore, and get out of it the metal it contains, the firſt ſtep is to free it from a great deal of earth and ſtones which commonly adhere to it very ſlightly and ſuperficially. This is effected by pounding the ore, and then waſhing it in water; to the bottom of which the metalline parts preſently ſink, as being the heavieſt, while the ſmall particles of earth and ſtone remain ſuſpended ſome time longer.

Thus the metallic part is left combined with ſuch matters only as are moſt intimately complicated with it. Theſe ſubſtances are moſt commonly ſulphur and arſenic. Now, as they are much more volatile than other mineral matters, they may be diſſipated in vapours, or the ſulphur may be conſumed, by expoſing the ore which contains them to a proper degree of heat. If the ſulphur and arſenic be deſired by themſelves, the fumes thereof may be catched and collected in proper veſſels and places. This operation is called *roaſting* in ore.

The metal thus depurated is now fit to be expoſed to a greater force of fire, capable of melting it.

On this occaſion the ſemi metals and the imperfect metals require the addition of ſome matter abounding in phlogiſton, particularly charcoal-duſt; becauſe theſe metallic ſubſtances loſe their phlogiſton by the action of the fire, or of the fluxes joined with them, and therefore without this precaution would never acquire either the ſplendor or the ductility of a metal. By this means the metallic ſubſtance is more accurately ſeparated from the earthy and ſtony parts, of which ſome portion always remains combined therewith till it is brought to fuſion. For, as we obſerved before, a metallic glaſs or calx only will contract an union with ſuch matters; a metal poſſeſſed of its phlogiſton and metalline form being utterly incapable thereof.

We took notice of the cauſe of this ſeparation above, where we ſhewed that a metal poſſeſſed of its phlogiſton and metalline form will not remain intimately united with any calcined or vitrified matter, not even with its own calx or glaſs.

The metal therefore on this occaſion gathers into a maſs, and lies at the bottom of the veſſel, as being moſt ponderous; while the heterogeneous matters float upon it in the form of a glaſs, or a ſemi-vitrification. Theſe floating matters take the name of *ſcoriæ*, and the metalline ſubſtance at bottom is called the *regulus*.

It frequently happens, that the metalline regulus thus precipitated, is itſelf a compound of ſeveral metals mixed together, which are afterwards to be ſeparated.

It is proper to obſerve, before we quit this ſubject, that the rules here laid down for analyſing ores are not abſolutely general: For example, it is often adviſeable to roaſt the ore before you waſh it; for by that means ſome ores are opened, attenuated, and made very friable, which would coſt much trouble and expence, on account of their exceſſive hardneſs, if you ſhould attempt to pound them without a previous torrefaction.

It is alſo frequently neceſſary to ſeparate the ore from part only of its ſtone; ſometimes to leave the whole; and ſometimes to add more to it, before you ſmelt it. This depends on the quality of the ſtone, which always helps to promote fuſion when it is in its own nature fuſible and vitrifiable: It is then called the *fluor* of the ore.

We ſhall now give a ſuccinct account of the principal ores and mineral bodies, contenting ourſelves with juſt pointing out the particulars of which they ſeverally conſiſt.

Of the PYRITES.

The Yellow Pyrites.

THE yellow pyrites is a mineral conſiſting of ſulphur, iron, an unmetallic earth, and frequently a little copper: The ſulphur, which is the only one of theſe principles that is volatile, may be ſeparated from the reſt by ſublimation: It uſually makes a fourth, and ſometimes a third, of the whole weight of theſe pyrites. The other principles are ſeparated from one another by fuſion and reduction with the phlogiſton, which, by metallizing the ferruginous and cupreous earths, parts them from the unmetallic earth: for this earth vitrifies, and cannot afterwards continue united with metallic matters poſſeſſed of their metalline form.

There is yet another way of decompoſing the yellow pyrites, which is to let it lie till it effloreſces, or begins to ſhoot into flowers; which is nothing but a ſort of ſlow accenſion of the ſulphur it contains. The ſulphur being by this means decompoſed, its acid unites with the ferruginous and cupreous parts of the pyrites, and therewith forms green and blue vitriols; which may be extracted by ſteeping in water the pyrites which has effloreſced or been burnt, and then evaporating the lixivium to a pellicle; for by this means the vitriol will ſhoot into cryſtals.

Sometimes the pyrites contains alſo an earth of the ſame nature with that of alum: A pyrites of this ſort, after flowering, yields alum as well as vitriol.

The White Pyrites.

The white pyrites contains much arſenic, a ferruginous earth, and an unmetallic earth. The arſenic being a volatile principle, may be ſeparated by ſublimation or diſtillation from the reſt, which are fixed; and theſe again may be disjoined from each other by fuſion and reduction, as was ſaid in relation to the yellow pyrites.

The Copper Pyrites.

The copper pyrites contains ſulphur, copper, and an unmetallic earth. A great deal thereof likewiſe holds arſenic, and its colour approaches more or leſs to orange, yellow, or white, according to the quantity of arſenic in it. It may be decompoſed by the ſame means as the yellow and white pyrites.

OF ORES.

Of Gold Ores.

Gold being conſtantly found in its metalline form, and never combined with ſulphur and arſenic, its ores are not, properly ſpeaking, ores; becauſe the metal contained in them is not mineralized. The gold is only lodged between particles of ſtone, earth, or ſand, from which it is eaſily ſeparated by lotion, and by amalgamation with quick-ſilver. The gold thus found is ſeldom pure, but is frequently alloyed with more or leſs ſilver, from which it is to be ſeparated by quartation.

It is alſo very common to find gold in moſt ores of other metals or ſemi-metals, and even in the pyrites; but the quantity contained therein is generally ſo ſmall, that it would not pay the coſt of extracting it. However, if any ſhould incline to attempt it, merely out of curioſity, it would be neceſſary to begin with treating theſe ores in the manner proper for ſeparating their metalline part; then to cupel the metalline regulus ſo obtained; and laſtly, to refine it by quartation.

Of Silver Ores.

It is no rare thing to find ſilver, as well as gold, in its metalline form, only lodged in ſundry earths and ſtony matters, from which it may be ſeparated in the ſame manner as gold. But the greateſt quantities of this metal are uſually dug out of the bowels of the earth in a truly mineral ſtate; that is, combined with different ſubſtances, and particularly with ſulphur and arſenic.

Several ſilver ores are diſtinguiſhed by peculiar characteriſtics, and are accordingly denoted by particular names. That which is called the *vitreous ſilver ore*, is ſcarce any thing elſe but a combination of ſilver and ſulphur. Another is known by the name of the *horny ſilver ore*, becauſe when in thin plates it is ſemi-tranſparent: In this ore the ſilver is mineralized by ſulphur and a little arſenic. The *red ſilver ore* is of the colour which its name imports, ſometimes more, ſometimes leſs vivid; and is chiefly compoſed of ſilver, arſenic, and ſulphur: It alſo contains a little iron.

Theſe three ores are very rich in ſilver: the firſt contains nearly three-fourths of its weight, and the others about two-thirds of theirs.

There is a fourth, called the *white ſilver ore*, which though it be heavier, is not ſo rich in ſilver, becauſe it contains much copper. Many other ores contain ſilver, yet are not, properly ſpeaking, ſilver ores; becauſe a much greater quantity of other metals than of ſilver is found in them.

When a ſilver ore is to be decompoſed, in order to have the ſilver pure, or when ſilver is to be extracted out of any ore that contains it, the firſt thing to be done is to roaſt the ore in order to clear it of the volatile minerals: and as ſilver cannot be had pure without the operation of the cupel, which requires more or leſs lead to be joined with it, it is uſual to mix with the torrified ſiler ore a quantity of lead proportioned to that of the heterogeneous matters combined with the ſilver, and to melt the whole together. Part of the added lead vitrifies during the fuſion, and at the ſame time converts ſome of the heterogeneous matter alſo into glaſs, with which it forms a ſcoria that riſes to the ſurface of the matter. The other part of the lead, with which the ſilver is mixed, falls to the bottom in the form of a regulus, which muſt be cupelled in order to have the ſilver pure.

Of Copper Ores.

Copper is much ſeldomer found in a metalline form, than gold or ſilver; it is commonly in a mineral ſtate; it is mineralized by ſulphur and arſenic: almoſt all its ores contain alſo more or leſs iron; ſometimes a little ſilver or even gold, together with unmetallic earths and ſtones, as all ores do.

Moſt copper ores are of a beautiful green or blue, or elſe in ſhades blended of theſe two colours. The minerals called mountain green, and mountain blue, are true copper ores; not in the form of hard ſtones, like other ores, but crumbly and friable like earth.

Nevertheleſs there are ſeveral copper ores of different colours, as aſh-coloured, whitiſh, and ſhaded with yellow or orange: which colours ariſe from the different proportions of arſenic, ſulphur, and iron, which theſe ores contain.

In order to decompoſe a copper ore, and to extract the copper it contains, it is firſt of all to be freed from as many of its earthy, ſtony, ſulphureous, and arſenical parts, as is poſſible, by roaſting and waſhing; then what remains is to be mixed with a flux compounded of a fixed alkali and ſome inflammable matter; a little ſea-ſalt is to be put over all, and the whole melted by a ſtrong fire. The ſalts facilitate the fuſion and ſcorification of the unmetallic matters, and therewith form a ſlag, which being the lighteſt riſes to the ſurface. The metalline matters are collected below in the form of a ſhining regulus of copper; which however, is not uſually fine copper, but requires to be purified.

In order to ſeparate the copper from the unmetallic matters, it is abſolutely neceſſary to melt its ore along with the inflammable ſubſtances abounding in phlogiſton. For, as this metal is not poſſeſſed of its metalline form while it is in a mineral ſtate, as it is deſtitute of the true quantity of phlogiſton. and, though it were not, would loſe it by the action of the fire, it would come to paſs, that, if its ore were melted without the addition of any inflammable matter, the cupreous earth, or calx, would be ſcorified and confounded with the unmetallic matters; and as all metallic matters, except gold and ſilver, are ſubject to this inconvenience as well as copper, the addition of an inflammable ſubſtance, in fluxing all ores that contain them, is a general rule that ought conſtantly to be obſerved.

Of Iron Ores.

Iron is ſeldom found pure and malleable in the earth; yet it is much ſeldomer found in the mineral ſtate, properly ſo called, than any of the other metals: for moſt iron ores are ſcarce any thing more than a ferruginous earth mixed in different proportions with unmetallic earths and ſtones. Some of them, however, contain alſo volatile minerals, ſuch as ſulphur and arſenic; and therefore it is neceſſary to roaſt the iron ores, like all others, before you attempt to extract the metal out of them. That being done, they are to be ſmelted with a flux conſiſting of fuſible and inflammable matters, as the general rule directs.

Iron is the commoneſt of all metals; nay, it is ſo univerſally diffuſed through the earth, that it is difficult to find any ſtone, earth, or ſand, that does not contain ſome of it; and therefore none of theſe are uſually conſidered and treated as iron ores, except ſuch as contain a great deal of that metal, and melt eaſily. The hematites, emery, yellow pyrites, calamine, all contain a pretty conſiderably quantity of iron; but nobody attempts to extract it from them, becauſe they are very hard to melt.

Ferruginous earth being naturally of an orange colour, a ſtone or earth may be judged to contain iron, if either naturally or after roaſting it appears to have any ſhade of yellow or red.

The ſingular property which iron has of being attracted by the magnet, and of being the only body, excluſive of all others, that is ſo, likewiſe affords us an eaſy method of diſcovering the preſence of this metal among other matters, where it often exiſts in ſuch a ſmall quantity that it could not otherwiſe be found out. For this purpoſe the body in which iron is ſuſpected to lurk, muſt be pulveriſed and torrefied with ſome inflammable matter; and then the powder thus roaſted being touched with a magnet, or a magnetical bar, if it contains any particles of iron they will infallibly adhere to the magnet or bar.

Of Tin Ores.

Tin is never found in the earth pure and malleable, but always in a mineral ſtate, and always mineraliſed by arſenic. Tin ores are not ſulphureous; whence it comes that though tin be the lighteſt of all metals, its ores are nevertheleſs heavier than thoſe of other metals, as arſenic greatly exceeds ſulphur in gravity. Some tin ores contain alſo a little iron. The ores of tin are to be waſhed, roaſted, and ſmelted with a reducing flux, according to the general rules.

Of Lead Ores.

Lead, like tin, is never found but in a mineral ſtate. It is moſt commonly mineraliſed by ſulphur; yet there are ſome lead ores which alſo contain arſenic.

Lead ores, as well as all others, muſt be roaſted and ſmelted with a reducing flux: however, as it is difficult to free them from all their ſulphur by torrefaction only, the reducing flux employed in their fuſion may be made up with a quantity of iron filings, which being incapable of any union with lead, and having a much greater affinity than that metal with ſulphur, will on this occaſion be of great ſervice by interpoſing between them.

Of Quick-Silver Ores.

Running mercury is ſometimes found in certain earths, or grey friable ſtones; but moſt commonly in a mineral ſtate. It is always mineralized by ſulphur, and by ſulphur alone: ſo that cinabar is the only ore of quick-ſilver that we know of: and a very rich one it is, ſeeing it contains ſix or ſeven times as much mercury as ſulphur.

Roaſting can be of no uſe towards decompoſing the ore of mercury, and ſeparating its ſulphur; becauſe mercury being itſelf very volatile would be carried off by the fire together with the ſulphur. In order therefore to part the two ſubſtances of which cinabar conſiſts, recourſe muſt neceſſarily be had to ſome third body, which will unite with one of them, and by that means ſeparate it from the other. Now all the metals, except gold, having a greater affinity than mercury with ſulphur, ſuch a body is eaſily found: any metal but gold may be employed with ſucceſs in this decompoſition; but as iron hath a greater affinity with ſulphur than any of the reſt, and is, moreover, the only one that cannot unite with mercury, it muſt, on account of theſe two qualities, be preferred to all the reſt.

Fixed alkalis are alſo well qualified to abſorb the ſulphur of cinabar. Cinabar muſt be decompounded in cloſe veſſels, and by the way of diſtillation: otherwiſe the mercury, as ſoon as it ſeparates from the ſulphur, will be diſſipated in vapours and entirely loſt.

In this operation it is needleſs to add either flux or phlogiſton; becauſe the cinabar is decompoſed without melting, and the mercury, though in a mineral ſtate, contains, like gold and ſilver, all the phlogiſton requiſite to ſecure its metalline properties.

Of the Ores of Regulus of Antimony.

Regulus of antimony is always found in a mineral ſtate; it is mineraliſed by ſulphur: but ſometimes, tho' rarely, it is alſo combined with a little arſenic.

When the ore of regulus of antimony is to be decompoſed,

poſed, the firſt thing to be done, is to expoſe it to a degree of heat too weak to melt its earthy and ſtony parts, but ſtrong enough to fuſe its reguline together with its ſulphureous parts, which by this means are ſeparated from the earth, and united into one maſs, known by the name of Antimony.

It is plain, that this firſt operation, which is founded on the great fuſibility of antimony, produces, with regard to the ore of regulus of antimony, the ſame effect that waſhing hath on other ores: ſo that after this firſt fuſion nothing more is requiſite to the obtaining of a pure regulus of antimony, but to ſeparate it from its ſulphur by roaſting, and to melt it with ſome matter abounding in phlogiſton, in the ſame manner as other metallic matters are treated. The term calcination is generally uſed to expreſs this torrefaction of antimony, by means whereof the metallic earth of the regulus of antimony is ſeparated from its ſulphur.

As regulus of antimony hath, like mercury, much leſs affinity with ſulphur than the other metals have, it follows that antimony may be decompoſed by the ſame means as cinabar; but the regulus ſo obtained is adulterated with a portion of the additament made uſe of, which combines therewith.

Of the Ores of Biſmuth.

The ore of biſmuth conſiſts of the ſemi-metal mineraliſed by the arſenic, and of an unmetallic earth. It is very eaſy to decompoſe this ore, and to extract the biſmuth it contains: for this purpoſe it need only be expoſed to a moderate heat, whereby the arſenic will be diſſipated in vapours, and the biſmuth melted, which will then ſeparate from the unmetallic earth. This earth, at leaſt in ſeveral ores of biſmuth, poſſeſſes the property of tinging all vitrifiable matters with which it is melted of a beautiful blue colour.

To decompoſe the ore of biſmuth no flux or inflammable matter is uſed; becauſe this ſemi-metal is poſſeſſed, even in its mineral ſtate, of all the phlogiſton requiſite to maintain its metalline properties; and its great fuſibility makes it unneceſſary to melt the metallic earth contained in its ore.

Of the Ores of Zinc.

Zinc is not generally obtained from a particular ore of its own; but ſublimes during the fuſion of a mineral, or rather a confuſed maſs of minerals, that contains this ſemi-metal together with iron, copper, lead, ſulphur, arſenic, and, like all other ores, an unmetallic earth.

Nevertheleſs there is a ſubſtance which may be conſidered as the proper ore of zinc, becauſe it contains a pretty large quantity of that ſemi-metal, a little iron, and an unmetallic earth. It is called calamine, or *lapis calaminaris*: but hitherto the art of procuring zinc directly from this mineral hath no where been practiſed. Calamine is commonly employed only to convert copper into braſs or a yellow metal, by cementing it therewith. Indeed till lately no eaſy or practicable method of obtaining pure zinc from calamine was publicly known; for that ſemi-metal being volatile and very inflammable, its ore cannot be fuſed like others. Mr Margraaf was the firſt who, by mixing powdered charcoal with calamine in cloſe veſſels, obtained a perfect zinc from it, by the means of diſtillation or ſublimation.

Of Arſenical Minerals.

Arsenic, as well as ſulphur, is naturally combined with almoſt all ores, or minerals containing metallic ſubſtances. As it is very volatile, while the matters with which it is united are fixed, at leaſt in compariſon therewith, it is eaſily ſeparated by ſublimation.

The minerals that contain moſt arſenic are the white pyrites, orpiment, and cobalt. We have already conſidered the white pyrites: as to orpiment, it conſiſts of ſulphur and arſenic. Both theſe ſubſtances being very volatile, it is difficult to ſeparate them by ſublimation: yet, with proper management, and a due regulation of the fire, this ſeparation may be effected; becauſe ſulphur ſublimes a little more eaſily than arſenic. But it is more convenient, as well as more expeditious, to make uſe of ſome additament that hath a greater affinity with one of thoſe ſubſtances than with the other. Fixed alkalis and mercury, both of which have more affinity with ſulphur than with arſenic, may be very properly employed on this occaſion Cobalt is a mineral compoſed of arſenic, an unmetallic earth, and frequently biſmuth: and as none of theſe are very volatile, except the arſenic, this may be eaſily ſeparated from the reſt by ſublimation. The unmetallic earth which remains has, like that of the ore of biſmuth, the property of giving a blue colour to any vitrifiable matters melted with it; whence it is conjectured, that cobalt and the ore of biſmuth have a great reſemblance, or are often blended with each other.

Beſides the minerals already recited, there is found in the bowels of the earth another ſpecies of compound body, of which we have already taken notice; but which is ſuppoſed, with ſome degree of probability, to belong as much to the vegetable as to the mineral kingdom: we mean the bitumens; which the beſt obſervations oblige us to conſider as vegetable oils, that by lying long in the earth have contracted an union with the mineral acids, and by that means acquired the thickneſs, conſiſtence, and other properties obſervable in them.

By diſtillation they yield an oil, and an acid not unlike a mineral acid. Mr Bourdelin has even demonſtrated, by a very artful and ingenious proceſs, that amber contains a manifeſt acid of ſea-ſalt.

Explanation of the Table of Affinities or elective Attractions.

We have already explained what is meant by affinities, and have laid down the principal laws to which the relations of different bodies are ſubject. The late Mr Geoffroy, being convinced of the advantages which all who cultivate chemiſtry would receive from having conſtantly before their eyes a ſtate of the beſt aſcertained relations between the chief agents in chemiſtry, was the firſt who undertook to reduce them into order, and unite them all in one point of view, by means of a table. This table will be of conſiderable uſe to ſuch as are beginning to ſtudy

4 AP 54

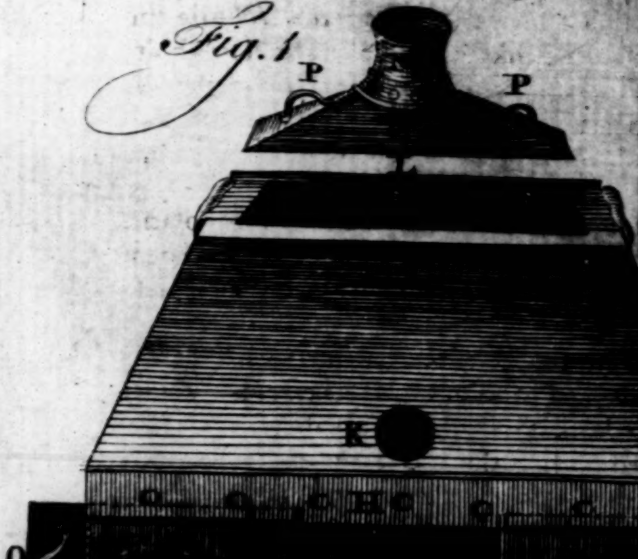
GEOFFROY'S TABLE of the COMPARATIVE AFFINITIES obſerv'd between ſundry Subſtances.

I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	X.	XI.	XII.	XIII.	XIV.	XV.	XVI.
⤳	>⊖	>⦶	>⊕	⛛	⊖▿	⊖▵	MS	🜍	☿	♄	♀	☽	♂	♕	▽
⊖▿	♃	♂	🜎	>⊕	>⊕	>⊕	>⊖	⊖▿	☉	☽	☿	♄	♕	♂	VS
⊖▵	♕	♀	⊖▿	>⦶	>⦶	>⦶	>⊕	♂	☽	♀	LC	♀	☽ ♀ ♄	☽ ♀ ♄	⊖
⛛	♀	♄	⊖▵	>⊖	>⊖	>⊖	>⦶	♀	♄						
MS	☽	☿	⛛		✠		✠	♄	♀						
	☿	☽	♂		🜍			☽	Zc						
			♀					♕	♕						
			☽					☿							
	☉							☉							

Explanation of the Characters

⤳ *Acid Spirits*
>⊖ *Marine Acid*
>⦶ *Nitrous Acid*
>⊕ *Vitriolic Acid*
⊖▿ *Fixed Alkali*
⊖▵ *Volatile Alkali*
⛛ *Abſorvent Earths*
MS *Metallic Subſtances*
☿ *Mercury*
♕ *Regulus of Antimony*
☉ *Gold*
☽ *Silver*
♀ *Copper*
♂ *Iron*
♄ *Lead*
♃ *Tin*
Zc *Zinc*
LC *Calamine*
🜍 *Sulphur*
🜎 *Phlogiſton*
✠ *Spirits of Vinegar*
▽ *Water*
⊖ *Neutral Salts*
VS *Ardent Spirits*

Fig. 1



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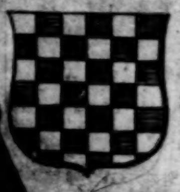

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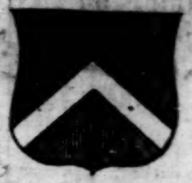

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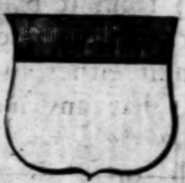

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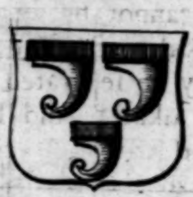

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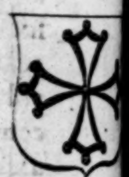

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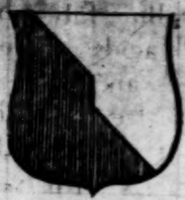

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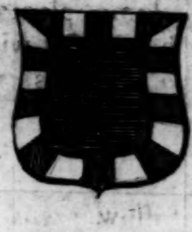

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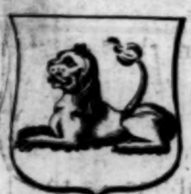

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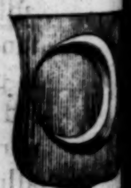

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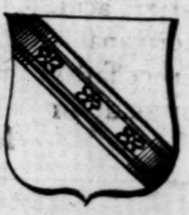

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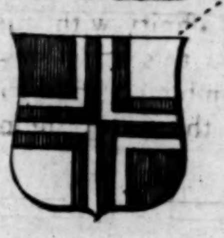

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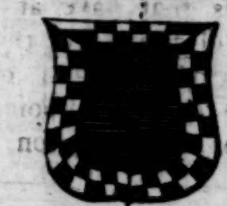

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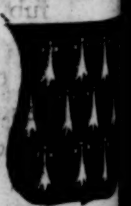

A. Bell S

ſtudy chemiſtry, in helping them to form a juſt idea of the relations which different ſubſtances have with one another; and the practical chemiſt will thereby be enabled to account for what paſſes in ſeveral of his operations, otherwiſe difficult to be underſtood, as well as to judge what may be expected to reſult from mixtures of different compounds. Theſe reaſons have induced us to inſert it at the end of this elementary treatiſe, and to give a ſhort explanation of it here; eſpecially as it will ſerve at the ſame time for a recapitulation of the whole work, in which the ſeveral axioms of this table are diſperſed. See Plate LXV.

The upper line of Mr Geoffroy's table comprehends ſeveral ſubſtances uſed in chemiſtry. Under each of thoſe ſubſtances are ranged in diſtinct columns ſeveral matters compared with them, in the order of their relation to that firſt ſubſtance; ſo as that which is the neareſt to it is that which hath the greateſt affinity with it, or that which none of the ſubſtances ſtanding below it can ſeparate therefrom; but which, on the contrary, ſeparates them all when they are combined with it, and expels them in order to join itſelf therewith. The ſame is to be underſtood of that which occupies the ſecond place of affinity; that is, it has the ſame property with regard to all below it, yielding only to that which is above it: and ſo of all the reſt.

At the top of the firſt column ſtands the character which denotes an acid in general. Immediately under this ſtands the mark of a fixed alkali, being placed there as the ſubſtance which has the greateſt affinity with an acid. After the fixed alkali, appears the volatile alkali, whoſe affinity with acids yields only to the fixed alkali. Next come the abſorbent earths; and, laſt of all, metallic ſubſtances. Hence it follows, that when a fixed alkali is united with an acid, it cannot be ſeparated therefrom by any other ſubſtance; that a volatile alkali united with an acid cannot be ſeparated from it by any thing but a fixed alkali; that an abſorbent earth combined with an acid may be ſeparated from it either by a fixed or by a volatile alkali; and laſtly, that any metallic ſubſtance combined with an acid, may be ſeparated from it by a fixed alkali, a volatile alkali, or an abſorbent earth.

At the head of the ſecond column ſtands the character of the marine acid, which ſignifies that the affinities of this acid are the ſubject of the column. Immediately below it is placed the mark of tin. As this is a metalline ſubſtance, and as the firſt column places metalline ſubſtances in the loweſt degree of affinity with all acids, it is plain we muſt ſuppoſe fixed alkalis, volatile alkalis, and abſorbent earths, to be placed here in order after the marine acids and before tin. Tin, then, is of all metalline ſubſtances that which has the greateſt affinity with the marine acid; and then follow regulus of antimony, copper, ſilver, mercury. Gold comes laſt of all; and there are no leſs than two vacant places above it. By this means it is in ſome ſort excluded from the rank of ſubſtances that have an affinity with the marine acid. The reaſon thereof is, that this acid alone is not capable of diſſolving gold and combining therewith, neceſſarily requiring for that purpoſe the aid of the nitrous acid, or at leaſt of the phlogiſton.

The third column exhibits the affinities of the nitrous acid, the character whereof ſtands at its head. Immediately below it is the ſign of iron, as the metal which has the greateſt affinity with this acid; and then follow other metals, each according to the degree of its relation, *viz.* copper, lead, mercury, and ſilver. In this column, as in the preceding one, we muſt ſuppoſe the ſubſtances, which in the firſt column ſtand above metallic ſubſtances, to be placed in their proper order before iron.

The fourth column is intended to repreſent the affinities of the vitriolic acid. The phlogiſton ſtands uppermoſt. Below it the fixed alkalis, volatile alkalis, and abſorbent earths, to ſhew that this is an exception to the firſt column. As to metalline ſubſtances, Mr Geoffroy has ſet down but three, being thoſe with which the vitriolic acid has the moſt perceptible affinity: theſe metals, placed in the order of their affinities, are iron, copper, and ſilver.

The fifth column ſhews the affinities of abſorbent earths. As theſe earths have no ſenſible affinity but with acids, this column contains only the characters of the acids ranked according to the degree of their ſtrength, or affinity with the earths, *viz.* the vitriolic, the nitrous, and the marine acids. Underneath this laſt might be placed the acid of vinegar, or the vegetable acid.

The ſixth column expreſſes the affinities of fixed alkalis with acids, which are the ſame with thoſe of abſorbent earths. Moreover, we find ſulphur placed here below all the acids; becauſe liver of ſulphur, which is a combination of ſulphur with a fixed alkali, is actually decompounded by any acid: for any acid precipitates the ſulphur and unites with the alkali.

Immediately over the ſulphur, or in the ſame ſquare with it, might be ſet a mark denoting the volatile ſulphureous ſpirit; becauſe, like ſulphur, it has leſs affinity than any other acid with fixed alkalis. Oils might alſo be ranked with ſulphur, becauſe they unite with fixed alkalis, and therewith form ſoaps which are decompounded by any acid whatever.

The ſeventh column points out the affinities of volatile alkalis, which are likewiſe the ſame as thoſe of abſorbent earths; and the vegetable acid might be placed here alſo under the marine acid.

The eighth column ſpecifies the affinities of metallic ſubſtances with acids. The affinities of the acids, which with reſpect to fixed alkalis, volatile alkalis, and abſorbent earths, ſucceed each other uniformly, do not appear in the ſame order here. The marine acid, inſtead of being placed below the vitriolic and nitrous acids, ſtands, on the contrary, at their head; becauſe, in fact, this acid ſeparates metalline ſubſtances from all the other acids with which they happen to be united, and, forcing theſe acids to quit poſſeſſion, intrudes into their place. Nevertheleſs, this is not a general rule; for ſeveral metalline ſubſtances muſt be excepted, particularly iron and copper.

The ninth column declares the affinities of ſulphur. Fixed alkalis, iron, copper, lead, ſilver, regulus of antimony, mercury, and gold, ſtand below it in the order of their affinities. With regard to gold, it muſt be obſerved, that it will not unite with pure ſulphur; it ſuffers itſelf to be diſſolved only by the liver of ſulphur, which is known to be a compoſition of ſulphur and fixed alkali.

At the head of the tenth column appears mercury, and beneath it ſeveral metalline ſubſtances, in the order of their affinities with it. Thoſe metalline ſubſtances are gold, ſilver, lead, copper, zinc, and regulus of antimony.

The eleventh column ſhews that lead has a greater affinity with ſilver than with copper.

The twelfth, that copper has a greater affinity with mercury than with calamine.

The thirteenth, that ſilver has a greater affinity with lead than with copper.

The fourteenth contains the affinities of iron. Regulus of antimony ſtands immediately underneath it, as being the metallic ſubſtance which has the greateſt affinity with it. Silver, copper, and lead, are placed together in the next ſquare below, becauſe the degrees of affinity which thoſe metals have with iron are not exactly determined.

The ſame is to be ſaid of the fifteenth column: Regulus of antimony ſtands at its head; iron is immediately below it; and below the iron the ſame three metals occupy one ſquare as before.

Laſtly, The ſixteenth column indicates that water has a greater affinity with ſpirit of wine than with ſalts. By this general expreſſion muſt not be underſtood any ſaline ſubſtance whatever; but only the neutral ſalts, which ſpirit of wine frees from the water that kept them in ſolution. Fixed alkalis, on the contrary, as well as the mineral acids, have a greater affinity than ſpirit of wine with water; ſo that theſe ſaline ſubſtances, being well dephlegmated and mixed with ſpirit of wine, imbibe the water it contains and rectify it.

The Theory of Conſtructing the Veſſels moſt commonly uſed in Chemiſtry.

CHEMISTS cannot perform the operations of their art without the help of a conſiderable number of veſſels, inſtruments, and furnaces, adapted to contain the bodies on which they intend to work, and to apply to them the ſeveral degrees of heat required by different proceſſes.

Veſſels intended for chemical operations ſhould be able to bear, without breaking, the ſudden application of great heat and great cold; be impenetrable to every thing, and unalterable by any ſolvent; unvitrifiable, and capable of enduring the moſt violent fire without melting: But hitherto no veſſels have been found with all theſe qualities united.

They are made of ſundry materials, namely, of metal, of glaſs, and of earth. Metalline veſſels, eſpecially thoſe made of iron or copper, are apt to be corroded by almoſt every ſaline, oily, or even aqueous ſubſtance. For this reaſon, in order to render the uſe of them a little more extenſive, they are tinned on the inſide. But, notwithſtanding this precaution, they are on many occaſions not to be truſted; and ſhould never be employed in any nice operations which require great accuracy; they are, moreover, incapable of reſiſting the force of fire.

Earthen veſſels are of ſeveral ſorts. Some, that are made of a refractory earth, are capable of being ſuddenly expoſed to a ſtrong fire without breaking, and even of ſuſtaining a great degree of heat for a conſiderable time: But they generally ſuffer the vapours of the matters which they contain, as well as vitrified metals, to paſs through them; eſpecially the glaſs of lead, which eaſily penetrates them, and runs through their pores, as through a a ſieve. There are others made of an earth, that, when well baked, looks as if it were half vitrified: Theſe being much leſs porous are capable of retaining the vapours of the matters which they contain, and even glaſs of lead in fuſion; which is one of the ſevereſt trials a veſſel can be put to: But then they are more brittle than the other ſort.

Good glaſs-veſſels ſhould conſtantly be employed in preference to all others, whenever they can poſſibly be uſed: And that not only becauſe they are no way injured by the moſt active ſolvents, nor ſuffer any part of what they contain to paſs through, but alſo becauſe their tranſparency allows the chemiſt to obſerve what paſſes within them; which is always both curious and uſeful. But it is pity, that veſſels of this ſort ſhould not be able to endure a fierce fire without melting.

Diſtillation, as hath been already ſaid, is an operation by which we ſeparate from a body, by the help of a gradual heat, the ſeveral principles of which it conſiſts.

There are three methods of diſtilling. The firſt is performed by applying the heat over the body whoſe principles are to be extracted. In this caſe, as the liquors when heated and converted into vapours conſtantly endeavour to fly from the centre of heat, they are forced to re-unite in the lower part of the veſſel that contains the matter in diſtillation, and ſo paſſing through the pores or holes of that veſſel, they fall into another cold veſſel applied underneath to receive them. This way of diſtilling is, on this account, called diſtilling *per deſcenſum*. It requires no other apparatus than two veſſels figured like ſegments of hollow ſpheres, whereof that which is pierced with little holes, and intended to contain the matter to be diſtilled, ought to be much leſs than the other which is to contain the fire, and cloſe its aperture exactly; the whole together being ſupported vertically upon a third veſſel, which is to ſerve the purpoſe of a recipient, admitting into its mouth the convex bottom of the veſſel containing the matter to be diſtilled, which muſt accurately fill it. This method of diſtilling is but little uſed.

The ſecond method of diſtilling is performed by applying the heat underneath the matter to be decompoſed. On this occaſion the liquors being heated, rarefied, and converted into vapours, riſe, and are condenſed in a veſſel contrived for that purpoſe, which we ſhall preſently deſcribe. This way of diſtilling is called diſtilling *per aſcenſum*, and is much uſed.

The veſſel in which the diſtillation *per aſcenſum* is performed, we call an alembic. Plate LXIV. fig. 1.

There are ſeveral ſorts thereof differing from one another both in the matter of which, and the manner in which, they are made.

Thoſe employed to draw the odoriferous waters and eſſential oils of plants are generally made of copper, and conſiſt of ſeveral pieces. The firſt, which is deſigned to contain the plant, is formed nearly like a hollow cone, the vertex whereof is drawn out in the ſhape of a hollow cylinder or tube: This part is named the cuburbit, Plate LXIV. fig. 1. A; and its tube the neck of the alembic B. To the upper end of this tube another veſſel is ſoldered: This is called the head C, and commonly has likewiſe the form of a cone, joined to the neck of the alembic by its baſe, round which on the inſide is hollowed a ſmall groove communicating with an orifice that opens at its moſt depending part. To this orifice is ſoldered a ſmall pipe in a direction ſloping downwards, which is called the noſe, ſpout, or beak D of the alembic.

As ſoon as the matters contained in the alembic grow hot, vapours begin to ariſe from them, and aſcending through the neck of the alembic into the head, are by the ſides thereof ſtopped and condenſed: From thence they trickle down in little ſtreams to the groove, which conveys them to the ſpout; and by that they paſs out of the alembic into a glaſs veſſel or receiver G with a long neck, the end of the ſpout being introduced into that neck and luted thereto.

To facilitate the refrigeration and condenſation of the vapours circulating in the head, all alembics of metal are moreover provided with another piece, which is a kind of large pan of the ſame metal, fitted and ſoldered round the head. This piece ſerves to keep cold water in, which inceſſantly cools the head, and therefore it is called the refrigeratory E. The water in the refrigeratory itſelf grows hot after ſome time, and muſt therefore be changed occaſionally; the heated water being firſt drawn off by means of a cock fixed near the bottom of the refrigeratory. All copper alembics ſhould be tinned on the inſide for the reaſons already given.

When ſaline ſpirits are to be diſtilled, alembics of metal muſt not be uſed; becauſe the ſaline vapours would corrode them. In this caſe recourſe muſt be had to alembics of glaſs. Theſe conſiſt of pieces only; namely, a cucurbit, whoſe ſuperior orifice is admitted into, and exactly luted with its head, which is the ſecond piece.

In general, as alembics require that the vapours of the matter to be diſtilled ſhould riſe to a conſiderable height, they ought to be uſed only when the moſt volatile principles are to be drawn from bodies: And the lighter and more volatile the ſubſtances to be ſeparated by diſtillation are, the taller muſt the alembic be; becauſe the moſt ponderous parts, being unable to riſe above a certain heighth, fall back again into the cucurbit as ſoon as they arrive there, leaving the lighter to mount alone, whoſe volatility qualifies them to aſcend into the head.

When a matter is to be diſtilled that requires a very tall alembic, and yet does not admit of a metalline veſſel, the end will be beſt anſwered by a glaſs veſſel of a round or oval ſhape, having a very long neck, with a ſmall head fitted to its extremity. Such a veſſel ſerves many purpoſes: It is ſometimes employed as a receiver, and at other times as a digeſting veſſel; on which laſt occaſion it goes under the name of a matraſs, fig. 3. When one of theſe provided with a head, (fig. 3. C), is applied to the purpoſe of diſtilling, it forms a ſort of alembic.

There are ſome alembics of glaſs, blown in ſuch a manner by the workmen, that the body and head form but one continued piece. As theſe alembics do not ſtand in need of having their ſeveral pieces luted together, they are very uſeful on ſome occaſions, when ſuch exceeding ſubtile vapours riſe as are capable of tranſpiring through lutes. The head muſt be open at the top, and provided with a ſhort tube, through which by means of a funnel with a long pipe, the matter to be diſtilled may be introduced into the cucurbit. This is to be exactly cloſed with a glaſs ſtopple, the ſurface whereof muſt be made to fit the inſide of the tube in every point, by rubbing thoſe two pieces well together with emery.

Another ſort of alembic hath alſo been invented, which may be uſed with advantage when cohobation is required; that is, when the liquor obtained by diſtillation is to be returned upon the matter in the cucurbit; and eſpecially when it is intended that this cohobation ſhall be repeated a great number of times. The veſſel we are ſpeaking of is conſtructed exactly in the ſame manner as that laſt deſcribed; except that its beak, inſtead of being in a ſtreight line as in the other alembics, forms a circular arch, and re-enters the cavity of the cucurbit, in order to convey back again the liquor collected in the head. This inſtrument hath commonly two beaks oppoſite to each other, both turned in this manner, and is called a *pelican*: It ſaves the artiſt the trouble of frequently unluting and reluting his veſſels, as well as the loſs of a great many vapours.

There are certain ſubſtances which in diſtillation afford matters in a concrete form, or riſe wholly in the form of a very light powder, called *flowers*. When ſuch ſubſtances are to be diſtilled, the cucurbit which contains them is covered with a head without a noſe, which is named a *blind-head*.

When the flowers riſe in great quantities and very high, a number of heads is employed to collect them; or rather a number of a kind of pots, conſiſting of a body only without any bottom, which fitting one into the other form a canal, that may be lengthened or ſhortened at pleaſure, according as the flowers to be ſublimed are more or leſs volatile. The laſt of the heads, which terminates the canal, is quite cloſe at one end, and makes a true blind-head. Theſe veſſels are called *aludels*: they are uſually of earthen or ſtone ware.

All the veſſels above mentioned are fit only for diſtilling ſuch light volatile matters as can be eaſily raiſed and brought over; ſuch as phlegm, eſſential oils, fragrant waters, acid oily ſpirits, volatile alkalis, *&c.* But when the point is to procure, by diſtillation, principles that are much leſs volatile, and incapable of riſing high, ſuch as the thick fetid oils, the vitriolic, the nitrous, and the marine acids, *&c.* we are under a neceſſity of having recourſe to other veſſels, and another manner of diſtilling.

It is eaſy to imagine, that ſuch a veſſel muſt be much lower than the alembic. It is indeed no more than a hollow globe, whoſe upper part degenerates into a neck or tube, that is bent into a horizontal poſition; for which reaſon this inſtrument is called a *retort:* It is always of one ſingle piece.

The matter to be diſtilled is introduced into the body of the retort by means of a ladle with a long tubular ſhank. Then it is ſet in a furnace built purpoſely for this uſe, and ſo that the neck of the retort coming out of the furnace may, like the the noſe of the alembic, ſtand in a ſloping poſition, to facilitate the egreſs of the liquors, which by its means are conveyed to a receiver, into which it is introduced, and with which it is luted. This way of diſtilling, in which the vapours ſeem rather to be driven out of the veſſel horizontally and laterally, than raiſed up and ſublimed, is for that reaſon called diſtillation *per latus.*

Retorts are, of all the inſtruments of diſtillation, thoſe that muſt ſuſtain the greateſt heat, and reſiſt the ſtrongeſt ſolvents; and therefore they muſt not be made of metal. Some, however, which are made of iron may do well enough on certain occaſions: The reſt are either of glaſs or earth. Thoſe of glaſs, for the reaſons above given, are preferable to the other ſort, in all caſes where they are not to be expoſed to ſuch a force of fire as may melt them. The beſt glaſs, that which ſtands both heat and ſolvents beſt, is that in which there are feweſt alkaline ſalts: Of this ſort is the green German glaſs: The beautiful white cryſtal glaſs is far from being equally ſerviceable.

Retorts, as well as alembics, may be of different forms. For example, ſome matters are apt to ſwell and riſe over the neck of the retort in ſubſtance without ſuffering any decompoſition; when ſuch matters are to be diſtilled in a retort, it is proper that the body of the veſſel, inſtead of being globular, be drawn out into the form of a pear, ſo as nearly to reſemble that of a cucurbit. In a retort of this kind, the diſtance between the bottom and the neck being much greater than in thoſe whoſe bodies are ſpherical, the matters contained have much more room for expanſion; ſo that the inconvenience here mentioned is thereby prevented. Retorts of this form are called Engliſh retorts: as they hold the middle place between alembics and common retorts, they may be uſed to diſtill ſuch matters as have a mean degree of volatility between the greateſt and the leaſt.

It is moreover proper to have in a laboratory ſundry retorts with necks of different diameters. Wide necks will be found the fitteſt for conveying thick matters, and ſuch as readily become fixed; for inſtance, ſome very thick fetid oils, butter of antimony, *&c.* for as theſe matters acquire a conſiſtence as ſoon as they are out of the reach of a certain degree of heat, they would ſoon choak up a narrow neck, and by ſtopping the vapours, which riſe at the ſame time from the retort, might occaſion the burſting of the veſſels.

Some retorts are alſo made with an opening on their upper ſide, like that of tubulated glaſs alembics, which is to be cloſed in the ſame manner with a glaſs ſtopple. Theſe retorts are alſo called *tubulated retorts*, and ought always to be uſed whenever it is neceſſary to introduce freſh matter into the retort during the operation; ſeeing it may be done by means of this invention, without unluting and reluting the veſſels; which ought always to be avoided as much as poſſible.

One of the things that moſt perplexes the chemiſts is, the prodigious elaſticity of many different vapours, which are frequently diſcharged with impetuoſity during the diſtillation, and are even capable of burſting the veſſels with exploſion, and with danger to the artiſt. On ſuch occaſions it is abſolutely neceſſary to give theſe vapours vent, as we ſhall direct in its proper place: But as that can never be done without loſing a great many of them; as ſome of them in particular are ſo elaſtic, that ſcarce any at all would remain in the veſſel; for inſtance, thoſe of the ſpirit of nitre, and eſpecially thoſe of the ſmoking ſpirit of ſalt; the practice is to make uſe of very large receivers, of about eighteen or twenty inches diameter, that the vapours may have ſufficient room to circulate in, and, by applying to the wide ſurface preſented them by the extenſive inſide of ſuch a large veſſel, may be condenſed into drops. Theſe huge receivers are commonly in the form of hollow globes, and are called *ballons.*

To give theſe vapours ſtill more room, ballons have been contrived with two open gullets in each, diametrically oppoſite to one another; whereof one admits the neck of the retort, and the other is received by one of the gullets of a ſecond ballon of the ſame form, which is joined in like manner to a third, and ſo on. By this artifice the ſpace may be enlarged at pleaſure. Theſe ballons with two necks are called *adopters.*

Operations on bodies that are abſolutely fixed, as metals, ſtones, ſand, *&c.* require only ſuch veſſels as are capable of containing thoſe bodies and reſiſting the force of fire. Theſe veſſels are little hollow pots, of different dimenſions, which are called crucibles. Crucibles can hardly be made of any thing but earth; they ought to have a cover of the ſame material fitted to ſhut them cloſe. The beſt earth we know is that whereof thoſe pots are made in which butter is brought from Bretagne: Theſe pots themſelves are exceeding good crucibles; and they are almoſt the only ones that are capable of holding glaſs of lead in fuſion, without being penetrated by it.

For the roaſting of ores, that is, freeing them by the help of fire from their ſulphureous and arſenical parts, little cups made of the ſame material with crucibles are uſed; but they are made flat, ſhallow, and wider above than below, that theſe volatile matters may the more freely exhale. Theſe veſſels are called *teſts*, or *ſcorifiers:* They are ſcarce uſed but in the docimaſtic art, that is, in making ſmall aſſays of ores.

The Theory of conſtructing the Furnaces moſt commonly uſed in Chemiſtry.

SKILL in conducting and applying fire properly, and determining its different degrees, is of very great conſequence to the ſucceſs of chemical operations.

As it is exceeding difficult to govern and moderate the action of fire, when the veſſels in which any operation is performed are immediately expoſed to it, chemiſts have contrived to convey heat to their veſſels, in nice operations, through different mediums, which they place occaſionly between thoſe veſſels and the fire.

Thoſe intermediate ſubſtances in which they plunge their veſſels are called *baths*. They are either fluid or ſolid: The fluid baths are water, or its vapours. When the diſtilling veſſel is ſet in water, the bath is called *balneum mariæ*, or the water bath; and the greateſt degree of heat of which it is ſuſceptible is that of boiling water. When the veſſel is expoſed only to the vapours which exhale from water, this forms the vapour-bath: the heat of which is nearly the ſame with that of the *balneum mariæ*. Theſe baths are uſeful for diſtilling eſſential oils, ardent ſpirits, ſweet-ſcented waters; in a word, all ſuch ſubſtances as cannot bear a greater heat without prejudice either to their odour, or to ſome of their other qualities.

Baths may alſo be made of any other fluids, ſuch as oils, mercury, *&c.* which are capable of receiving and communicating much more heat; but they are very ſeldom uſed. When a more conſiderable degree of heat is required, a bath is prepared of any ſolid matter reduced to a fine powder, ſuch as ſand, aſhes, filings of iron, *&c.* The heat of theſe baths may be puſhed ſo far as to make the bottom of the veſſel become faintly red. By plunging a thermometer into the bath, by the ſide of the veſſel, it is eaſy to obſerve the preciſe degree of heat applied to the ſubſtance on which you are working. It is neceſſary that the thermometers employed on this occaſion be conſtructed on good principles, and ſo contrived as to be eaſily compared with thoſe of the moſt celebrated natural philoſophers. Thoſe of the illuſtrious Reaumur are moſt uſed and beſt known, ſo that it would not be amiſs to give them the preference. When a greater heat is required than any of thoſe baths can give, the veſſels muſt be ſet immediately on live-coals, or in a flaming fire: this is called working with a naked fire; and in this caſe it is much more difficult than in the other to determine the degrees of heat.

There are ſeveral ways of applying a naked fire. When the heat or flame is reflected upon the upper part of the veſſel which is expoſed to the fire, this is called a reverberated heat. A melting heat is that which is ſtrong enough to fuſe moſt bodies. A forging heat is that of a fire which is forcibly excited by the conſtant blaſt of a pair of bellows, or more.

There is alſo another ſort of fire which ſerves very commodiouſly for many operations, becauſe it does not require to be fed or frequently mended: This is afforded by a lamp with one or more wicks, and may be called a lamp-heat. It is ſcarce ever employed but to heat baths, in operations which require a gentle and long continued warmth: if it hath any fault, it is that of growing gradually hotter.

All theſe different ways of applying fire require furnaces of different conſtructions: We ſhall therefore deſcribe ſuch as are of principal and moſt neceſſary uſe.

Furnaces muſt be divided into different parts or ſtories, each of which has its particular uſe and name.

The lower part of the furnace deſigned for receiving the aſhes, and giving paſſage to the air, is called the aſh hole The aſh-hole is terminated above by a grate, the uſe of which is to ſupport the coals and wood, which are to be burnt thereon: This part is called the fire-place. The fire-place is in like manner terminated above by ſeveral iron bars, which lie quite a-croſs it from right to left, in lines parallel to each other: The uſe of theſe bars is to ſuſtain the veſſels in which the operations are to be performed. The ſpace above theſe bars to the top of the furnace is the upper ſtory, and may be called the laboratory of the furnace. Laſtly, ſome furnaces are quite covered above, by means of a kind of vaulted roof called the dome.

Furnaces have moreover ſeveral apertures: one of theſe is at the aſh-hole, which gives paſſage to the air, and through which the aſhes that fall through the grate are raked out; this aperture is called the aſh-hole door: another is at the fire-place, through which the fire is ſupplied with fuel, as occaſion requires; this is called the mouth or door of the fire-place, or the ſtoke-hole: there is a third in the upper ſtory, through which the neck of the veſſel paſſes; and a fourth in the dome, for carrying off the fuliginoſities of combuſtible matters, which is called the chimney.

To conclude, there are ſeveral other openings in the ſeveral parts of the furnace, the uſe whereof is to admit the air into thoſe places, and alſo, as they can be eaſily ſhut, to incite or ſlacken the activity of the fire, and ſo to regulate it; which has procured them the title of *regiſters*. All the other openings of the furnace ſhould be made to ſhut very cloſe, the better to aſſiſt in governing the fire; by which means they likewiſe do the office of regiſters.

In order to our forming a juſt and general idea of the conſtruction of furnaces, and of the diſpoſition of the ſeveral apertures in them, with a view to increaſe or diminiſh the activity of the fire, it will be proper to lay down, as our ground-work, certain principles of natural philoſophy, the truth of which is demonſtrated by experience.

And firſt, every body knows that combuſtible matters will not burn or conſume unleſs they have a free communication with the air; inſomuch that if they be deprived thereof, even when burning moſt rapidly, they will be extinguiſhed at once: that conſequently combuſtion is greatly promoted by the frequent acceſſion of freſh air; and that a ſtream of air, directed ſo as to paſs with impetuoſity through burning fuel, excites the fire to the greateſt poſſible activity.

Secondly, It is certain that the air which touches or comes near ignited bodies is heated, rarefied, and rendered lighter than the air about it; that is, further diſtant from the centre of heat; and conſequently that this air ſo heated and become lighter is neceſſarily determined thereby to aſcend and mount aloft, in order to make room for that which is leſs heated and not ſo light, which by its weight and elaſticity tends to occupy the place quitted by the other. Another conſequence hereof is, that if fire be kindled in a place incloſed every where but above and below, a current of air will be formed in that place, running in a direction from the bottom to the top; ſo that if any light bodies be applied to the opening below, they will be carried up towards the fire; but, on the contrary, if they be held at the opening above, they will be impelled by a force which will drive them up and carry them away from the fire.

Thirdly, and laſtly, it is a truth demonſtrated in hydraulics, that the velocity of a given quantity of any fluid, determined to flow in any direction whatever, is ſo much the greater, the narrower the channel is to which that fluid is confined; and conſequently that the velocity of a fluid will be increaſed by making it run from a wider through a narrower paſſage.

Theſe principles being eſtabliſhed, it is eaſy to apply them to the conſtruction of furnaces. Firſt, if a fire be kindled in the fire-place of a furnace, which is open on all ſides, it burns nearly as if it were in the open air. It has with the ſurrounding air a free communication; ſo that freſh air is continually admitted to facilitate the entire combuſtion of the inflammable matters employed as fuel. But there being nothing to determine that air to paſs with rapidity through the fire in this caſe, it does not at all augment the activity thereof, but ſuffers it to waſte away quietly.

Secondly, If the aſh-hole or dome of a furnace in which a fire is burning be ſhut quite cloſe, then there is no longer any free communication between the air and the fire: if the aſh-hole be ſhut, the air is debarred from having free acceſs to the fire; if the dome be ſtopt, the egreſs of the air rarefied by the fire is prevented; and conſequently the fire muſt in either caſe burn very faintly and ſlowly, gradually die away, and at laſt go quite out.

Thirdly, If all the openings of the furnace be wholly cloſed, it is evident that the fire will be very quickly extinguiſhed.

Fourthly, If only the lateral openings of the fire-place be ſhut, leaving the aſh-hole and upper part of the furnace open; it is plain that the air entering by the aſh-hole will neceſſarily be determined to go out at top, and that conſequently a current of air will be formed, which will paſs through the fire, and make it burn briſkly and vigorouſly.

Fifthly, If both the aſh-hole and the upper ſtory of the furnace be of ſome length, and form canals either cylindric or priſmatic, then the air being kept in the ſame direction through a longer ſpace, the courſe of its ſtream will be both ſtronger and better determined, and conſequently the fire will be more animated by it.

Sixthly, and laſtly, if the aſh hole and the upper part of the furnace, inſtead of being cylindric or priſmatic canals, have the form of truncated cones or pyramids, ſtanding on their baſes, and ſo ordered that the upper opening of the aſh-hole adjoining to the fire-place may be wider than the baſe of the ſuperior cone or pyramid; then the ſtream of air, being forced to paſs inceſſantly from a larger channel through a ſmaller, muſt be conſiderably accelerated, and procure to the fire the greateſt activity which it can receive from the make of a furnace.

The materials fitteſt for building furnaces are, 1. Bricks, joined together with potters clay mixed with ſand, and moiſtened with water. 2. Potters clay mingled with potſherds, moiſtened with water, and baked in a violent fire. 3. Iron; of which all furnaces may be made; with this precaution, that the inſide be provided with a great many prominent points, as faſtenings for a coat of earth, with which the internal parts of the furnace muſt neceſſarily be covered to defend it from the action of the fire.

The reverberating furnace is one of thoſe that are moſt employed in chemiſtry: it is proper for diſtillations by the retort, and ſhould be conſtructed in the following manner.

Firſt, The uſe of the aſh-hole being, as was ſaid, to give paſſage to the air, and to receive the aſhes, no bad conſequence can attend its being made pretty high: It may have from twelve to twenty or twenty-four inches in heighth. Its aperture ſhould be wide enough to admit billets of wood when a great fire is to be made.

Secondly, The aſh-hole muſt be terminated at its upper part by an iron grate, the bars of which ſhould be very ſubſtantial, that they may reſiſt the action of the fire: this grate is the bottom of the fire-place, and deſtined to ſupport the coals. In the lateral part of the fire-place, and nearly about the ſame height with the grate, there ſhould be a hole of ſuch a ſize that it may eaſily admit charcoal, as well as little tongs and ſhovels for managing the fire. This aperture or mouth of the fire-place ſhould be perpendicularly over the mouth of the aſh-hole.

Thirdly, from ſix to eight or ten inches high above the grate, over the aſh-hole, little apertures muſt be made in the walls of the furnace, of eight or ten lines in diameter, an inch from one another, and thoſe in one ſide muſt be diametrically oppoſite to thoſe in the other. The uſe of theſe holes is to receive bars of iron for the retort to reſt on; which ſhould be, as was ſaid, at different heights, in order to accommodate retorts of different ſizes. At the upper extremity of this part of the furnace, which reaches from the iron bars to the top, the heighth whereof ſhould be ſomewhat leſs than the width of the furnace, muſt be cut a ſemi-circular aperture for the neck of the retort to come through. This hole muſt by no means be over the doors of the fire-place and aſh-hole; for then, as it gives paſſage to the neck of the retort, it muſt of courſe be oppoſite to the receiver, and in that caſe the receiver itſelf would ſtand over againſt thoſe two apertures; which would be attended with this double inconvenience, that the receiver would not only grow very hot, but greatly embarraſs the operator, whoſe free acceſs to the fire-place and aſh-hole would be thereby obſtructed. It is proper therefore, that the ſemi-circular cut we are ſpeaking of be ſo placed, that, when the greateſt ballons are luted to the retort, they may leave an open paſſage to the fire-place or aſh-hole.

Fourthly, in order cover in the laboratory of the reverberating furnace, there muſt be a roof made for it in the form of a cupola, or concave hemiſphere, having the ſame diameter as the furnace. This dome ſhould have a ſemi-circular cut in its rim anſwering to that above-directed to be made in the upper extremity of the furnace, ſo that, when adjuſted to each other, the two together may form a circular hole for the neck of the retort to paſs through. At the top of this dome there muſt alſo be a circular hole of three or four inches diameter, carrying a ſhort tapering funnel of the ſame diameter, and three inches high, which will ſerve for a chimney to carry off all fuliginoſities, and accelerate the current of the air. This paſſage may be ſhut at pleaſure with a flat cover. Moreover, as it is neceſſary that the dome ſhould be taken off and put on with eaſe, it ſhould have two ears or handles for that purpoſe: a portative or moveable furnace ſhould alſo have a pair of handles fixed oppoſite to each other between the aſh-hole and the fire place.

Sixthly and laſtly, a conical canal muſt be provided of about three foot long, and ſufficiently wide at its lower end to admit the funnel of the aperture at the top of the dome. This conical tube is to be applied to the dome when the fire is required to be extremely active: it tapers gradually from its baſe upwards, and breaks off as if truncated at top, where it ſhould be about two inches wide.

Beſides the apertures already mentioned as neceſſary to a reverberating furnace, there muſt alſo be many other ſmaller holes made in its aſh-hole, fire-place, laboratory, and dome, which muſt all be ſo contrived as to be eaſily opened and ſhut with ſtopples of earth: theſe holes are the regiſters of the furnace, and ſerve to regulate the activity of the fire according to the principles before laid down.

When the action of the fire is required to be exactly uniform and very briſk, it is neceſſary to ſtop carefully with moiſt earth all the little chinks in the juncture of the dome with the furnace, between the neck of the retort and the circular hole through which it paſſes, and which it never fills exactly, and laſtly the holes which receive the iron bars that ſuſtain the retort.

It is proper to have in a laboratory ſeveral reverberating furnaces of different magnitudes; becauſe they muſt be proportioned to the ſize of the retorts employed. The retort ought to fill the furnace, ſo as to leave only the diſtance of an inch between it and the inſide of the furnace.

Yet when the retort is to be expoſed to a moſt violent fire, and eſpecially when it is required that the heat ſhall act with equal force on all parts of the furnace, and as ſtrongly on its vault as on its bottom, a greater diſtance muſt be left between the retort and the inſide of the furnace; for then the furnace may be filled with coals, even to the upper part of the dome. If moreover ſome pieces of wood be put into the aſh-hole, the conical canal fitted on to the funnel of the dome, and all the apertures of the furnace exactly cloſed, except the aſh-hole and the chimney, the greateſt heat will then be excited that this furnace can produce.

The furnace now deſcribed may alſo be employed in many other chemical operations. If the dome be laid aſide, an alembic may very well be placed therein: but then the ſpace, which will be left between the body of the alembic and the top of the upper part of the furnace, muſt be carefully filled up with Windſor-loam moiſtened; for without that precaution the heat would ſoon reach the very head, which ought to be kept as cool as poſſible, in order to promote the condenſation of the vapours.

On this occaſion therefore it will be proper to leave no holes open in the fire-place, but the lateral ones; of which alſo thoſe over againſt the receiver muſt be ſtopped.

A pot or broad-brimmed earthen pan may be placed over this furnace, and being ſo fitted to it as to cloſe the upper part thereof accurately, and filled with ſand, may ſerve for a ſand-heat to diſtill with.

The bars deſigned to ſupport diſtilling veſſels being taken out, a crucible may ſtand therein, and many operations be performed that do not require the utmoſt violence of fire. In a word, this furnace is one of the moſt commodious that can be, and more extenſively uſeful than any other.

The melting furnace is deſigned for applying the greateſt force of heat to the moſt fixed bodies, ſuch as metals and earths. It is never employed in diſtilling: it is of no uſe but for calcination and fuſion; and conſequently need not admit any veſſels but crucibles.

The aſh-hole of this furnace differs from that of the reverberating furnace only in this, that it muſt be higher, in order to raiſe the fire-place to a level with the artiſt's hand; becauſe in that all the operations of this furnace are performed. The aſh-hole therefore muſt be about three foot high: and this height procures it moreover the advantage of a good draught of air. For the ſame reaſon, and in conſequence of the principles we laid down, it ſhould be ſo built that its width leſſening inſenſibly from the bottom to the top, it may be narrower where it opens into the fire-place than any where below.

The aſh-hole is terminated at its upper end, like that of the reverberating furnace, by a grate which ſerves for the bottom of the fire-place, and ought to be very ſubſtantial that it may reſiſt the violence of the fire. The inſide of this furnace is commonly an elliptic curve; becauſe it is demonſtrated by mathematicians, that ſurfaces having that curvature reflect the rays of the ſun, or of fire, in ſuch a manner, that, meeting in a point or a line, they produce there a violent heat. But to anſwer this purpoſe, thoſe ſurfaces muſt be finely poliſhed; an advantage hardly procureable to the internal ſurface of this furnace, which can be made of nothing but earth: beſides, if it were poſſible to give it a poliſh, the violent action of the fire that muſt be employed in this furnace would preſently deſtroy it. Yet the elliptical figure muſt not be entirely diſregarded: for, if care be taken to keep the internal ſurface of the furnace as ſmooth as poſſible, it will certainly reflect the heat pretty ſtrongly, and collect it about the center.

The fire-place of this furnace ought to have but four apertures.

Firſt, that of the lower grate, which communicates with the aſh-hole.

Secondly, a door in its fore-ſide, through which may be introduced coals, crucibles, and tongs for managing them: this aperture ſhould be made to ſhut exactly with a plate of iron, having its inſide coated with earth, and turning on two hinges fixed to the furnace.

Thirdly, over this door a hole ſlanting downwards towards the place where the crucible is to ſtand. The uſe of this hole is to give the operator an opportunity of examining the condition of the matters contained in his crucible, without opening the door of the fire-place: this hole ſhould be made to open and ſhut eaſily, by means of a ſtopple of earth.

Fourthly, a circular aperture of about three inches wide in the upper part or vault of the furnace, which ſhould gradually leſſen and terminate, like that of the dome of the reverberating furnace, in a ſhort conical funnel of abount three inches long, and fitted to enter the conical pipe before deſcribed, which is applied when the activity of the fire is to be increaſed.

When this furnace is to be uſed, and a crucible to be placed in it, care muſt be taken to ſet on the grate a cake of baked earth ſomewhat broader than the foot of the crucible. The uſe of this ſtand is to ſupport the crucible, and raiſe it above the grate, for which purpoſe it ſhould be two inches thick. Were it not for this precaution, the bottom of the crucible, which would ſtand immediately on the grate, could never be thoroughly heated, becauſe it would be always expoſed to the ſtream of cold air which enters by the aſh-hole. Care ſhould alſo be taken to heat this earthen bottom red-hot before it be placed in the furnace, in order to free it from any humidity, which might otherwiſe happen to be driven againſt the crucible during the operation, and occaſion its breaking.

We omitted to take notice, in ſpeaking of the aſh hole, that, beſides its door, it ſhould have about the middle of its height a ſmall hole, capable of receiving the noſel of a good perpetual bellows, which is to be introduced into it and worked, after the door is exactly ſhut, when it is thought proper to excite the activity of the fire to the utmoſt violence.

The forge is only a maſs of bricks of about three foot high, along whoſe upper ſurface is directed the noſe or pipe of a pair of large perpetual bellows, ſo placed that the operator may eaſily blow the fire with one hand. The coals are laid on the hearth of the forge near the noſe of the bellows; they are confined, if neceſſary, to prevent their being carried away by the wind of the bellows, within a ſpace incloſed by bricks; and then by pulling the bellows the fire is continually kept up in its greateſt activity. The forge is of uſe when there is occaſion to apply a great degree of heat ſuddenly to any ſubſtance, or when it is neceſſary that the operator be at liberty to handle frequently the matters which he propoſes to fuſe or calcine.

The cupelling furnace is that in which gold and ſilver are purified, by the means of lead, from all alloy of other metallic ſubſtances. This furnace muſt give a heat ſtrong enough to vitrify lead, and therewith all the alloy which the perfect metals may contain. This furnace is to be built in the following manner.

Firſt, of thick iron-plates, or of ſome ſuch compoſition of earth as we recommended for the conſtruction of furnaces, muſt be formed a hollow quadrangular priſm, whoſe ſides may be about a foot broad, and from ten to eleven inches high; and extending from thence upwards may converge towards the top, ſo as to form a pyramid truncated at the height of ſeven or eight inches, and terminated by an aperture of the width of ſeven or eight inches every way. The lower part of the priſm is terminated and cloſed by a plate of the ſame materials of which the furnace is conſtructed.

Secondly, in the fore-ſide or front of this priſm there is an opening of three or four inches in height by five or ſix inches in breadth: this opening, which ſhould be very near the bottom, is the door of the aſh-hole. Immediately over this opening is placed an iron grate, the bars of which are quadrangular priſms of half an inch ſquare, laid parallel to each other, and about eight or nine inches aſunder, and ſo diſpoſed that two of their angles are laterally oppoſite, the two others looking one directly upwards, and the other downwards. As in this ſituation the bars of the grate preſent to the fire-place very oblique ſurfaces, the aſhes and very ſmall coals do not accumulate between them, or hinder the free entrance of the air from the aſh-hole. This grate terminates the aſh-hole at its upper part, and ſerves for the bottom of the fire-place.

Thirdly, three inches, or three and a half, above the grate, there is in the fore-ſide of the furnace another opening terminated by an arch for its upper part, which conſequently has the figure of a ſemi-circle: it ought to be four inches wide at bottom, and three inches and an half high at its middle. This opening is the door of the fire-place; yet it is not intended for the ſame uſes as the door of the fire-place in other furnaces: the purpoſe for which it is actually deſtined ſhall be explained when we come to ſhew how the furnace is to be uſed. An inch above the door of the fire-place, ſtill in the foreſide of the furnace, are two holes of about an inch diameter, and at the diſtance of three inches and a half from each other, to which anſwer two other holes of the ſame ſize, made in the hinder part, directly oppoſite to theſe. There is, moreover, a fifth hole of the ſame width about an inch above the door of the fire-place. The deſign of all theſe holes ſhall be explained when we deſcribe the manner in which theſe furnaces are to be uſed.

Fourthly, the fore-part of the furnace is bound by three iron braces, one of which is fixed juſt below the door of the aſh-hole; the ſecond occupies the whole ſpace between the aſh-hole door and the door of the fire-place, and has two holes in it, anſwering to thoſe which we directed to be made in the furnace itſelf about this place; and the third is placed immediately over the door of the fire-place. Theſe braces muſt extend from one corner of the front of the furnace to the other, and be faſtened thereto with iron pins, in ſuch a manner that their ſides next to the doors may not lie quite cloſe to the body of the furnace, but form a kind of grooves for the iron plates to ſlide in, that are deſigned to ſhut the two doors of the furnace when it is neceſſary. Each of theſe iron plates ſhould have a handle, by which it may be conveniently moved; and to each door there ſhould be two plates, which meeting each other, and joining exactly in the middle of the door-place, may ſhut it very cloſe. Each of the two plates belonging to the door of the fire-place ought to have a hole in its upper part; one of theſe holes ſhould be a ſlit of about two lines wide, and half an inch long; the other may be a ſemi-circular opening of one inch in height and two in breadth. Theſe holes ſhould be placed ſo that neither of them may open into the fire-place when the two plates are joined together in the middle of the door to ſhut it cloſe.

Fifthly, to terminate the furnace above, there muſt be a pyramid, formed of the ſame materials with the furnace, hollow, quadrangular, three inches high, on a baſe of ſeven inches, which baſe muſt exactly fit the upper opening of the furnace: the top of this pyramidal cover muſt end in a tube of three inches in diameter and two in height, which muſt be almoſt cylindrical, and yet a little inclining to the conical form. This tube ſerves, as in the furnaces already deſcribed, to carry the conical funnel, which is fitted to the upper part when a fire of extraordinary activity is wanted.

The furnace thus conſtructed is fit to ſerve all the purpoſes for which it is deſigned; yet, before it can be uſed, another piece muſt be provided, which, though it does not properly belong to the furnace, is nevertheleſs neceſſary in all the operations performed by it; and that is a piece contrived to contain the cupels, or other veſſels which are to be expoſed to the fire in this furnace. It is called a *muffle*, and is made in the following manner.

On an oblong ſquare, of four inches in breadth, and ſix or ſeven in length, a concave ſemi-cylinder is erected, in the form of a vault, which makes a ſemi-circular canal, open at both ends. One of theſe is almoſt entirely cloſed, except that near the bottom two ſmall ſemi-circular holes are left. In each of its ſides likewiſe two ſuch holes are made, and the other end is left quite open.

The muffle is intended to bear and communicate the fierceſt heat; and therefore it muſt be made thin, and of an earth that will reſiſt the violence of fire, ſuch as that of which crucibles are made. The muffle being thus conſtructed, and then well baked, is fit for uſe.

When it is to be uſed, it muſt be put into the furnace by the upper opening, and ſet upon two iron bars, introduced through the holes made for that purpoſe below the door of the fire-place. The muffle muſt be placed on theſe bars in the fire-place, in ſuch a manner that its open end ſhall ſtand next to and directly againſt the door of the fire-place, and may be joined to it with lute. Then the cupels are ranged in it, and the furnace is filled up, to the height of two or three inches above the muffle, with ſmall coals not bigger than a walnut, to the end that they may lie cloſe round the muffle, and procure it an equal heat on every ſide. The chief uſe of the muffle is to prevent the coals and aſhes from falling into the cupels, which would be very prejudicial to the operations carrying on in them: for the lead would not vitrify as it ought, becauſe the immediate contact of the coals would continually reſtore its phlogiſton; or elſe the glaſs of lead, which ought to penetrate and paſs through the cupels, would be rendered incapable of ſo doing; becauſe the aſhes mixing therewith would give it ſuch a conſiſtence and tenacity as would deſtroy that property, or at leaſt conſiderably leſſen it. The openings, therefore, which are left in the lower part of the muffle, ſhould not be ſo high as to admit coals or aſhes to get into the cupels; the uſe of them is to procure an eaſier paſſage for the heat and the air to thoſe veſſels. The muffle is left quite open in its fore-part, that the operator may be at liberty to examine what paſſes in the cupels, to ſtir their contents, to remove them from one place to another, to convey new matters into them, *&c.* and alſo to promote the free acceſs of the air, which muſt concur with the fire towards the evaporation neceſſary to the vitrification of lead; which air, if freſh were not often enough admitted, would be incapable of producing that effect; becauſe it would ſoon be loaded with ſuch a quantity of vapours that it could not take up any more.

The government of the fire in this furnace is founded on the general principles above laid down for all furnaces. Yet as there are ſome little differences, and as it is very eſſential to the ſucceſs of the operations for which this furnace is intended, that the artiſt ſhould be abſolutely maſter of his degree of heat, we ſhall in few words ſhew how that may be raiſed or lowered.

When the furnace is filled with coals and kindled, if the door of the aſh-hole be ſet wide open, and that of the fire-place ſhut very cloſe, the force of the fire is increaſed; and if, moreover, the pyramidal cover be put on the top, and the conical funnel added to it, the fire will become ſtill more fierce.

Seeing the matters contained in this furnace are encompaſſed with fire on all ſides, except in the fore part oppoſite to the door of the fire-place, and as there are occaſions which require that the force of the fire ſhould be applied to this part alſo, an iron box, of the ſhape and ſize of the door, hath been contrived to anſwer that purpoſe. This box is filled with lighted coals, and applied immediately to the door-place, by which means the heat there is conſiderably augmented. This help may be made uſe of at the beginning of the operation, in order to accelerate it, and bring the heat ſooner to the deſired degree; or in caſe a very fierce heat be required; or at a time when the air being hot and moiſt will not make the fire burn with the neceſſary vigour.

The heat may be leſſened, by removing the iron box, and ſhutting the door of the fire-place quite cloſe. It may be ſtill further and gradually diminiſhed, by taking off the conical funnel from the top; by ſhutting the door of the fire-place with one of its plates only, that which has the leaſt, or that which has the greateſt aperture in it; by taking off the pyramidal cover; by ſhutting the aſh-hole door wholly or in part; and laſtly, by ſetting the door of the fire-place wide open: but, in this laſt caſe, the cold air penetrates into the cavity of the muffle, and refrigerates the cupels more than is almoſt ever neceſſary. If it be obſerved, during the operation, that the muffle grows cold in any particular part, it is a ſign there is a vacuity left by the coals in that place: in this caſe an iron wire muſt be thruſt into the furnace, through the hole which is over the door of the fire-place, and the coals ſtirred therewith, ſo as to make them fall into their places and fill up the vacant interſtices.

It is proper to obſerve, that, beſides what has been ſaid concerning the ways of increaſing the activity of the fire in the cupelling furnace, ſeveral other cauſes alſo may concur to procure to the matters contained in the muffle a greater degree of heat: for example, the ſmaller the muffle is, the wider and more numerous the holes in it are; the nearer to its bottom, or further end, the cupels are placed, the more will the matters therein contained be affected with heat.

Beſides the operations to be performed by the cupel, this furnace is very uſeful, and even neceſſary, for many chemical experiments; ſuch, for inſtance, as thoſe relating to ſundry vitrifications and enamelling. As it is pretty low, the beſt way is to place it, when it is to be uſed, on a baſe of brick-work that may raiſe it to a level with the operator's hand.

A lamp-furnace is exceeding uſeful for all operations that require only a moderate, but long continued degree of heat. The furnace for working with a lamp heat is very ſimple: it conſiſts only of a hollow cylinder, from ſifteen to eighteen inches high, and five or ſix in diameter, having at its bottom an aperture large enough for a lamp to be introduced and withdrawn with eaſe. The lamp muſt have three or four wicks, to the end that by lighting more or fewer of them a greater or leſs degree of heat may be produced. The body of the furnace muſt moreover have ſeveral ſmall holes in it, in order to ſupply the flame of the lamp with air enough to keep it alive.

On the top of this furnace ſtands a baſon five or ſix inches deep, which ought to fill the cavity of the cylinder exactly, and to be ſupported at its circumference by a rim which may entirely cover and cloſe the furnace: The uſe of this baſon is to contain the ſand through which the lamp-heat is uſually conveyed.

Beſides this, there muſt be a kind of cover or dome made of the ſame material with the furnace, and of the ſame diameter with the ſand-bath, without any other opening than a hole, nearly circular, cut in its lower extremity. This dome is a ſort of reverberatory, which ſerves to confine the heat and direct it towards the body of the retort; for it is uſed only when ſomething is to be diſtilled in a veſſel of this faſhion; and then the hole at its bottom ſerves for a paſſage to the neck of the retort. This dome ſhould have an ear or handle, for the conveniency of putting it on and taking it off with eaſe.

Of Lutes.

CHEMICAL veſſels, eſpecially ſuch as are made of glaſs, and the earthen veſſels commonly called ſtoneware, are very ſubject to break when expoſed to ſudden heat or cold; whence it comes that they often crack when they begin to heat, and alſo when being very hot they happen to be cooled, either by freſh coals thrown into the furnace, or by the acceſs of cold air. There is no way to prevent the former of theſe accidents, but by taking the pains to warm your veſſel very ſlowly, and by almoſt inſenſible degrees. The ſecond may be avoided by coating the body of the veſſel with a paſte or lute, which being dried will defend it againſt the attacks of cold.

The fitteſt ſtuff for coating veſſels is a compoſition of fat earth, Windſor-loam, fine ſand, filings of iron, or powdered glaſs, and chopped cow's hair, mixed and made into a paſte with water. This lute ſerves alſo to defend glaſs veſſels againſt the violence of the fire, and to prevent their melting eaſily.

In almoſt all diſtillations it is of great conſequence, as hath been ſaid, that the neck of the diſtilling veſſel be exactly joined with that of the receiver into which it is introduced, in order to prevent the vapours from eſcaping into the air and ſo being loſt: And this junction is effected by means of a lute.

A few ſlips of paper, applied round the neck of the veſſels with common ſize, will be ſufficient to keep in ſuch vapours as are aqueous, or not very ſpirituous.

If the vapours are more acrid and more ſpirituous, recourſe may be had to ſlips of bladder long ſteeped in water, which, containing a ſort of natural glue, cloſe the junctures of the veſſels very well.

If it be required to confine vapours of a ſtill more penetrating nature, it will be proper to employ a lute that quickly grows very hard; particularly a paſte made with quick-lime and any ſort of jelly, whether vegetable or animal; ſuch as the white of an egg, ſtiff ſize, *&c.* This is an excellent lute, and not eaſily penetrated. It is alſo uſed to ſtop any cracks or fractures that happen to glaſs veſſels. But it is not capable of reſiſting the vapours of mineral acid ſpirits, eſpecially when they are ſtrong and ſmoking: For that purpoſe it is neceſſary to incorporate the other ingredients thoroughly with fat earth ſoftened with water; and even then it frequently happens that this lute is penetrated by acid vapours, eſpecially thoſe of the ſpirit of ſalt, which of all others are confined with the greateſt difficulty.

In ſuch caſes its place may be ſupplied with another, which is called fat lute, becauſe it is actually worked up with fat liquors. This lute is compoſed of a very fine cretaceous earth, called tobacco-pipe clay, moiſtened with equal parts of the drying oil of lint-ſeed, and a varniſh made of amber and gum copal. It muſt have the conſiſtence of a ſtiff paſte. When the joints of the veſſels are cloſed up with this lute, they may, for greater ſecurity, be covered over with ſlips of linen ſmeared with the lute made of quick-lime and the white of an egg.

Chemical veſſels are liable to be broken in an operation by other cauſes beſides the ſudden application of heat or cold. It frequently happens that the vapours of the matters, expoſed to the action of fire, ruſh out with ſuch impetuoſity, and are ſo elaſtic, that finding no paſſage through the lute with which the joints of the veſſels are cloſed, they burſt the veſſels themſelves, ſometimes with exploſion and danger to the operator.

To prevent this inconvenience, it is neceſſary, that in every receiver there be a ſmall hole, which being ſtopped only with a little lute may eaſily be opened and ſhut again as occaſion requires. It ſerves for a vent-hole to let out the vapours, when the receiver begins to be too much crowded with them. Nothing but practice can teach the artiſt when it is requiſite to open this vent. If he hits the proper time, the vapours commonly ruſh out with rapidity, and a conſiderable hiſſing noiſe; and the vent ſhould be ſtopped again as ſoon as the hiſſing begins to grow faint. The lute employed to ſtop this ſmall hole ought always to be kept ſo ductile, that by taking the figure of the hole exactly it may entirely ſtop it. Beſides, if it ſhould harden upon the glaſs, it would ſtick ſo faſt, that it would be very difficult to remove it without breaking

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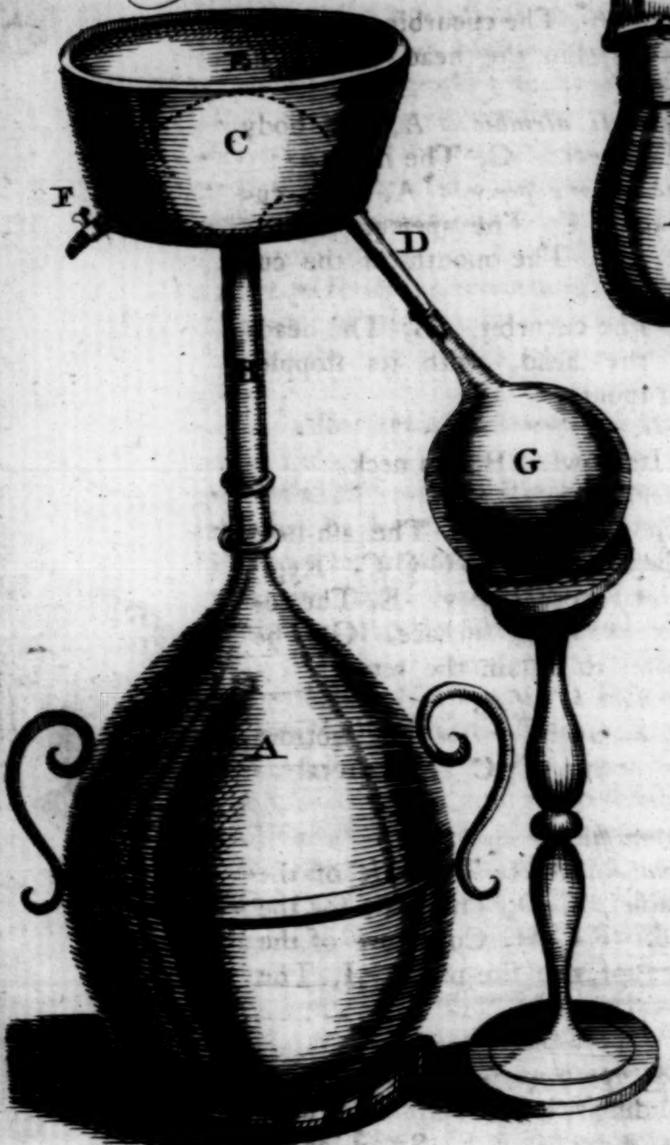
Plate. LXIV

Fig. 1.



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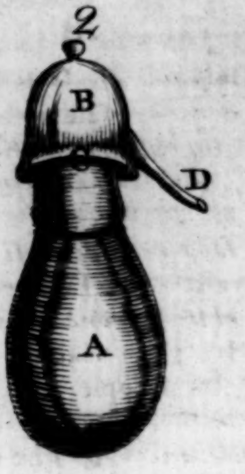

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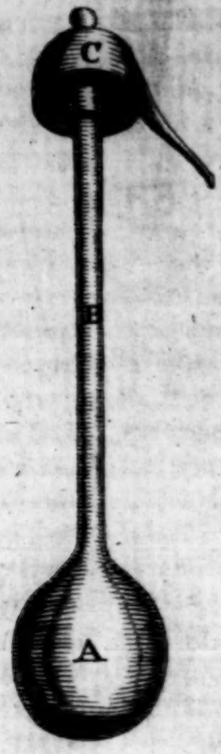

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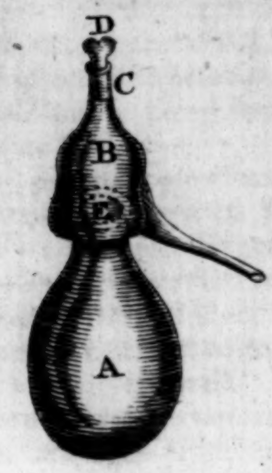

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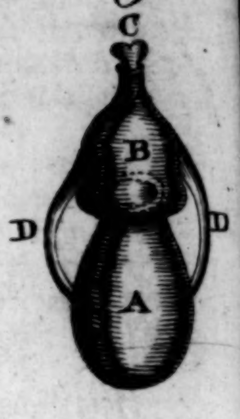

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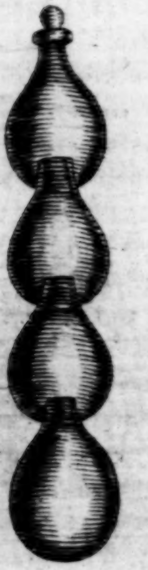

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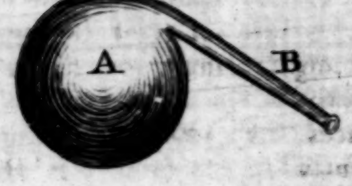

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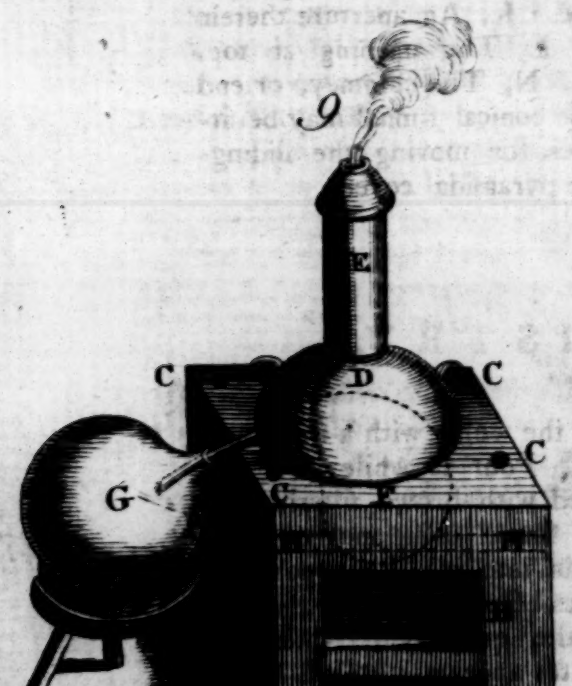

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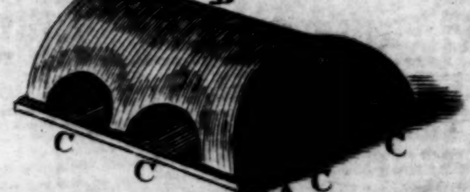

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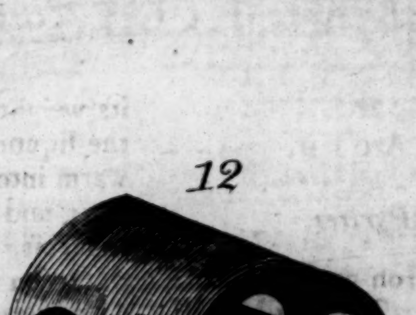

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ing the veſſel. This danger is eaſily avoided by making uſe of the fat lute, which continues pliant for a long time, when it is not expoſed to an exceſſive heat.

This way of ſtopping the vent-hole of the receiver has yet another advantage: For if the hole be of a proper width, as a line and half, or two lines, in diameter, then when the vapours are accumulated in too great a quantity, and begin to make a great effort againſt the ſides of the receiver, they puſh up the ſtopple, force it out, and make their way through the vent-hole: So that by this means the breaking of the veſſels may always be certainly prevented. But great care muſt be taken that the vapours be not ſuffered to eſcape in this manner, except when abſolute neceſſity requires it; for it is generally the very ſtrongeſt and moſt ſubtile part of a liquor which is thus diſſipated and loſt.

Heat being the chief cauſe that puts the elaſticity of the vapours in action, and prevents their condenſing into a liquor, it is of great conſequence in diſtillation that the receiver be kept as cool as poſſible. With this view a thick plank ſhould be placed between the receiver and the body of the furnace, to intercept the heat of the latter, and prevent its reaching the former. As the vapours themſelves riſe very hot from the diſtilling veſſel, they ſoon communicate their heat to the receiver, and eſpecially to its upper part, againſt which they ſtrike firſt. For this reaſon it is proper, that linen cloths dipt in very cold water be laid over the receiver, and frequently ſhifted. By this means the vapours will be conſiderably cooled, their elaſticity weakened, and their condenſation promoted.

By what hath been ſaid in this firſt part, concerning the properties of the principal agents in chemiſtry, the conſtruction of the moſt neceſſary veſſels and furnaces, and the manner of uſing them, we are ſufficiently prepared for proceeding directly to the operations, without being obliged to make frequent and long ſtops, in order to give the neceſſary explanations on thoſe heads.

Nevertheleſs, we ſhall take every proper occaſion to extend the theory here laid down, and to improve it by the addition of ſeveral particulars, which will find their places in our treatiſe of chemical operations.

Explanation *of* PLATE LXIV.

Fig. 1. *A copper alembic.* A, The cucurbit or body. B, the neck. C, The head. D, The beak, noſe, or ſpout. E, The refrigeratory, or cooler. F, Its cock. G, The receiver.

Fig. 2. *A glaſs alembic.* A, The cucurbit. B, The head. C, The gutter within the head. D, The beak.

Fig. 3. *A long-necked glaſs alembic.* A, The body of the matraſs. B, The neck. C, The head.

Fig. 4. *A glaſs alembic of one piece.* A, The cucurbit. B, The head. C, The aperture in the head. D, Its ſtopple. E, The mouth of the cucurbit.

Fig. 5. *A pelican.* A, The cucurbit. B, The head. C, The aperture in the head, with its ſtopple. D D, The two curved ſpouts.

Fig. 6. *A row of aludels.*

Fig. 7. *A retort.* A, Its bowl. B, Its neck.

Fig. 8. *An Engliſh retort.*

Fig. 9. *A reverberating furnace.* A, The aſh-hole door. B, The fire-place door. C C C C, Regiſters. D, The dome, or reverberatory. E, The conical funnel. F, The retort in the furnace. G, The receiver. H H, Iron bars to ſuſtain the retort.

Fig. 10. *The conical furnace by itſelf.*

Fig. 11. *Back-view of a muffle.* A, The bottom of the muffle. B, Its arch. C C C, Lateral apertures.

Fig. 12. *Fore-view of a muffle.*

Fig. 13. *A melting furnace.* A A, The baſe of the furnace. B, The aſh-hole. C D, The grate for the fire. E, The fire-place. F G H, Curvature of the inſide of the upper part of the fire-place. I, The ſhaft, or chimney.

Plate LXV. Fig. 1. *A cupelling furnace.* A, The aſh-hole. B B, Its ſliding doors. C, The fire-place. D D, Its ſliding doors. E F, Small apertures in the ſliders. G G, Holes for bars to bear the muffles. H H H, Iron braces in the fore-part of the furnace, which form grooves for the doors of the fire-place and aſh-hole to ſlide in. I, The upper pyramidal part of the furnace. K, An aperture therein for managing the coals. L, The opening at top. M, The pyramidal cover. N, The chimney, or end of the ſhaft, on which the conical funnel may be fitted. O O O O, Handles for moving the ſliding-doors. P P, Ears of the pyramidal covers.

PART II. PRACTICE of CHEMISTRY.

Of the Vitriolic Acid.

To extract Vitriol from the Pyrites.

Take any quantity you pleaſe of iron pyrites; leave them for ſome time expoſed to the air: They will crack, ſplit, loſe their brightneſs, and fall into powder. Put this powder into a glaſs cucurbit, and pour upon it twice its weight of hot water; ſtir the whole with a ſtick, and the liquor will grow turbid. Pour it while it is yet warm into a glaſs funnel lined with brown filtering paper; and having placed your funnel over another glaſs cucurbit, let the liquor drain into it. Pour more hot water on the powdered pyrites, filter as before, and ſo go on, every time leſſening the quantity of water, till that which comes off the pyrites appears to have no aſtringent vitriolic taſte.

Put all theſe waters together into a glaſs veſſel that widens upwards; ſet it on a ſand bath, and heat the liquor till a conſiderable ſmoke ariſes; but take care not to make it boil. Continue the ſame degree of fire till the ſurface of the liquor begins to look dim, as if ſome duſt had fallen into it; then ceaſe evaporating, and remove the veſſel into a cool place: In the ſpace of four and twenty hours there will be formed therein a quantity of cryſtals, of a green colour and a rhomboidal figure: Theſe are vitriol of Mars, or copperas. Decant the remaining liquor; add thereto twice its weight of water; filter, evaporate, and cryſtallize as before; repeat theſe operations till the liquor will yield no more cryſtals, and keep by themſelves the cryſtals obtained at each cryſtalliſation.

In large works for extracting vitriol from the pyrites, they proceed thus. They collect a great quantity of pyrites on a piece of ground expoſed to the air, and pile them up in heaps of about three foot high. There they leave them expoſed to the action of the air, ſun, and rain, for three years together; taking care to turn them every ſix months, in order to facilite the efflorеſcence of thoſe which at firſt lay undermoſt. The rain-water which has waſhed thoſe pyrites is conveyed by proper channels into a ciſtern; and when a ſufficient quantity thereof is gathered, they evaporate it to a pellicle in large leaden boilers, having firſt put into it a quantity of iron, ſome part of which is diſſolved by the liquor, becauſe it contains a vitriolic acid that is not fully ſaturated therewith. When it is ſufficiently evaporated, they draw it off into large leaden or wooden coolers, and there leave it to ſhoot into cryſtals. In theſe laſt veſſels ſeveral ſticks are placed, croſſing each other in all manner of directions, in order to multiply the ſurfaces on which the cryſtals may faſten.

To extract Sulphur from the Pyrites, and other ſulphureous Minerals.

Reduce to a coarſe powder any quantity of yellow pyrites, or other mineral containing ſulphur. Put this powder into an earthen or glaſs retort, having a long wide neck, and ſo large a body that the matter may fill but two thirds of it. Set the retort in a ſand-bath fixed over a reverberating furnace: Fit to it a receiver half full of water, and ſo placed that the noſe of the retort may be about an inch under the water: Give a gradual fire, taking care you do not make it ſo ſtrong as to melt the matter. Keep the retort moderately red for one hour, or an hour and half, and then let the veſſels cool.

Almoſt all the ſulphur, ſeparated by this operation from its matrix, will be found at the extremity of the neck of the retort, being fixed there by the water. You may get it out either by melting it with ſuch a gentle heat as will not ſet it on fire, or by breaking the neck of the retort.

To extract Alum from aluminous Minerals.

Take ſuch minerals as are known or ſuſpected to contain alum. Expoſe them to the air, that they may effloreſce. If they remain there a year without any ſenſible change, calcine them, and then leave them expoſed to the air, till a bit thereof being put on the tongue imparts an aſtringent aluminous taſte.

When your matters are thus prepared, put them into a leaden or glaſs veſſel; pour upon them thrice their weight of hot water; boil the liquor; filter it; and repeat theſe operations till the earth be ſo edulcorated that the water which comes off it hath no taſte. Mix all theſe ſolutions together, and let them ſtand four and twenty hours, that the groſs and earthy parts may ſettle to the bottom; or elſe filter the liquor: then evaporate till it will bear a new-laid egg. Now let it cool, and ſtand quiet four and twenty hours: in that time ſome cryſtals will ſhoot, which are moſt commonly vitriolic; for alum is rarely obtained by the firſt cryſtalliſation. Remove theſe vitriolic cryſtals: if any cryſtals of alum be found amongſt them, theſe muſt be diſſolved anew, and ſet to cryſtalliſe a ſecond time in order to their purification; becauſe they partake of the nature as well as of the colour of vitriol. By this method extract all the alum that the liquor will yield.

If you get no cryſtals of alum by this means, boil your liquor again, and add to it a twentieth part of its weight of a ſtrong alkaline lixivium, or a third part of its weight of putrefied urine, or a ſmall quantity of quick-lime. Experience and repeated trials muſt teach you which of theſe three ſubſtances is to be preferred, according to the particular nature of the mineral on which you are to operate. Keep your liquor boiling, and if there be any alum in it, there will appear a white precipitate; in that caſe let it cool and ſettle. When the white precipitate is entirely fallen, decant the clear, and leave the cryſtals of alum to ſhoot at leiſure, till the liquor will yield no more; it will then be exceeding thick.

Alum is obtained from ſeveral ſorts of minerals. In ſome parts of Italy, and in ſundry other places, it effloreſces naturally on the ſurface of the earth. There it is ſwept together with brooms, and thrown into pits full of water. This water is impregnated therewith till it can diſſolve no more. Then it is filtered, and ſet to evaporate in large leaden veſſels; and when it is ſufficiently evaporated, and ready to ſhoot into cryſtals, it is drawn off into wooden coolers, and there left for the ſalt to cryſtalliſe.

In aluminous ſoils there are often found ſprings ſtrongly impregnated with alum; ſo that to obtain it the water need only be evaporated.

In the country about Rome there is a very hard ſtone, which is hewn out of the quarry, juſt like other ſtones for building: this ſtone yields a great deal of alum. In order to extract it, the ſtones are calcined for twelve or fourteen hours; after which they are expoſed to the air in heaps, and carefully watered three or four times a day for forty days together. In that time they begin to effloreſce, and to throw out a reddiſh matter on their ſurface. Then they are boiled in water, which diſſolves all the alum they contain, and being duly evaporated gives it back in cryſtals. This is the alum called Roman alum.

Several ſorts of pyrites alſo yield a great deal of alum. The Engliſh have a ſtone of this kind, which in colour is very like a ſlate. This ſtone contains much ſulphur, which they get rid of by roaſting it. After this they ſteep the calcined ſtone in water, which diſſolves the alum it contains, and to this ſolution they add a certain quantity of a lye made of the aſhes of ſea-weeds.

To extract the Vitriolic Acid from Green Vitriol.

Take any quantity of green vitriol: put it in an unglazed earthen veſſel, and heat it gradually. Vapours will ſoon begin to riſe. Increaſe the fire a little, and it will liquify by means of the water contained in it, and acquire what we called an *aqueous fluor*. Continue the calcination, and it will become leſs and leſs fluid, grow thick, and turn of a greyiſh colour. Now raiſe your fire, and keep it up till the ſalt recover its ſolidity, acquire an orange colour, and begin to grow red where it immediately touches the ſides of the veſſel. Then take it out and reduce it to powder.

Put the vitriol thus calcined and pulveriſed into a good earthen retort, of which one half at leaſt muſt remain empty. Set the retort in a reverberatory furnace: Fit thereto a large glaſs receiver, and, having luted the joint well, give fire by degrees. You will ſoon ſee white clouds riſe into the receiver, which will render it opaque and heat it. Continue the ſame degree of fire till theſe clouds diſappear: They will be ſucceeded by a liquor which will trickle down the ſides of the receiver in veins. Still keep up the fire to the ſame degree as long as theſe veins appear. When they begin to abate, encreaſe the fire, and puſh it to the utmoſt extremity: Upon this there will come over a black, thick liquor: It will even be found congealed, and prove the icy oil of vitriol, if care hath been taken to change the receiver, keep the veſſels perfectly cloſe, and give a ſufficient degree of heat. Proceed thus till nothing more comes over, or at leaſt very little. Let the veſſels cool, unlute them, pour the contents of the receiver into a bottle, and ſeal it hermetically.

To decompoſe Sulphur, and extract its Acid, by burning it.

Take any quantity of the pureſt ſulphur; fill therewith a crucible or other earthen diſh; heat it till it melts; then ſet it on fire, and when its whole ſurface is lighted, place it under a large glaſs head, ſo that the flame of the ſulphur do not touch either its ſides or bottom; that the air have free acceſs, in order to make the ſulphur burn clear; that the head incline a little toward the ſide on which its beak is, that as the vapours condenſe therein the liquor may run off with eaſe. To the beak of this veſſel fit a receiver: The fumes of the lighted ſulphur will be condenſed, and gather into drops in the head, out of which they will run into the receiver. There, when the ſulphur has done burning, you will find an acid liquor, which is the ſpirit of ſulphur.

To concentrate the Vitriolic Acid.

Take the vitriolic acid you intend to concentrate, that is, to dephlegmate and make ſtronger: Pour it into a good glaſs retort, of ſuch a ſize that your quantity of acid may but half fill it: Set this retort in the ſand-bath of a reverberating furnace; fit it to a receiver; lute it on, and give a gradual fire. There will come over into the receiver a clear liquor, the firſt drops of which will be but faintly acid: This is the moſt aqueous part.

When the drops begin to follow one another much more ſlowly, raiſe your fire, till the liquor begin to bubble a little in the middle. Keep it thus gently boiling, till one half or two thirds thereof be come over into the receiver. Then let your veſſels cool; unlute them; what remains in the retort pour into a cryſtal bottle, and ſtop it exactly with a glaſs ſtopple rubbed with emery.

To decompoſe vitriolated Tartar by means of the Phlogiſton; or to compoſe Sulphur by combining the Vitriolic Acid with the Phlogiſton.

Take equal parts of vitriolated tartar, and very dry ſalt of tartar, ſeparately reduced to powder; add an eighth part of their weight of charcoal-duſt; and mix the whole together very accurately. Throw this mixture into a red-hot crucible, placed in a furnace filled with burning coals. Cover it very cloſe, and keep it very hot, till the mixture melt, which may be known by uncovering the crucible from time to time. There will then appear a bluiſh flame, accompanied with a pungent ſmell of ſulphur.

Take the crucible out of the fire; diſſolve its contents in hot water; filter the ſolution through brown paper ſupported by a glaſs funnel; drop into the filtered liquor by little and little any acid whatever. As you add the acid, the liquor will grow more and more turbid, and let fall a grey precipitate. Continue dropping in more acid till the liquor will yield no more precipitate. Filter it a ſecond time to ſeparate it from the precipitate: What remains on the filter is a true inflammable ſulphur, which you may either melt or ſublime into flowers.

Of the NITROUS ACID.

To extract nitre out of nitrous earths and ſtones. The purification of ſalt petre. Mother of nitre. Magneſia.

Take any quantity of nitrous earths or ſtones; reduce them to powder; and therewith mix a third part of the aſhes of green wood and quick-lime. Put this mixture into a barrel or vat, and pour on it hot water to about twice the weight of the whole maſs. Let it ſtand thus for twenty four hours, ſtirring it from time to time with a ſtick. Then filter the liquor through brown paper, or paſs it through a flannel bag, till it come clear: it will then have a yellowiſh colour. Boil this liquor, and evaporate till you perceive that a drop of it let fall on any cold body coagulates. Then ſtop the evaporation, and ſet your liquor in a cool place. In the ſpace of four and twenty hours cryſtals will be formed in it, the figure of which is that of an hexagonal priſm, having its oppoſite planes generally equal, and terminated at each extremity by a pyramid of the ſame number of ſides. Theſe cryſtals will be of a browniſh colour, and deflagrate on a live coal.

Decant the liquor from theſe cryſtals; mix it with twice its weight of hot water; evaporate and cryſtalliſe as before. Repeat the ſame operation till the liquor will yield no more cryſtals: it will then be very thick, and goes by the name of *mother of nitre*.

Earths and ſtones that have been impregnated with animal or vegetable juices ſuſceptible of putrefaction, and have been long expoſed to the air, but ſheltered from the ſun and rain, are thoſe which yield the greateſt quantity of nitre. But all ſorts of earths and ſtones are not equally fit to produce it. None is ever found in flints or ſands of a cryſtalline nature.

Some earths and ſtones abound ſo with nitre, that it effloreſces ſpontaneouſly on their ſurface, in the form of a cryſtalline down. This nitre may be collected with brooms, and accordingly has the name of *ſalt-petre ſweepings*. Some of this ſort is brought from India.

The proceſs by which our ſalt-petre makers extract nitre in quantities, out of rubbiſh and nitrous earths, is very nearly the ſame with that here ſet down: ſo that we ſhall not enter into a particular account of it. We ſhall only take notice of one thing, which it is of ſome conſequence to know; namely, that there is no nitrous earth which does not contain ſea ſalt alſo. The greateſt quantities of this ſalt are to be found in thoſe earths which have been drenched with urine or other animal excrements. Now, as the rubbiſh of old houſes in great cities is in this claſs, it comes to paſs, that when the ſalt-petre workers evaporate a nitrous lixivium drawn from that rubbiſh, as ſoon as the evaporation is brought to a certain pitch, a great many little cryſtals of ſea-ſalt form in the liquor, and fall to the bottom of the veſſel.

The ſalt-petre workers in France call theſe ſaline particles *the grain*, and take great care to ſeparate them from the liquor, (which as long as it continues hot keeps the ſalt-petre diſſolved) before they ſet it to cryſtalliſe. This fact ſeems a little ſingular, conſidering that ſea-ſalt diſſolves in water more eaſily than ſalt-petre, and cryſtalliſes with more difficulty.

In order to diſcover the cauſe of this phenomenon, we muſt recollect, firſt, that water can keep but a determinate quantity of any ſalt in ſolution, and that if water fully ſaturated with a ſalt be evaporated, a quantity of ſalt will cryſtalliſe in proportion to the quantity of water evaporated. Secondly, that thoſe ſalts which are the moſt ſoluble in water, particularly thoſe which run in the air, will diſſolve in cold and in boiling water equally; whereas much greater quantities of the other ſalts will diſſolve in hot and boiling water than in cold water. Theſe things being admitted, when we know that ſea-ſalt is one of the firſt ſort, and ſalt-petre of the ſecond, the reaſon why ſea-ſalt precipitates in the preparation of ſalt-petre appears at once. For,

When the ſolution of ſalt-petre and ſea ſalt comes to be evaporated to ſuch a degree that it contains as much ſea-ſalt as it poſſibly can, this ſalt muſt begin to cryſtalliſe, and continue to do ſo gradually as the evaporation advances. But becauſe at the ſame time it does not contain as much ſalt-petre as it can hold, ſeeing it is capable of diſſolving a much greater quantity thereof when it is boiling hot than when it is cold, this laſt named ſalt will not cryſtalliſe ſo ſoon. If the evaporation were continued till the caſe of the ſalt-petre came to be the ſame with that of the ſea-ſalt, then the ſalt-petre alſo would begin to cryſtalliſe gradually in proportion to the water evaporated, and the two ſalts would continue cryſtalliſing promiſcuouſly together: but it is never carried ſo far; nor is it ever neceſſary; for as the water cools it becomes more and more incapable of holding in ſolution the ſame quantity of ſalt-petre as when it was boiling hot.

And then comes the very reverſe, with regard to the cryſtalliſing of the two ſalts; for then the ſalt-petre ſhoots, and not the ſea-ſalt. The reaſon of this fact alſo is founded on what has juſt been ſaid. The ſea-ſalt, of which cold water will diſſolve as much as boiling water, and which owed its cryſtalliſing before only to the evaporation, now ceaſes to cryſtalliſe as ſoon as the evaporation ceaſes; while the ſalt-petre, which the water kept diſſolved only becauſe it was boiling hot, is forced to cryſtalliſe merely by the cooling of the water.

When the ſolution of ſalt-petre has yielded as many cryſtals of that ſalt as it can yield by cooling, it is again evaporated, and being then ſuffered to cool yields more cryſtals And thus they continue evaporating and cryſtalliſing till the liquor will afford no more cryſtals. It is plain, that as the ſalt-petre cryſtalliſes, the proportion of ſea-ſalt to the diſſolving liquor increaſes; and as a certain quantity of water evaporates alſo during the time employed in cryſtalliſing the ſalt petre, a quantity of ſea ſalt, proportioned to the water ſo evaporating, muſt cryſtalliſe in that time: and this is the reaſon why ſalt-petre is adulterated with a mixture of ſea-ſalt. It likewiſe follows, that the laſt cryſtals of nitre, obtained from a ſolution of ſalt petre and ſea-ſalt, contain much more ſea-ſalt than the firſt.

From all that has been ſaid concerning the cryſtalliſation of ſalt-petre and ſea-ſalt, it is eaſy to deduce the proper way of purifying the former of theſe two ſalts from a mixture of the latter. For this purpoſe the ſalt-petre to be refined need only be diſſolved in fair water. The proportion between the two ſalts in this ſecond ſolution is very different from what it was in the former; for it contains no more ſea-ſalt than what had cryſtalliſed along with the ſalt-petre under favour of the evaporation, the reſt having been left diſſolved in the liquor that refuſed to yield any more nitrous cryſtals.

As there is therefore a much greater quantity of ſalt-petre than of ſea-ſalt in this ſecond ſolution, it is eaſy to evaporate it to ſuch a degree that a great deal of ſalt-petre ſhall cryſtalliſe, while much more of the water muſt neceſſarily be evaporated before any of the ſea-ſalt will cryſtalliſe.

However, the ſalt-petre is not yet entirely freed from all mixture of ſea-ſalt by this firſt purification; for the the cryſtals obtained from this liquor, in which ſea-ſalt is diſſolved, are ſtill incruſted, and, as it were, infected therewith: hence it comes, that, to refine the ſalt-petre thoroughly, theſe cryſtalliſations muſt be repeated four or five times.

The ſalt-petre men commonly content themſelves with cryſtalliſing it thrice, and call the produce ſalt-petre of the firſt, ſecond, or third ſhoot, according to the number of cryſtalliſations it has undergone. But their beſt refined ſalt-petre, even that of the third ſhooting, is not yet ſufficiently pure for chemical experiments that require much accuracy: ſo that it muſt be further purified, but ſtill by the ſame method.

The nitrous acid is not pure in the earths and ſtones from which it is extracted. It is combined partly with the very earth in which it is formed, and partly with the volatile alkali produced by the putrefaction of the vegetable or animal matters that concurred to its generation. A fixed alkali and quick-lime are added to the lixivium of a nitrous earth, in order to decompoſe the nitrous ſalts formed in that earth, and to ſeparate the acid from the volatile alkali and the abſorbent earth with which it is united: thence comes that copious ſediment which appears in the lye at the beginning of the evaporation. Theſe matters form with that acid a true nitre, much more capable than the original nitrous ſalts of cryſtalliſation, detonation, and the other properties which are eſſential thereto. The baſis of nitre is therefore a fixed alkali mixed with a little lime.

The mother of nitre, which will yield no more cryſtals, is brown and thick: by evaporation over a fire it is further inſpiſſated, and becomes a dry, ſolid body; which however being left to itſelf ſoon gives, and runs into a liquor. This water ſtill contains a good deal of nitre, ſea-ſalt, and the acids of theſe ſalts united with an abſorbent earth. It contains moreover a great deal of a fat, viſcid matter, which prevents its cryſtalliſing.

All ſaline ſolutions in general, after having yielded a certain quantity of cryſtals, grow thick, and refuſe to part with any more, though they ſtill contain much ſalt. They are all called *mother-waters*, as well as that which hath yielded nitre. The mother-waters of different ſalts may prove the ſubjects of curious and uſeful enquiries.

If a fixed alkali be mixed with the mother of nitre, a copious white precipitate immediately falls, which being collected and dried is called *magneſia*. This precipitate is nothing but the abſorbent earth that was united with the nitrous acid, together with a good deal of the lime that was added, and was alſo united with that acid, from which they are now ſeparated by the fixed alkali, according to the uſual laws of affinities or elective attractions.

The vitriolic acid poured upon mother of nitre cauſes many acid vapours to riſe, which are a compound of the nitrous and marine acids, that is, an *aqua regia*. On this occaſion alſo there falls a large quantity of a white powder, which is ſtill called *magneſia*; yet it differs from the former in that it is not, like it, a pure abſorbent earth, but combined with the vitriolic acid.

An *aqua regis* may alſo be drawn from nitrous earths by the force of fire only, without the help of any additament.

To decompoſe Nitre by means of the Phlogiſton. Nitre fixed by Charcoal. Clyſſus *of Nitre.* Sal Polychreſtum.

Take the pureſt ſalt-petre in powder; put it into a large crucible, which it may but half fill; ſet the crucible in a common furnace, and ſurround it with coals. When it is red-hot the nitre will melt, and become as fluid as water. Then throw into the crucible a ſmall quantity of charcoal-duſt: the nitre and the charcoal will immediately deflagrate with violence; and a great commotion will be raiſed, accompanied with a conſiderable hiſſing, and abundance of black ſmoke. As the charcoal waſtes, the detonation will abate, and ceaſe entirely as ſoon as the coal is quite conſumed.

Then throw into the crucible the ſame quantity of charcoal-duſt as before, and the ſame phenomena will be repeated. Let this coal alſo be conſumed: then add more, and go on in the ſame manner till you can excite no further deflagration; always obſerving to let the burning coal be entirely conſumed before you add any freſh. When no deflagration enſues, the matter contained in the crucible will have loſt much of its fluidity.

Nitre will not take fire, unleſs the inflammable matter added to it be actually burning, or the nitre itſelf red hot, and ſo thoroughly ignited as immediately to kindle it. Therefore, if you would procure the detonation of nitre with charcoal, and make uſe of cold charcoal, as in the proceſs, the nitre in the crucible muſt be red hot, and in perfect fuſion: but you may alſo uſe live coals, and then the nitre need not be red-hot.

The matter remaining in the crucible after the operation, is a very ſtrong fixed alkali. Being expoſed to the air, it quickly extracts the moiſture thereof, and runs into a liquor. It is called *alkalizated nitre*, or to diſtinguiſh it from nitre alkalizated by other inflammable matters, *nitre fixed by charcoal*.

The nitrous acid is not only diſſipated during the deflagration of the nitre, but is even deſtroyed, and perfectly decompoſed. The ſmoke that riſes during the operation has not the leaſt odour of an acid.

In order to collect the vapours diſcharged by the deflagration of nitre, fit to a tubulated earthen retort two or three large adopters: ſet the retort in a furnace; and under it make a fire ſufficient to keep its bottom moderately red. Then take a ſmall quantity, two or three pinches for example, of a mixture of three parts of nitre with one of charcoal-duſt, and drop it into the retort through its tube, which muſt be uppermoſt, and immediately ſtopped cloſe. A detonation inſtantly enſues, and the vapours that riſe from the inflammed mixture of nitre and charcoal, paſſing out through the neck of the retort into the adopters,, circulate therein for a while, and at laſt condenſe into a liquor.

When the detonation is over, and the vapours condenſed, or nearly ſo, drop into the retort another equal quantity of the mixture; and repeat this till you find there is liquor enough in the recipients to be examined with eaſe and accuracy. This liquor is almoſt inſipid, and ſhews no tokens of acidity; or at moſt but very ſlight ones. It is called *clyſſus* of nitre.

Nitre is alſo decompoſed and takes fire by the means of ſulphur; but the circumſtances and the reſult differ widely from thoſe produced therewith by charcoal or any other inflammable body.

Nitre deflagrates with ſulphur on account of the phlogiſton which the latter contains. If one part of ſulphur be mixed with two or three parts of nitre, and the mixture thrown by little and little into a red-hot crucible, upon every projection there ariſes a detonation accompanied with a vivid flame.

The vapours diſcharged on this occaſion have the mingled ſmell of a ſulphureous ſpirit and ſpirit of nitre; and if they be collected by means of a tubulated retort, and ſuch an apparatus of veſſels as was uſed in the preceding experiment, the liquor contained in the recipients is found to be an actual mixture of the acid of ſulphur, the ſulphureous ſpirit, and the acid of nitre; the firſt being of greater quantity than the other two, and the ſecond greater than the laſt.

Nor is the remainder after detonation a fixed alkali, as in the former experiments; but a neutral ſalt, conſiſting of the acid of ſulphur combined with the alkali of nitre; a ſort of vitriolated tartar, known in medicine by the name of *ſal polychreſtum*.

To decompoſe Nitre by means of the Vitriolic Acid. The Smoking Spirit of Nitre. Sal de duobus. *The Purification of Spirit of Nitre.*

Take equal parts of well purified nitre and green vitriol: dry the nitre thoroughly, and bruiſe it to a fine powder. Calcine the vitriol to redneſs: reduce it likewiſe to a very fine powder; and mingle theſe two ſubſtances well together. Put the mixture into an earthen long neck, or a good glaſs retort coated, of ſuch a ſize that it may be but half full.

Set this veſſel in a reverberating furnace covered with its dome; apply a large glaſs receiver, having a ſmall hole in its body, ſtopped with a little lute. Let this receiver be accurately luted to the retort with the fat lute, and the joint covered with a ſlip of canvas ſmeared with lute made of quick-lime and the white of an egg. Heat the veſſels very gradually. The receiver will ſoon be filled with very denſe red vapours, and drops will begin to diſtill from the noſe of the retort.

Continue the diſtillation, increaſing the fire a little when you obſerve the drops to follow each other but ſlowly, ſo that above two thirds of a minute paſſes between them; and, in order to let out the redundant vapours, open the ſmall hole in the receiver from time to time. Towards the end of the operation raiſe the fire ſo as to make the retort red. When you find that, even when the retort is red-hot, nothing more comes over, unlute the receiver, and without delay pour the liquor it contains into a cryſtal bottle, and cloſe it with a cryſtal ſtopple rubbed in its neck with emery. This liquor will be of a reddiſh yellow colour, ſmoking exceedingly, and the bottle containing it will be conſtantly filled with red fumes like thoſe obſerved in the receiver.

By the proceſs here delivered, a very ſtrong, perfectly dephlegmated, and vaſtly ſmoking ſpirit of nitre is obtained.

When the operation is over, you will find a red maſs at the bottom of the retort, caſt as it were in a mould. This is a neutral ſalt of the nature of vitriolated tartar, reſulting from the union of the acid of the vitriol with the alkaline baſis of the nitre.

The ferruginous baſis of the vitriol, which is mixed with this ſalt, gives it the red colour. To ſeparate it therefrom, you muſt pulveriſe it, diſſolve it in boiling water, and filter the ſolution ſeveral times through brown paper; becauſe the ferruginous earth of the vitriol is ſo fine, that ſome of it will paſs through the firſt time. When the ſolution is very clear, and depoſites no ſediment, let it be ſet to ſhoot, and it will yield cryſtals of vitriolated tartar; to which chemiſts have given the peculiar title of *ſal de duobus*.

Nitre may alſo be decompoſed, and its acid obtained, by the interpoſition of any of the other vitriols, alums, gypſums, boles, clays; in ſhort, by means of any compound in which the vitriolic acid is found, provided it have not a fixed alkali for its baſis.

The diſtillers of *aqua fortis*, who make large quantities at a time, and who uſe the leaſt chargeable methods, do their buſineſs by the means of earths impregnated with the vitriolic acid; ſuch as clays and boles. With theſe earths they accurately mix the nitre from which they intend to draw their ſpirit: this mixture they put into large oblong earthen pots, having a very ſhort curved neck, which enters a recipient of the ſame matter and form. Theſe veſſels they place in two rows oppoſite to each other in long furnaces, and cover them over with bricks cemented with Windſor-loam, which ſerves for a reverberatory: then they light the fire in the furnace, making it at firſt very ſmall, only to warm the veſſels; after which they throw in wood, and raiſe the fire till the pots grow quite red-hot, in which degree they keep it up till the diſtillation is entirely finiſhed.

Moſt experiments require the ſpirit of nitre to be abſolutely pure; and if it be intended for ſuch, it muſt be perfectly cleanſed from the vitriolic taint.

This is eaſily effected by mixing your ſpirit with very pure nitre, and diſtilling it a ſecond time. The vitriolic acid, with which this ſpirit of nitre is adulterated, coming in contact with a great quantity of undecompoſed nitre, unites with its alkaline baſis, and expels a proportionable quantity of the nitrous acid.

Of the MARINE ACID.

To extract Sea-ſalt from Sea-water, and from Brine-ſprings. Epſom Salt.

Filter the ſalt-water from which you intend to extract the ſalt; evaporate it by boiling, till you ſee on its ſurface a dark pellicle: this conſiſts wholly of little cryſtals of ſalt juſt beginning to ſhoot: now ſlacken the fire, that the brine may evaporate more ſlowly, and without any agitation. The cryſtals, which at firſt were very ſmall, will become larger, and form hollow truncated pyramids, the apices whereof will point downwards, and their baſes be even with the ſurface of the liquor.

Theſe pyramidal cryſtals are only collections of ſmall cubical cryſtals concreted into this form. When they have acquired a certain magnitude they fall to the bottom of the liquor. When they come to be in ſuch heaps as almoſt to reach the ſurface of the liquor, decant it from them, and continue the evaporation till no more cryſtals of ſea-ſalt will ſhoot.

The acid of ſea-ſalt is ſcarce ever found, either in ſea-water or in the earth, otherwiſe than united with a fixed alkali of a particular kind, which is its natural baſis; and conſequently it is in the form of a neutral ſalt. This ſalt is plentifully diſſolved in the waters of the ocean, and when obtained therefrom bears the name of *ſea-ſalt*. It is alſo found in the earth in vaſt cryſtalline maſſes, and is then called *ſal-gem*; ſo that ſea-ſalt and ſal-gem are but one and the ſame ſort of ſalt, differing very little from each other, except as to the places where they are found.

In the earth are alſo found ſprings and fountains, whoſe waters are ſtrong brines, a great deal of ſea-ſalt being diſſolved in them. Theſe ſprings either riſe directly from the ſea, or run through ſome mines of ſal-gem, of which they take up a quantity in their paſſage.

As the ſame, or at leaſt nearly the ſame quantity of ſea-ſalt will continue diſſolved in cold water as boiling water will take up, it cannot ſhoot, as nitre does, by the mere cooling of the water in which it is diſſolved: it cryſtalliſes only by the means of evaporation, which continually leſſens the proportion of the water to the ſalt; ſo that it is always capable of containing juſt ſo much the leſs ſea-ſalt the more there is cryſtalliſed.

The brine ſhould not boil after you perceive the pellicle of little cryſtals beginning to form on its ſurface; for the calmneſs of the liquor allows them to form more regularly, and become larger. Nor after this ſhould the evaporation be hurried on too faſt; for a ſaline cruſt would form on the liquor, which, by preventing the vapours from being carried off, would obſtruct the cryſtalliſation.

If the evaporation be continued after the liquor ceaſes to yield any cryſtals of ſea-ſalt, other cryſtals will be obtained of an oblong four-ſided form, which have a bitter taſte, and are almoſt always moiſt. This ſort of ſalt is known by the name of *Epſom ſalt*, which it owes to a ſalt ſpring in England, from the water of which it was firſt extracted. This ſalt, or rather ſaline compound, is a congeries of Glauber's ſalt and ſea-ſalt, in a manner confounded together, and mixed with ſome of the mother of ſea-ſalt, in which is contained a kind of bituminous matter. Theſe two neutral ſalts, which conſtitute the Epſom ſalt, may be eaſily ſeparated from each other, by means of cryſtalliſation only. Epſom ſalt is purgative and bitter; and therefore named *ſal catharticum amarum*, or bitter purging ſalts.

There are different methods uſed in great works for obtaining ſea-ſalt out of water in which it is diſſolved. The ſimpleſt and eaſieſt is that practiſed in France, and in all thoſe countries which are not colder. On the ſea-ſhore they lay out a ſort of broad ſhallow pits, pans, or rather ponds, which the ſea fills with the tide of flood. When the ponds are thus filled, they ſtop their communication with the ſea, and leave the water to evaporate by the heat of the ſun; by which means all the ſalt contained in it neceſſarily cryſtalliſes. Theſe pits are called *ſalt-ponds*. Salt can be made in this way in the ſummer-time only, at leaſt in France, and other countries of the ſame temperature; for during the winter, when the ſun has leſs power, and rains are frequent, this method is not practicable.

For this reaſon, as it often rains in the province of Normandy, the inhabitants take another way to extract ſalt from ſea-water. The labourers employed for this purpoſe raiſe heaps of ſand on the ſhore, ſo that the tide waters and drenches them when it flows, and leaves the ſand dry when it ebbs. During the interval between two tides of flood the ſun and the air eaſily carry off the moiſture that was left, and ſo the ſand remains impregnated with all the ſalt that was contained in the evaporated water. Thus they let it acquire as much ſalt as it can by ſeveral returns of flood, and then waſh it out with freſh water, which they evaporate over a fire in leaden boilers.

To obtain the ſalt from brine-ſprings, the water need only be evaporated; but as ſeveral of theſe ſprings contain too little ſalt to pay the charges that would be incurred, if the evaporation were effected by the force of fire only, the manufacturers have fallen upon a leſs expenſive method of getting rid of the greateſt part of the water, and preparing the brine for cryſtalliſation, in much leſs time, and with much leſs fire, than would otherwiſe have been neceſſary.

The method conſiſts in making the water fall from a certain height on a great many ſmall ſpars of wood, which divide it into particles like rain. This is performed under ſheds open to all the winds, which paſs freely through this artificial ſhower. By this means the water preſents to the air a great extent of ſurface, being indeed reduced almoſt entirely to ſurface, and the evaporation is carried on with great eaſe and expedition. The water is raiſed by pumps to the height from which it is intended to fall.

Experiments concerning the decompoſition of Sea-ſalt, by means of the phlogiſton. Kunckel's *Phoſphorus.*

“Of pure urine that has fermented five or ſix days take a quantity in proportion to the quantity of phoſphorus you intend to make: it requires about one third part of a hogſhead to make a dram of phoſphorus. Evaporate it in iron pans, till it become clotted, hard, black, and nearly like chimney-ſoot; at which time it will be reduced to about a ſixtieth part of its original weight before evaporation.

“When the urine is brought to this condition, put it in ſeveral portions into ſo many iron pots, under which you muſt keep a pretty briſk fire ſo as to make their bottoms red, and ſtir it inceſſantly till the volatile ſalt and the fetid oil be almoſt wholly diſſipated, till the matter ceaſe to emit any ſmoke, and till it ſmell like peach-bloſſoms. Then put out the fire, and pour on the matter, which will now be reduced to a powder, ſomewhat more than twice its weight of warm water. Stir it about in this water, and leave it to ſoak therein for twenty-four hours. Pour off the water by inclination; dry the drenched matter, and pulveriſe it. The previous calcination carries off from the matter about a third of its weight, and the lixiviation waſhes out half the remainder.

“With what remains thus calcined, waſhed, and dried, mix half its weight of gravel, or yellow free-ſtone raſped, having ſifted out and thrown away all the fineſt particles. River-ſand is not proper on this occaſion, becauſe it flies in a hot fire. Then add to this mixture a ſixteenth part of its weight of charcoal, made of beech, or of any other wood except oak, becauſe that alſo flies. Moiſten the whole with as much water as will bring it to a ſtiff paſte, by working and kneading it with your hands: Now introduce it into your retort, taking care not to daub its neck. The retort muſt be of the beſt earth, and of ſuch a ſize, that when your matter is in it, a full third thereof ſhall ſtill be empty.

“ Place your retort, thus charged, in a reverberating furnace, ſo proportioned, that there may be an interval of two inches all round between the ſides of the furnace and the bowl of the retort, even where it contracts to form the neck, which ſhould ſtand inclined at an angle of ſixty degrees. Stop all the apertures of the furnace, except the doors of the fire-place and aſh-hole.

“ Fit on to the retort a large glaſs ballon two thirds full of water, and lute them together, as in diſtilling the ſmoking ſpirit of nitre. In the hinder part of this ballon, a little above the ſurface of the water, a ſmall hole muſt be bored. This hole is to be ſtopped with a ſmall peg of birch-wood, which muſt ſlip in and out very eaſily, and have a ſmall knob to prevent its falling into the ballon. This peg is to be pulled out from time to time, that by applying the hand to the hole it may be known whether the air rarefied by the heat of the retort, iſſues out with too much or too little force.

“ If the air ruſhes out with too much rapidity, and with a hiſſing noiſe, the door of the aſh-hole muſt be entirely ſhut, in order to ſlacken the fire. If it do not ſtrike pretty ſmartly againſt the hand, that door muſt be opened wider, and large coals thrown into the fire-place to quicken the fire immediately.

“ The operation uſually laſts four and twenty hours; and the following ſigns ſhew that it will ſucceed, provided the retort reſiſt the fire.

“ You muſt begin the operation with putting ſome unlighted charcoal in the aſh-hole, and a little lighted charcoal at the door thereof, in order to warm the retort very ſlowly. When the whole is kindled, puſh it into the aſh hole, and cloſe the door thereof with a tile. This moderate heat brings over the phlegm of the mixture. The ſame degree of heat muſt be kept up four hours, after which ſome coals may be laid on the grate of the fire-place, which the fire underneath will kindle by degrees. With this ſecond heat brought nearer the retort, the ballon grows warm, and is filled with white vapours which have the ſmell of fetid oil. In four hours after, this veſſel will grow cool and clear; and then you muſt open the door of the aſh-hole one inch, throw freſh coals into the fire-place every three minutes, and every time ſhut the door of it, leſt the cold air from without ſhould ſtrike againſt the bottom of the retort and crack it.

“ When the fire has been kept up to this degree for about two hours, the inſide of the ballon begins to be netted over with a volatile ſalt of a ſingular nature, which cannot be driven up but by a very violent fire, and which ſmells pretty ſtrong of peach-kernels. Care muſt be taken that this concrete ſalt do not ſtop the little hole in the ballon: for in that caſe it would burſt, the retort being then red-hot, and the air exceedingly rarefied. The water in the ballon, being heated by the vicinity of the furnace, exhales vapours which diſſolve this ſprigged ſalt, and the ballon clears up in half an hour after it has ceaſed riſing.

“ In about three hours from the firſt appearance of this ſalt, the ballon is again filled with new vapours, which ſmell like ſal ammoniac thrown upon burning coals. They condenſe on the ſides of the receiver into a ſalt which is not branched like the former, but appears in long perpendicular ſtreaks, which the vapours of the water do not diſſolve. Theſe white vapours are the fore-runners of the phoſphorus; and a little before they ceaſe to riſe they loſe their firſt ſmell of ſal ammoniac, and acquire the odour of garlick.

“ As they aſcend with great rapidity, the little hole muſt be frequently opened, to obſerve whether the hiſſing be not too ſtrong; for in that caſe it would be neceſſary to ſhut the door of the aſh-hole quite cloſe. Theſe white vapours continue two hours. When you find they ceaſe riſing, make a ſmall paſſage through the dome, by opening ſome of its regiſters, that the flame may juſt begin to draw. Keep up the fire in this mean ſtate till the firſt volatile phoſphorus begin to appear.

“ This appears in about three hours after the white vapours firſt begin to riſe. In order to diſcover it, pull out the little birchen peg once every minute, and rub it againſt ſome hot part of the furnace, where it will leave a trail of light, if there be any phoſphorus upon it.

“ Soon after you obſerve this ſign, there will iſſue out through the little hole of the ballon a ſtream of bluiſh light, which continues of a greater or ſhorter extent to the end of the operation. This ſtream or ſpout of light does not burn. If you hold your finger againſt it for twenty or thirty ſeconds, the light will adhere to it; and if you rub that finger over your hand, the light will beſmear it, and render it luminous.

“ But from time to time this ſtreamer darts out to the length of ſeven or eight inches, ſnapping and emitting ſparks of fire; and then it burns all combuſtible bodies that come in its way. When you obſerve this, you muſt manage the fire very warily, and ſhut the door of the aſh-hole quite cloſe, yet without ceaſing to throw coals into the fire-place every two minutes.

“ The volatile phoſphorus continues two hours; after which the little ſpout of light contracts to the length of a line or two: And now is the time for puſhing your fire to the utmoſt: Immediately ſet the door of the aſh hole wide open, throw billets of wood into it, unſtop all the regiſters of the reverberatory, ſupply the fire-place with large coals every minute: In ſhort, for ſix or ſeven hours all the inſide of the furnace muſt be kept of a white heat, ſo that the retort ſhall not be diſtinguiſhable.

“ In this fierce extremity of heat the true phoſphorus diſtills like an oil, or like melted wax: One part thereof floats on the water in the recipient, the other falls to the bottom. At laſt the operation is known to be quite over when the upper part of the ballon, in which the volatile phoſphorus appears condenſed in a blackiſh film, begins to grow red: For this ſhews that the phoſphorus is burnt where the red ſpot appears. You muſt now ſtop all the regiſters, and ſhut all the doors of the furnace, in order to ſmother the fire; and then cloſe up the little hole in the ballon with fat lute or bees-wax. In this condition the whole muſt be left for two days; becauſe the veſſels muſt not be ſeparated till they are perfectly cold, leſt the phoſphorus ſhould take fire.

"As ſoon as the fire is out, the ballon, which is then in the dark, preſents a moſt agreeable object: All the empty part thereof above the water ſeems filled with a beautiful blue light; which continues for ſeven or eight hours, or as long as the ballon keeps warm, never diſappearing till it is cooled.

"When the furnace is quite cold, take out the veſſels, and ſeparate them from each other as neatly as poſſible. With a linen cloth wipe away all the black ſtuff you find in the mouth of the ballon; for if that filth ſhould mix with the phoſphorus, it would hinder it from being tranſparent when moulded. This muſt be done with great expedition: After which pour into the ballon two or three quarts of cold water, to accelerate the precipitation of the phoſphorus that ſwims at top. Then agitate the water in the ballon, to rinſe out all the phoſphorus that may ſtick to the ſides; pour out all the water thus ſhaken and turbid, into a very clean earthen pan, and let it ſtand till it grows clear. Then decant this firſt uſeleſs water, and on the blackiſh ſediment left at the bottom of the pan pour ſome boiling water to melt the phoſphorus; which thereupon unites with the fuliginous matter, or volatile phoſphorus, that precipitated with it, both together forming a maſs of the colour of ſlate. When this water, in which you have melted the phoſphorus is cool enough, take out the phoſphorus, throw it into cold water, and therein break it into little bits in order to mould it.

"Then take a matras, having a long neck ſomewhat wider next the body than at its mouth: Cut off half the body, ſo as to make a funnel of the neck part, the ſmaller end of which muſt be ſtopped with a cork. The firſt mould being thus prepared, plunge it endwiſe, with its mouth uppermoſt, in a veſſel full of boiling water, and fill it with that water. Into this funnel throw the little bits of your ſlate-like maſs, which will melt again in this hot water, and fall ſo melted to the bottom of the tube. Stir this melted matter with an iron wire, to promote the ſeparation of the phoſphorus from the fuliginous matter with which it is fouled, and which, being leſs ponderous than the phoſphorus, will gradually riſe above it towards the upper part of the cylinder.

"Keep the water in the veſſel as hot as at firſt, till on taking out the tube you ſee the phoſphorus clean and tranſparent. Let the clear tube cool a little, and then ſet it in cold water, where the phoſphorus will congeal as it cools. When it is perfectly congealed, pull out the cork, and with a ſmall rod near as big as the tube, puſh the cylinder of phoſphorus towards the mouth of the funnel, where the feculency lies. Cut off the black part of the cylinder, and keep it apart: For when you have got a quantity thereof, you may melt it over again in the ſame manner, and ſeparate the clean phoſphorus which it ſtill contains. As to the reſt of the cylinder which is clean and tranſparent, if you intend to mould it into ſmaller cylinders, you may cut it in ſlices, and melt it again by the help of boiling water in glaſs-tubes of ſmaller dimenſions."

It is proper to obſerve, in the firſt place, that one of the moſt uſual cauſes of miſcarriage in this operation is a defect of the requiſite qualities in the retort employed. It is abſolutely neceſſary to have that veſſel made of the beſt earth, and ſo well made that it ſhall be capable of reſiſting the utmoſt violence of fire, continued for a very long time.

We ſhall, in the ſecond place, obſerve with M. Hellot, "that, before you ſet your retort in the furnace, it is proper to make an eſſay of your matter, to ſee if there be reaſon to hope for ſucceſs. For this purpoſe put about an ounce thereof into a ſmall crucible, and heat it till the veſſel be red. The mixture, after having ſmoked, ought to chop and crack without puffing up, or even riſing in the leaſt. From theſe cracks will iſſue undulated flames, white and bluiſh, darting upwards with rapidity. This is the firſt volatile phoſphorus, which occaſions all the danger of the operation. When theſe firſt flaſhes are over, increaſe the heat of your matter by laying a large live coal upon the crucible. You will then ſee the ſecond phoſphorus, like a luminous, ſteady vapour, of a colour inclining to violet, covering the whole ſurface of the matter: It continues for a very long time, and diffuſes a ſmell of garlick, which is the diſtinguiſhing odour of the phoſphorus you are ſeeking.

"When this luminous vapour is entirely gone, pour the red-hot matter out of the crucible upon an iron plate. If you do not find one drop of ſalt in fuſion, but that, on the contrary, the whole falls readily into powder, it is a proof that your matter was ſufficiently lixiviated, and that it contains no more fixed ſalt, or ſea-ſalt, if you will, than is requiſite. If you find on the plate a drop of ſalt coagulated, it ſhews that there is too much left in it, and that there is danger of your miſcarrying in the operation, becauſe the redundant ſalt would corrode and eat through the retort. In this caſe your matter muſt be waſhed again, and then ſufficiently dried."

The furnace muſt be ſo conſtructed, that within a narrow compaſs it may give a heat at leaſt equal to that of a glaſs-houſe furnace, or rather greater, eſpecially during the laſt ſeven or eight hours of the operation. M. Hellot, in his Memoir, gives an exact deſcription of ſuch a furnace.

"As certain accidents may happen in the courſe of the operation, ſome precautions are to be taken againſt them. For inſtance, if the ballon ſhould break while the phoſphorus is diſtilling, and any of it ſhould fall on combuſtible bodies, it would ſet them on fire, and probably burn the laboratory, becauſe it is not to be diſtinguiſhed without the greateſt difficulty. The furnace muſt therefore be erected under ſome vault, or upon a bed of brick-work, raiſed under ſome chimney that draws well: Nor muſt any furniture or utenſil of wood be left near it. If a little flaming phoſphorus ſhould fall on a man's legs or hands, in leſs than three minutes it would burn its way to the very bone. In ſuch a caſe nothing but urine will ſtop its progreſs.

"If the retort crack while the phoſphorus is diſtilling, there is an unſucceſsful end of your operation. It is eaſy to perceive this by the ſtink of garlick which you will ſmell about the furnace; and moreover, the flame that iſſues through the apertures of the reverberatory will be of a beautiful violet colour. The acid of ſea-ſalt always gives this colour to the flame of ſuch matters as are burnt along with it. But if the retort break before the phoſphorus hath made its appearance, its contents may be ſaved by throwing a number of cold bricks into the fire-place, and upon them a little water to quench the fire at once." All theſe uſeful obſervations we owe alſo to M. Hellot.

The phoſphorus here deſcribed was firſt diſcovered by a citizen of Hamburg named Brandt, who worked upon urine in ſearch of the philoſopher's ſtone. Afterwards two other ſkilful chemiſts, who knew nothing more of the proceſs than that phoſphorus was obtained from urine, or in general from the human body, likewiſe endeavoured to diſcover it; and each of them ſeparately did actually make the diſcovery. Theſe two chemiſts were Kunckel and Boyle.

The former perfected the diſcovery, and found out a method of making it in conſiderable quantities at a time; which occaſioned it to be called *Kunckel's phoſphorus*. The other, who was an Engliſh gentleman, had not time to bring his diſcovery to perfection, and contented himſelf with lodging a voucher of his having diſcovered it in the hands of the ſecretary of the Royal Society of London, who gave him a certificate thereof.

" Though Brandt, who had before this ſold his ſecret to a chemiſt named Krafft, ſold it afterwards to ſeveral other perſons, and even at a very low rate: and though Mr Boyle publiſhed the proceſs for making it; yet it is extremely probable that both of them kept in their own hands the maſter-key; I mean, *the particular management neceſſary to make the operation ſucceed:* For till Kunckel found it out, no other chemiſt ever made any conſiderable quantity thereof, except Mr Godfrey Hanwitz, an Engliſh chemiſt, to whom Mr Boyle revealed the whole myſtery.

" And thus it came to paſs, that, after Kunckel and Boyle died, M Godfrey Hankwitz was the only chemiſt that could ſupply Europe therewith; on which account it is likewiſe very well known by the name of *Engliſh phoſphorus*."

Almoſt all the chemiſts conſider phoſphorus as a ſubſtance conſiſting of the acid of ſea ſalt combined with the phlogiſton, in the ſame manner as ſulphur conſiſts of the vitriolic acid combined with the phlogiſton. This opinion is founded on the following principles.

Firſt, urine abounds with ſea-ſalt, and contains alſo a great deal of phlogiſton: now theſe are the ingredients of which they conjecture phoſporus to be compoſed.

Secondly, phoſphorus has many of the properties of ſulphur; ſuch as being ſoluble in oils; melting with a gentle heat; being very combuſtible; burning without any ſoot; giving a vivid and bluiſh flame; and laſtly, leaving an acid liquor when burnt: ſenſible proofs that it differs from ſulphur in nothing but the nature of its acid.

Thirdly, this acid of phoſphorus, being mixed with a ſolution of ſilver in ſpirit of nitre, precipitates the ſilver; and this precipitate is a true *luna cornea*, which appears to be more volatile even than the common ſort. This fact proves more inconteſtably that the acid of phoſphorus is of the ſame nature with that of ſea-ſalt.

Fourthly, M. Stahl obſerves, that if ſea-ſalt be caſt on live coals, they inſtantly burn with great activity; that they emit a vivid flame, and are much ſooner conſumed than if none of this ſalt had touched them; that ſea-ſalt in ſubſtance, which will bear the violence of fire a conſiderable time when fuſed in a crucible, without ſuſtaining any ſenſible diminution, yet evaporates very quickly, and is reduced to white flowers, by the immediate contact of burning coals; and laſtly, that the flame which riſes on this occaſion is of a blue colour inclining to violet, eſpecially if it be not thrown directly on the coals themſelves, but kept in fuſion amidſt burning coals. in a crucible ſo placed that the vapour of the ſalt may join with the inflamed phlogiſton as it riſes from the coals.

Theſe experiments of Mr Stahl's prove, that the phlogiſton acts upon the acid of ſea-ſalt, even while it is combined with its alkaline baſis. The flame that appears on this occaſion may be conſidered as an imperfect phoſphorus: and indeed its colour is exactly like that of phoſphorus.

All the facts above related evince, that the acid of phoſphorus is akin to that of ſea-ſalt; or rather, that it is the very ſame. But there are other facts which prove, that this acid undergoes ſome change at leaſt, ſome peculiar preparation, before it enters into the compoſition of a true phoſphorus; and that, when extricated therefrom by burning, it is not a pure acid of ſea-ſalt, but is ſtill adulterated with a mixture of ſome other ſubſtance, which makes it conſiderably different from that acid. For theſe obſervations we are obliged to M. Marggraff.

M. Marggraff hath alſo publiſhed a proceſs for making phoſphorus, and aſſures us, that by means thereof we may obtain in leſs time, with leſs heat, leſs trouble, and leſs expence, a greater quantity of phoſphorus than by any other method. His operation is this:

He takes two pounds of ſal ammoniac in powder, which he mixes accurately with four pounds of minium. This mixture he puts into a glaſs retort, and with a graduated fire draws off a very ſharp, volatile, urinous ſpirit.

We obſerved in Part I. that ſome metallic ſubſtances have the property of decompoſing ſal ammoniac, and ſeparating its volatile alkali. Minium, which is a calx of lead, is one of thoſe metallic ſubſtances. In this experiment it decompoſes the ſal ammoniac, and ſeparates its volatile alkali: what remains in the retort is a combination of the minium with the acid of ſal ammoniac, which is well known to be the ſame with the marine acid; and conſequently the reſidue of this operation is a ſort of *plumbum corneum*.

The quantity thereof is four pounds eight ounces. Of this he mixes three pounds with nine or ten pounds of urine, that has ſtood putrefying for two months, evaporated to the conſiſtence of honey. Theſe he mixes by little and little in an iron pan over the fire, ſtirring the mixture from time to time. Then he adds half a pound of charcoal duſt, and evaporates the matter, kept continually ſtirring, till the whole be brought to a black powder. He next diſtills the mixture in a glaſs retort with degrees of fire, which he raiſes towards the end ſo as to make the retort red-hot, in order to expel all the urinous ſpirit, ſuperfluous oil, and ammoniacal ſalt. The diſtillation being finiſhed, there remains nothing in the retort but a very friable *caput mortuum*.

This remainder he pulveriſes again, and throws a pinch of it on live coals to diſcover whether or no the matter be rightly prepared for yielding phoſphorus. If it be ſo, it preſently emits an arſenical odour, and a blue undulating flame, which paſſes over the ſurface of the coals like a wave.

Being thus aſſured of the ſucceſs of his operation, he puts one half of his matter, in three equal parts, into three ſmall earthen German retorts, capable of holding about eighteen ounces of water a-piece. Theſe three retorts, none of which is above three quarters full, he places together in one reverberatory furnace, built much like thoſe we have deſcribed, except that it is ſo conſtructed as to hold the three retorts diſpoſed in one line. To each retort he lutes a recipient ſomething more than half full of water, ordering the whole in ſuch a manner, that the noſes of his retorts almoſt touch the ſurface of the water.

He begins the diſtillation with warming the retorts ſlowly, for about an hour, by a gentle heat. When that time is elapſed he raiſes the fire gradually, ſo that in half an hour more the coals begin to touch the bottoms of the retorts. He continues throwing coals into the furnace by little and little, till they riſe half way the height of the retorts; and in this he employs another half hour. Laſtly, in the next half hour he raiſes the coals above the bowels of the retorts.

Then the phoſphorus begins to aſcend in clouds: on this he inſtantly increaſes the heat of the fire as much as poſſible, filling the ſurface quite up with coals, and making the retorts very red. This degree of fire cauſes the phoſphorus to diſtill in drops which fall to the bottom of the water. He keeps up this intenſe heat for an hour and half, at the end of which the operation is finiſhed; ſo that it laſts but four hours and a half in all: In the ſame manner he diſtills the ſecond moiety of his mixture in three other ſuch retorts.

He purifies and moulds his phoſphorus much in the ſame manner as M. Hellot does. From the quantity of ingredients above-mentioned, he obtains two ounces and a half fine cryſtalline moulded phoſphorus.

The acid of phoſphorus ſeems to be more fixed than any other: and therefore if you would ſeparate it by burning from the phlogiſton with which it is united, there is no occaſion for ſuch an apparatus of veſſels as is employed for obtaining the ſpirit of ſulphur. For this acid will remain at the bottom of the veſſel in which you burn your phoſphrus: indeed, if it be urged by the force of fire, its moſt ſubtile part evaporates, and the remainder appears in the form of a vitrified matter.

This acid efferveſces with fixed and volatile alkalis, and therewith forms neutral ſalts; but very different from ſea-ſalt, and from ſal ammoniac. That which has a fixed alkali for its baſis does not crackle when thrown on burning coals; but ſwells and vitrifies like borax. That which has a volatile alkali for its baſis ſhoots into long pointed cryſtals; and, being urged by fire in a retort, lets go its volatile alkali, a vitrified matter remaining behind.

We ſhall conclude this article with an account of certain properties of phoſporus which have not yet been mentioned.

Phoſphorus diſſolves by lying expoſed to the air. What water cannot effect, ſays M. Hellot, or at leaſt requires eight or ten years to bring about, the moiſture of the air accompliſhes in ten or twelve days; whether it be that the phoſphorus takes fire in the air, and the inflammable part evaporating, almoſt entirely, leaves the acid of the phoſphorus naked, which like all other acids, when exceedingly concentrated, is very greedy of moiſture; or elſe that the moiſture of the air, being water divided into infinitely fine particles, is ſo ſubtile as to find its way through the pores of the phoſphorus, into which the groſſer particles of common water can by no means inſinuate themſelves.

Phoſphorus heated by the vicinity of fire, or by being any way rubbed, ſoon takes fire and burns fiercely. It is ſoluble in all oils, and in æther, giving to thoſe liquors the property of appearing luminous, when the bottle containing the ſolution is opened. Being boiled in water, it likewiſe communicates thereto this luminous quality.

The late Mr Groſſe obſerved, that phoſphorus being diſſolved in eſſential oils cryſtalliſes therein. Theſe cryſtals take fire in the air, either when thrown into a dry veſſel, or wrapt up in a piece of paper. If they be dipped in ſpirit of wine, and taken out immediately, they do not afterwards take fire in the air: they ſmoke a little, and for a very ſhort time, but hardly waſte at all. Though ſome of them were left in a ſpoon for a fortnight, they did not ſeem to have loſt any thing of their bulk: but when the ſpoon was warmed a little they took fire, juſt like common phoſphorus that had never been diſſolved and cryſtalliſed in an eſſential oil.

M. Marggraff, having put a dram of phoſphorus with an ounce of highly concentrated ſpirit of nitre into a glaſs retort, obſerved, that, without the help of fire, the acid diſſolved the phoſphorus; that part of the acid came over into the recipient which was luted to the retort; that at the ſame time the phoſphorus took fire, burnt furiouſly, and burſt the veſſels with exploſion. Nothing of this kind happens when any of the other acids, though concentrated, are applied to phoſphorus.

To decompoſe Sea ſalt by means of the Vitriolic Acid. Glauber's Salt. The Purification and Concentration of Spirit of Salt.

PUT the ſea-ſalt from which you mean to extract the acid into an unglazed earthen pipkin, and ſet it amidſt live coals. The ſalt will decrepitate, grow dry, and fall into a powder. Put this decrepitated ſalt into a tubulated glaſs retort, leaving two thirds thereof empty. Set the retort in a reverberating furnace; apply a receiver like that uſed in diſtilling the ſmoking ſpirit of nitre, and lute it on in the ſame manner, or rather more exactly if poſſible. Then through the hole in the upper convexity of the retort pour a quantity of highly concentrated oil of vitriol, equal in weight to about a third part of your ſalt, and immediately ſhut the hole very cloſe with a glaſs ſtopple, firſt rubbed therein with emery ſo as to fit it exactly.

As ſoon as the oil of vitriol touches the ſalt, the retort and receiver will be filled with abundance of white vapours; and ſoon after, without lighting any fire in the furnace, drops of a yellow liquor will diſtil from the noſe of the retort. Let the diſtillation proceed in this manner without fire, as long as you perceive any drops come; afterwards kindle a very ſmall fire under the retort, and continue diſtilling and raiſing the fire by very ſlow degrees, and with great caution, to the end of the diſtillation; which will be finiſhed before you have occaſion to make the retort red-hot. Unlute the veſſels, and without delay pour the liquor, which is a very ſmoking ſpirit of ſalt, out of the receiver into a cryſtal bottle, like that directed for the ſmoking ſpirit of nitre.

When the operation is finiſhed, we find a white, ſaline maſs at the bottom of the retort as in a mould. If this maſs be diſſolved in water, and the ſolution cryſtallized, it yields a conſiderable quantity of ſea-ſalt that hath not been decompoſed, and a neutral ſalt conſiſting of the vitriolic acid united with the alkaline baſis of that part which hath been decompoſed. This neutral ſalt, which bears the name of *Glauber* its inventor, differs from vitriolated tartar, or the *Sal de duobus*, which remains after diſtilling the nitrous acid, eſpecially in that it is more fuſible, more ſoluble in water, and hath its cryſtals differently figured. But as in theſe two ſalts the acid is the ſame, the differences that appear between them muſt be attributed to the peculiar nature of the baſis of ſea-ſalt.

Spirit of ſalt drawn by the proceſs above deſcribed is tainted with a ſmall mixture of the vitriolic acid, carried up by the force of fire before it had time to combine with the alkali of the ſea-ſalt; which happens likewiſe to the nitrous acid procured in the ſame manner. If you deſire to have it pure, and abſolutely free from the acid of vitriol, it muſt be diſtilled a ſecond time from ſea-ſalt, as the acid of nitre was before directed to be diſtilled again from freſh nitre, in order to purify it from any vitriolic taint.

To decompoſe Sea-ſalt by means of the Nitrous Acid. Aqua regis. *Quadrangular Nitre.*

Take dried ſea-ſalt: bruiſe it to powder; put it into a glaſs retort, leaving one half of the veſſel empty. Pour upon it a third of its weight of good ſpirit of nitre. Place your retort in the ſand-bath of a reverberating furnace; put on the dome; lute to the retort a receiver having a ſmall hole in it, and heat the veſſels very ſlowly. There will come over into the receiver ſome vapours, and an acid liquor. Increaſe the fire gradually till nothing more riſes. Then unlute the veſſels, and pour the liquor out of the receiver into a cryſtal bottle, ſtopped like others containing acid ſpirits.

The nitrous acid hath a greater affinity than the marine acid with fixed alkalis. When therefore ſpirit of nitre and ſea-ſalt are mixed together, the ſame conſequences will follow as when the vitriolic acid is mixed with that ſalt; that is, the nitrous acid will, like the vitriolic, decompoſe it, by diſlodging its acid from its alkaline baſis, and aſſuming its place. But as the nitrous acid is conſiderably weaker, and much lighter, than the vitriolic acid, a good deal of it riſes along with the acid of ſea-ſalt during the operation. The liquor found in the receiver is therefore a true *aqua regis*.

If decrepitated ſalt, and a right ſmoking ſpirit of nitre, be employed in this proceſs, the *aqua regis* obtained will be very ſtrong.

The operation being finiſhed, there is left in the retort a ſaline maſs, containing ſea-ſalt not decompoſed, and a new ſpecies of nitre, which having for its baſis the alkali of ſea-ſalt, that is, an alkali of a peculiar nature, differs from the common nitre, 1. In the figure of its cryſtals; which are ſolids of four ſides, formed like lozenges: 2. In that it cryſtallizes with more difficulty, retains more water in its cryſtals, attracts the moiſture of the air, and diſſolves in water with the ſame circumſtances as ſea-ſalt.

Of BORAX.

To decompoſe Borax by the means of Acids, and to ſeparate from it the Sedative Salt by Sublimation and by Cryſtalliſation.

Reduce to a fine powder the borax from which you intend to extract the ſedative ſalt. Put this powder into a wide-necked glaſs retort. Pour upon it an eighth part of its weight of common water, to moiſten the powder; and then add concentrated oil of vitriol, to the weight of ſomewhat more than a fourth part of the weight of the borax. Set the retort in a reverberatory, make a moderate fire at firſt, and augment it gradually till the retort become red-hot.

A little phlegm will firſt come over, and then, with the laſt moiſture that the heat expels, the ſedative ſalt will riſe; by which means ſome of it will be diſſolved in this laſt phlegm, and paſs therewith into the receiver; but moſt of it will adhere in the form of ſaline flowers to the fore-part of the neck of the retort, juſt where it is clear of the groove of the furnace. There they collect into a heap, which the ſucceeding flowers puſh inſenſibly forward till they ſlightly ſtop the paſſage. Thoſe which riſe after the neck is thus ſtopped ſtick to the after part of it which is hot, vitrify in ſome meaſure, and form a circle of fuſed ſalt. In this ſtate the flowers of the ſedative ſalt ſeem to iſſue out of the circle, as from their baſis: They appear like very thin, light, ſhining ſcales, and muſt be bruſhed off with a feather.

At the bottom of the retort will be left a ſaline maſs: Diſſolve this in a ſufficient quantity of hot water; filter the ſolution, in order to free it from a brown earth which it depoſites; ſet the liquor to evaporate, and cryſtals of ſedative ſalt will form in it.

Though borax is of great uſe in many chemical operations, eſpecially in the fuſion of metals, as we ſhall have occaſion to ſee, yet, till of late years, chemiſts were quite ignorant of its nature, as they ſtill are of its origin; concerning which we know nothing with certainty, but that it comes rough from the Eaſt Indies, and is purified by the Dutch.

Of Operations on METALS.

Of GOLD.

To ſeparate Gold, by Amalgamation with Mercury, from the Earths and Stones with which it is found mixed.

PULVERISE the earths and ſtones containing gold. Put the powder into a little wooden tray; dip this tray in water, gently ſhaking it and its contents. The water will grow muddy, by taking up the earthy parts of the ore. Continue waſhing it in this manner till the water ceaſe to appear turbid. Upon the ore thus waſhed pour ſtrong vinegar, having firſt diſſolved therein, by the help of heat, about a tenth part of its weight of alum. The powder muſt be quite drenched and covered with this liquor, and ſo left to ſtand for twice twenty-four hours.

Decant the vinegar, and waſh your powder with warm water, till the laſt that comes off hath no taſte: then dry it, and put it into an iron mortar, with four times its weight of quick-ſilver: triturate the whole with a heavy wooden peſtle, till all the powder be of a blackiſh colour: then pour in a little water, and continue rubbing for ſome time longer. More earthy and heterogeneous particles will be ſeparated from the metalline parts by means of this water, which will look dirty: it muſt then be decanted, and more fair water added. Repeat this ſeveral times; then dry what remains in the mortar with a ſponge, and by the help of a gentle heat; you will find it an almalgam of the mercury with the gold.

Put this almalgam into a chamoy bag: tie a knot on its neck, and ſqueeze it hard between your fingers, over ſome wide-mouthed veſſel; there will iſſue through the pores of the leather numberleſs little jets of mercury, forming a ſort of ſhower, that will collect into large globules in the veſſel placed underneath. When you can force out no more mercury by this means, open the bag, and in it you will find the amalgam freed from the ſuperfluous mercury; the gold retaining only about as much thereof as nearly equals itſelf in weight.

Put this amalgam into a glaſs retort: ſet this retort in the ſand-bath of a reverberating furnace; cover it quite over with ſand; apply a glaſs receiver half full of of water, ſo that the noſe of the retort may be under the water. The receiver need not be luted to the retort. Give a gradual heat, and raiſe the fire till drops of the ſublimed mercury appear in the neck of the retort, and fall into the water with a hiſſing noiſe. If you hear any noiſe in the retort, ſlacken your fire a little. Laſtly, when you obſerve, that, though you raiſe the fire ſtill higher than before, nothing more will come over, take out your retort, break it, and there you will find the gold, which muſt be melted in a crucible with borax.

To diſſolve Gold in Aqua regis, *and by that means to ſeparate it from Silver.*

TAKE gold that is perfectly pure, or alloyed with ſilver only. Reduce it to little thin plates, by hammering it on an anvil. If it be not ſufficiently tough, neal it till it be red in a moderate, clear fire, quite free from ſmoking coals, and then let it cool gradually, which will reſtore its ductility.

When the plates are thin enough, make them red-hot once more, and cut them into ſmall bits with a pair of ſheers. Put theſe bits into a tall, narrow-mouthed cucurbit, and pour on them twice their weight of good *aqua regis*, made of one part ſal-ammoniac, or ſpirit of ſalt, and four parts ſpirit of nitre. Set the cucurbit in a ſand-bath moderately heated, ſtopping its orifice ſlightly with a paper coffin, to prevent any dirt from falling in. The *aqua regis* will preſently begin to ſmoke. Round the little bits of gold will be formed an infinite number of ſmall bubbles, which will riſe to the ſurface of the liquor. The gold will totally diſſolve, if it be pure, and the ſolution will be of a beautiful yellow colour: if the gold be alloyed with a ſmall quantity of ſilver, the latter will remain at the bottom of the veſſel in the form of a white powder. If the gold be alloyed with much ſilver, when the gold is diſſolved the ſilver will retain the form of the little metalline plates put into the veſſel.

When the diſſolution is completed, gently pour off the liquor into another low, wide-mouthed, glaſs cucurbit, taking care that none of the ſilver, which lies at the bottom in the form of a powder eſcape with the liquor. On this powder of ſilver pour as much freſh *aqua regis* as will cover it entirely; and repeat this till you are ſure that nothing more can be taken up by it. Laſtly, having decanted the *aqua regis* from the ſilver, waſh the ſilver with a little ſpirit of ſalt weakened with water, and add this ſpirit of ſalt to the *aqua regis* in which your gold is diſſolved. Then to the body containing theſe liquors fit a head and a receiver, and diſtill with a gentle heat, till the matter contained in the cucurbit become dry.

Mix together equal parts of common brimſtone, and a very ſtrong fixed alkali; for inſtance, nitre fixed by charcoal. Put them in a crucible, and melt the mixture, ſtirring it from time to time with a ſmall rod. There is no occaſion to make the fire very briſk, becauſe the ſulphur facilitates the fuſion of the fixed alkali. Some ſulphureous vapours will riſe from the crucible: the two ſubſtances will mix intimately together, and form a reddiſh compound. Then throw into the crucible ſome little pieces of gold beat into thin plates, ſo that the whole do not exceed in weight one third part of the liver of ſulphur: raiſe the fire a little. As ſoon as the liver of ſulphur is perfectly melted, it will begin to diſſolve the gold with ebullition; and will even emit ſome flaſhes of fire. In the ſpace of a few minutes the gold will be entirely diſſolved, eſpecially if it was cut and flatted into ſmall thin leaves.

The proceſs here delivered is taken from M. Stahl. The deſign of his inquiries was to diſcover how Moſes could burn the golden calf, which the Iſraelites had ſet up and worſhipped while he was on the mount; how he could afterwards reduce that calf to powder, throw it into the water which the people uſed, and make all who had apoſtatized drink thereof, as related in the book of

Exodus; and he concludes, that Moſes muſt have performed this operation by means of liver of ſulphur.

To ſeparate Gold from all other metallic Subſtances by means of Antimony.

HAVING put the gold you intend to purify into a crucible, ſet it in a melting furnace, cover it, and make the gold flow. When the metal is in fuſion, caſt upon it, by a little at a time, twice its weight of pure crude antimony in powder, and after each projection cover the crucible again immediately: this done keep the matter in fuſion for a few minutes. When you perceive that the metallic mixture is perfectly melted, and that its ſurface begins to ſparkle, pour it out into a hollow iron cone, previouſly heated, and ſmeared on the inſide with tallow. Immediately ſtrike with a hammer the floor on which the cone ſtands; and when all is cold, or at leaſt ſufficiently fixed, invert the cone and ſtrike it: the whole metallic maſs will fall out, and the under part thereof, which was at the point of the cone, will be a regulus more or leſs yellow as the gold was more or leſs pure. On ſtriking the metallic maſs, the regulus will freely part from the ſulphureous cruſt at top.

Return this regulus into the crucible, and melt it. Leſs fire will do now than was required before. Add the ſame quantity of antimony, and proceed as at firſt. Repeat the ſame operation a third time, if your gold be very impure.

Then put your regulus into a good crucible, much larger than is neceſſary to hold it. Set your crucible in a melting furnace, and heat the matter but juſt enough to make it flow, with a ſmooth, brilliant ſurface. When you find it thus conditioned, point towards it the noſe of a long-ſnouted pair of bellows, and therewith keep gently and conſtantly blowing. There will ariſe from the crucible a conſiderable ſmoke, which will abate greatly when you ceaſe to blow, and increaſe as ſoon as you begin again. You muſt raiſe the fire gradually as you approach towards the end of the operation. If the ſurface of the metal loſe its brilliant poliſh, and ſeem covered with a hard cruſt, it is a ſign the fire is too weak; in which caſe it muſt be increaſed, till the ſurface recover its ſhining appearance. At laſt, when no more ſmoke riſes, and the ſurface of the gold looks neat and greeniſh, caſt on it, by little and little, ſome pulverized nitre, or a mixture of nitre and borax. The matter will ſwell up. Continue thus adding more nitre gradually, till no commotion is thereby produced in the crucible; and then let the whole cool. If you find, when the gold is cold, that it is not tough enough, melt it over again; when it begins to melt caſt it in the ſame ſalts as before; and repeat this till it be perfectly ductile.

To ſeparate Silver from its Ore, by means of Scorification with Lead.

BEAT to powder in an iron mortar the ore from which you mean to ſeparate the ſilver, having firſt roaſted it well in order to free it from all the ſulphur and arſenic that it may contain. Weigh it exactly: then weigh out by itſelf eight times as much granulated lead. Put one half of this lead into a teſt, and ſpread it equally thereon: upon this lead lay your ore, and cover it quite ove with the remaining half of the lead.

Place the teſt thus loaded under the further end of the muffle in a cupelling furnace. Light your fire, and increaſe it by degrees. If you look through one of the apertures in the door of the furnace, you will perceive the ore, covered with calcined lead, ſwim upon the melted lead. Preſently afterwards it will grow ſoft, melt, and be thrown towards the ſides of the veſſel, the ſurface of the lead appearing in the midſt thereof bright and ſhining like a luminous diſc: the lead will then begin to boil, and emit fumes. As ſoon as this happens, the fire muſt be a little checked, ſo that the ebullition of the lead may almoſt entirely ceaſe for about a quarter of an hour. After this it muſt be excited to the degree it was at before, ſo that the lead may begin again to boil and ſmoke. Its ſhinning ſurface will gradually leſſen, and be covered with *ſcoriæ*. Stir the whole with an iron hook, and draw in towards the middle what you obſerve towards the ſides of the veſſel; to the end that, if any part of the ore ſhould ſtill remain undiſſolved by the lead, it may be mixed therewith.

When you perceive that the matter is in perfect fuſion, that the greateſt part of what ſticks to the iron hook, when you dip it in the melted matter, ſeparates from it again, and drops back into the veſſel; and that the extremity of this inſtrument, when grown cold, appears varniſhed over with a thin, ſmooth, ſhining cruſt; you may look on theſe as marks that the buſineſs is done; and the more uniform and evenly the colour of the cruſt is, the more perfect may you judge the ſcorification to be.

Matters being brought to this paſs, take the teſt with a pair of tongs from under the muffle, and pour its whole contents into an iron cone, firſt heated and greaſed with tallow. This whole operation laſts about three quarters of an hour. When all is cold, the blow of a hammer will part the regulus from the ſcoria; and as it is not poſſible, how perfect ſoever the ſcorification be, to avoid leaving a little lead containing ſilver in the ſcoria, it is proper to pulveriſe this ſcoria, and ſeparate therefrom whatever extends under the hammer, in order to add it to the regulus.

The refining of Silver by the Cupel.

TAKE a cupel capable of containing one third more matter than you have to put into it: ſet it under the muffle of a furnace like that deſcribed in our theoretical elements, as peculiarly appropriated to this ſort of operation. Fill the furnace with charcoal; light it; make the cupel red-hot, and keep it ſo till all its moiſture be evaporated; that is, for about a good quarter of an hour, if the cupel be made wholly of the aſhes of burnt bones; and for a whole hour, if there be any waſhed wood-aſh in its compoſition.

Reduce the regulus which remained after the preceding operation to little thin plates, flatting them with a ſmall hammer, and ſeparating them carefully from all the adherent ſcoria. Wrap theſe in a bit of paper, and with a ſmall pair of tongs put them gently into the cupel. When the paper is conſumed, the regulus will ſoon melt, and the ſcoria, which will be gradually produced by the lead as it turns to litharge, will be driven to the ſides of the cupel, and immediately abſorbed thereby. At the ſame time the cupel will aſſume a yellow, brown, or blackiſh colour, according to the quantity and nature of the ſcoria imbibed by it.

When you ſee the matter in the cupel in a violent ebullition, and emitting much ſmoke, lower the fire by the methods formerly preſcribed. Keep up ſuch a degree of heat only that the ſmoke which aſcends from the matter may not riſe very high, and that you may be able to diſtinguiſh the colour which the cupel acquires from the ſcoria.

Increaſe the fire by degrees, as more and more litharge is formed and abſorbed. If the regulus examined by this aſſay contain no ſilver, you will ſee it turn wholly into ſcoria, and at laſt diſappear. When it contains ſilver, and the quantity of lead is much diminiſhed, you will perceive little vivid iriſes, or beautiful rain-bow colours, ſhooting ſwiftly along its ſurface, and croſſing each other in many different directions. At laſt, when all the lead is deſtroyed, the thin dark ſkin, that is continually protruded by the lead while it is turning into litharge, and which hitherto covered the ſilver, ſuddenly diſappears; and, if at this moment the fire happen not to be ſtrong enough to keep the ſilver in fuſion, the ſurface of that metal will at once dart out a dazzling ſplendor; but, if the fire be ſtrong enough to keep the ſilver in fuſion, though freed from all mixture of lead, this change of colour, which is called its *fulguration*, will not be ſo perceptible, and the ſilver will appear like a bead of fire.

Theſe phenomena ſhew that the operation is finiſhed. But the cupel muſt ſtill be left a minute or two under the muffle, and then drawn ſlowly out with the iron hook towards the door of the furnace. When the ſilver is ſo cooled as to be but moderately red, you may take the cupel from under the muffle with your little tongs, and in the middle of its cavity you will find an exceeding white bead of ſilver, the lower part whereof will be unequal, and full of little pits.

To purify Silver by Nitre.

Granulate the ſilver you intend to purify, or reduce it to thin plates; put it into a good crucible; add thereto a fourth part in weight of very dry pulveriſed nitre, mixed with half the weight of the nitre of calcined wine-lees, and about a ſixth part of the ſame weight of common glaſs in powder. Cover this crucible with another crucible inverted; which muſt be of ſuch a ſize that its mouth may enter a little way into that of the lower one, and have its bottom pierced with a hole of about two lines in diameter. Lute the two crucibles together with clay and Windſor-loam. When the lute is dry, place the crucibles in a melting furnace. Fill the furnace with charcoal, taking care however that they do not riſe above the upper crucible.

Kindle the fire, and make your veſſels of a middling red heat. When they are ſo, take up with the tongs a live coal, and hold it over the hole of the upper crucible. If you immediately perceive a vivid ſplendor round the coal, and at the ſame time hear a gentle hiſſing noiſe, it is a ſign that the fire is of a proper ſtrength; and it muſt be kept up at the ſame degree till this phenomenon ceaſe.

Then increaſe the fire to the degree requiſite to keep pure ſilver in fuſion; and immediately take your veſſels out of the furnace. You will find the ſilver at the bottom of the lower crucible covered with a maſs of alkaline ſcoria of a greeniſh colour. If the metal be not rendered perfectly pure and ductile by this operation, it muſt be repeated a ſecond time.

To diſſolve Silver in Aqua Fortis, *and thereby ſeparate it from every other metalline Subſtance.*

The ſilver you intend to diſſolve being beaten into thin plates, put it into a glaſs cucurbit; pour on it twice its weight of good precipitated *aqua fortis*; cover the cucurbit with a paper, and ſet it on a ſand-bath moderately heated. The *aqua fortis* will begin to diſſolve the ſilver as ſoon as it comes to be a little warm. Red vapours will riſe; and from the upper ſurfaces of the ſilver there will ſeem to iſſue ſtreams of little bubbles, aſcending to the top of the liquor, between which and the ſilver they will form, as it were, a number of fine chains: This is a ſign that the diſſolution proceeds duly, and that the degree of heat is ſuch as it ought to be. If the liquor appear to boil and be agitated, a great many red vapours riſing at the ſame time, it is a ſign that the heat is too great, and ſhould be leſſened till it be reduced to the proper degree indicated above: having obtained that, keep it equally up till no more bubbles or red vapours appear.

If your ſilver be alloyed with gold, the gold will be found, when the diſſolution is finiſhed, at the bottom of the veſſel in the form of a powder. The ſolution muſt now be decanted while it is yet warm: on the powder pour half as much freſh *aqua fortis* as before, and make it boil; again decant this ſecond *aqua fortis*, and repeat the ſame a third time; then with fair water waſh the remaining powder well: It will be of a brown colour inclining to red.

To ſeparate Silver from the Nitrous Acid by Diſtillation. Cryſtals of Silver. The Infernal Stone.

Into a large, low, glaſs body, put the ſolution of ſilver from which you intend to ſeparate the ſilver by diſtillation. To this body fit a tubulated head provided with its ſtopple. Set this alembic in a ſand-bath, ſo that the body may be almoſt covered with ſand: apply a receiver, and diſtill with a moderate heat, ſo that the drops may ſucceed each other at the diſtance of ſome ſeconds. If the receiver grow very hot, check the fire. When red vapours begin to appear, pour into the alembic, through the hole in its head, a freſh quantity of your ſolution of ſilver, firſt made very hot. Continue diſtilling in this manner, and repeating the addition of freſh liquor, till all your ſolution be put into the alembic. When you have no more freſh ſolution to put in, and when, the phlegm being all come over, red vapours begin again to appear, convey into the alembic half a dram or a dram of tallow, and diſtill to drineſs; which being done, increaſe your fire ſo as to make the veſſel containing the ſand-bath red-hot. In the alembic you will find a calx of ſilver, which muſt be melted in a crucible with ſome ſoap and calcined wine-lees.

If the diſtillation be ſtopped when part of the phlegm is drawn off, and the liquor be then ſuffered to cool, many cryſtals will ſhoot therein, which are a neutral ſalt conſtituted of the nitrous acid and ſilver. If the diſtillation be carried further, and ſtopped when near its concluſion, the liquor being then ſuffered to cool will wholly coagulate into a blackiſh maſs called the *infernal ſtone*.

To ſeparate Silver from the nitrous Acid by Precipitation. Luna Cornea. Luna Cornea *reduced.*

Into your ſolution of ſilver pour about a fourth part in weight of ſpirit of ſalt, ſolution of ſea-ſalt, or ſolution of ſal ammoniac. The liquor will inſtantly become turbid and milky. Add twice or thrice its weight of fair water, and let it ſtand ſome ſome hours to ſettle. It will depoſite a white powder. Decant the clear liquor, and on the precipitate pour freſh *aqua fortis*, or ſpirit of ſalt, and warm the whole on a ſand bath with a gentle heat for ſome time. Pour off this ſecond liquor, and boil your precipitate in pure water, ſhifting it ſeveral times, till the precipitate and the water be both quite inſipid. Filter the whole, and dry the precipitate, which will be a *luna cornea*, and muſt be reduced in the following manner.

Smear the inſide of a good crucible well with ſoap. Put your *luna cornea* into it; cover it with half its weight of ſalt of tartar, thoroughly dried and pulveriſed; preſs the whole hard down; pour thereon as much oil, or melted tallow, as the powder is capable of imbibing; ſet the crucible thus charged, and cloſe covered, in a melting furnace, and, for the firſt quarter of an hour, kindle no more fire than is neceſſary to make the crucible moderately red; after that raiſe it ſo as to melt the ſilver and the ſalt, throwing into the crucible from time to time little bits of tallow. When it ceaſes to ſmoke, let the whole cool; or pour it into a hollow iron cone, warmed and tallowed.

To diſſolve Silver, and ſeparate it from Gold, by Cementation.

Mix thoroughly together fine brick-duſt four parts, vitriol calcined to redneſs one part, and ſea-ſalt or nitre one part. Moiſten this powder with a little water. With this cement cover the bottom of a crucible half an inch thick; on this firſt bed lay a thin plate of the maſs of gold and ſilver you intend to cement, and which you muſt previouſly take care to beat into ſuch thin plates. Cover this plate with a ſecond layer of cement, of the ſame thickneſs as the former; on this ſecond bed lay another plate of your metal; cover it in like manner with cement; and ſo proceed till the crucible be filled to within half an inch of its brim. Fill up the remaining ſpace with cement, and cloſe the crucible with a cover, luted with a paſte made of Windſor-loam and water: Set your crucible thus charged in a furnace, whoſe fire-place is deep enough to let it be entirely ſurrounded with coals, quite up to its mouth. Light ſome coals in the furnace, taking care not to make the fire very briſk at firſt; increaſe it by degrees, but only ſo far as to make the crucible moderately red; keep up the fire in this degree for eighteen or twenty hours: Then let the fire go out; open the crucible when it is cold, and ſeparate the cement from your plates of gold. Boil the gold repeatedly in fair water, till the water come off quite inſipid.

Of COPPER.

To ſeparate Copper from its Ore.

Beat your copper ore to a fine powder, having firſt freed it as accurately as poſſible, by waſhing and roaſting, from all ſtony, earthy, ſulphureous, and arſenical parts. Mix your ore thus pulveriſed with thrice its weight of the black flux; put the mixture into a crucible; cover it with common ſalt to the thickneſs of half an inch, and preſs the whole down with your finger. With all this the crucible muſt be but half full. Set it in a melting furnace; kindle the fire by degrees, and raiſe it inſenſibly till you hear the ſea-ſalt crackle. When the decrepitation is over, make the crucible moderately red-hot for half a quarter of an hour. Then give a conſiderable degree of heat, exciting the fire with a pair of good perpetual bellows, ſo that the crucible may become very red-hot, and be perfectly ignited. Keep the fire up to this degree for about a quarter of an hour; then take out the crucible, and with a hammer ſtrike a few blows on the floor on which you ſet it. Break it when cold. If the operation hath been rightly and ſucceſsfully performed, you will find at the bottom of the veſſel a hard regulus, of a bright yellow colour, and ſemi-malleable; and over it a ſcoria of a yellowiſh brown colour, hard, and ſhining, from which you may ſeparate the regulus with a hammer.

To purify black Copper, and render it malleable.

Break into ſmall bits the black copper you intend to purify; mix therewith a third part in weight of granulated lead, and put the whole into a cupel ſet under the muffle in a cupelling furnace, and previouſly heated quite red. As ſoon as the metals are in the cupel raiſe the fire conſiderably, making uſe, if it be needful, of a pair of perpetual bellows, to melt the copper ſpeedily. When it is thoroughly melted, lower the fire a little, and continue it juſt high enough to keep the metalline maſs in perfect fuſion. The melted matter will then boil, and throw up ſome ſcoriæ, which will be abſorbed by the cupel.

When moſt of the lead is conſumed, raiſe the fire again till the face of the copper become bright and ſhining, thereby ſhewing that all its alloy is ſeparated. As ſoon as your copper comes to this ſtate, cover it with charcoal duſt conveyed into the cupel with an iron laddle: Then take the cupel out of the furnace, and let it cool.

To deprive Copper of its Phlogiſton by Calcination.

Put your copper in filings into a teſt, and ſet it under the muffle of a cupelling furnace; light the fire, and keep up ſuch a degree of heat as may make the whole quite red, but not enough to melt the copper. The ſurface of the copper will gradually loſe its metalline ſplendor, and put on the appearance of a reddiſh earth. From time to time ſtir the filings with a little rod of copper or iron, and leave your metal expoſed to the ſame degree of fire till it be always calcined.

To reſuſcitate the Calx of Copper, and reduce it to Copper, by reſtoring its Phlogiſton.

Mix the calx of copper with thrice as much of the black flux; put the mixture into a good crucible, ſo as to fill two thirds thereof, and over it put a layer of ſea-ſalt a finger thick. Cover the crucible, and ſet it in a melting furnace; heat it gradually, and keep it moderately red till the decrepitation of the ſea-ſalt be over. Then raiſe the fire conſiderably by means of a good pair of perpetual bellows; ſatisfy yourſelf that the matter is in perfect fuſion, by dipping into the crucible an iron wire; continue the fire in this degree for half a quarter of an hour. When the crucible is cold, you will find at its bottom a button of very fine copper, which will eaſily ſeparate from the ſaline ſcoria at top.

To diſſolve Copper in the Mineral Acids.

On a ſand-bath, in a very gentle heat, ſet a matras containing ſome copper filings; pour on them twice their weight of oil of vitriol. That acid will preſently attack the copper. Vapours will riſe, and iſſue out of the neck of the matras. A vaſt number of bubbles will aſcend from the ſurface of the metal to the top of the liquor, and the liquor will acquire a beautiful blue colour. When the copper is diſſolved, put in a little and a little more, till you perceive the acid no longer acts upon it. Then decant the liquor, and let it ſtand quiet in a cool place. In a ſhort time great numbers of beautiful blue cryſtals will ſhoot in it. Theſe cryſtals are called *vitriol of copper*, or *blue vitriol*. They diſſolve eaſily in water.

Of IRON.

To ſeparate Iron from its Ore.

Pound into a coarſe powder the martial ſtones or earths out of which you deſign to extract the iron: Roaſt this powder in a teſt under the muffle for ſome minutes, and let your fire be briſk. Then let it cool, beat it very fine, and roaſt it a ſecond time, keeping it under the muffle till it emit no more ſmell.

Then mix with this powder a flux compoſed of three parts of nitre fixed with tartar, one part of fuſile glaſs, and half a part of borax and charcoal-duſt. The doſe of this reducing flux muſt be thrice the weight of the ore.

Put this mixture into a good crucible; cover it with about half a finger thick of ſea-ſalt; over the crucible put its cover, and lute it on with Windſor-loam made into a paſte with water. Having thus prepared your crucible, ſet it in a melting furnace, which you muſt fill up with charcoal. Light the fire, and let it kindle by gentle degrees, till the crucible become red-hot. When the decrepitation of the ſea-ſalt is over, raiſe your fire to the higheſt by the blaſt of a pair of perpetual bellows, or rather ſeveral. Keep up this intenſe degree of heat for three quarters of an hour, or a whole hour, taking care that during all this time the furnace be kept conſtantly filling up with freſh coals as the former conſume. Then take your crucible out of the furnace; ſtrike the pavement on which you ſet it ſeveral times with a hammer, and let it ſtand to cool: Break it, and you will find therein a regulus of iron covered with ſlag.

In ſmelting-houſes iron ore is fuſed amidſt charcoal, the phlogiſton of which combines with the martial earth, and gives it the metalline form. The iron thus melted runs down to the bottom of the furnace, from whence it is let out into large moulds, in which it takes the ſhape of oblong blocks, called *pigs* of iron. This iron is ſtill very impure, and quite unmalleable. Its want of ductility after the firſt melting ariſes partly from hence, that, notwithſtanding the previous roaſting which the ore underwent, there ſtill remains, after this firſt fuſion, a conſiderable quantity of ſulphur or arſenic combined with the metal.

A certain quantity of quick-lime, or of ſtones that will burn to lime, is frequently mixed with iron ore on putting it into the ſmelting furnace. The lime being an abſorbent earth, very apt to unite with ſulphur and arſenic, is of uſe to ſeparate thoſe minerals from the iron.

It is alſo of uſe to mix ſome ſuch matters with the ore, when the ſtones or earths which naturally accompany it are very fuſible; for, as the iron is of difficult fuſion, it may happen that the earthy matters mixed with the iron ſhall melt as eaſily as the metal, or perhaps more eaſily. In ſuch a caſe there is no ſeparation of the earthy from the metalline part, both of which melt and precipitate together promiſcuouſly: Now quick-lime, being extremely refractory, ſerves on this occaſion to check the melting of thoſe matters which are too fuſible.

Yet quick-lime, notwithſtanding its refractory quality, may ſometimes be of uſe as a flux for iron: This is the caſe when the ore happens to be combined with ſubſtances which, being united with lime, render it fuſible: Such are all arſenical matters, and even ſome earthy matters, which, being combined with quick-lime, make a fuſible compound.

When the ore of an iron mine is found difficult to reduce, it is uſually neglected even though it be rich; becauſe iron being very common, people chuſe to work thoſe mines only whoſe ores are ſmelted with the moſt eaſe, and require the leaſt conſumption of wood.

Yet refractory ores are not to be altogether rejected, when another iron ore of a different quality is found near them. For it often happens, that two ſeveral iron ores, which being worked ſeparately are very difficult to manage, and yield at laſt but bad iron, become very tractable, and yield excellent iron, when ſmelted together: And accordingly ſuch mixtures are often made at iron-works.

The iron obtained from ores by the firſt fuſion may be divided into two ſorts. The one, when cold, reſiſts the hammer, doth not eaſily break, and is in ſome meaſure extenſible on the anvil; but if ſtruck with a hammer, when red-hot, flies into many pieces: This ſort of iron hath always a mixture of ſulphur in it. The other ſort, on the contrary, is brittle when cold, but ſomewhat ductile when red-hot. This iron is not ſulphurated, is naturally of a good quality, and its brittleneſs ariſes from its metalline parts not being ſufficiently compacted together.

Iron abounds ſo much, and is ſo univerſally diffuſed through the earth, that it is difficult to find a body in which there is none at all: And this hath led ſeveral chemiſts into the error of thinking, that they had tranſmuted into iron ſeveral ſorts of earths in which they ſuſpected no iron, by combining them with an inflammable matter; whereas, in fact, all they did was to give the metalline form to a true martial earth which happened to be mixed with other earths.

To render Pig-iron and brittle Iron malleable.

INTO an earthen veſſel widening upwards, put ſome charcoal-duſt, and thereon lay the pig-iron which you propoſe to render ductile; cover it all over with a quantity of charcoal; excite the fire violently with a pair, or more, of perpetual bellows till the iron melt. If it do not readily flow and form a great deal of ſlag on its ſurface, add ſome flux, ſuch as a very fuſible ſand.

When the matter is in fuſion, keep ſtirring it from time to time, that all the parts thereof may be equally acted on by the air and the fire. On the ſurface of the melted iron *ſcoriæ* will be formed, which muſt be taken off as they appear. At the ſame time you will ſee a great many ſparkles darted up from the ſurface of the metal, which will form a ſort of fiery ſhower. By degrees, as the iron grows purer, the number of theſe ſparkles diminiſhes, though they never vaniſh entirely. When but few ſparkles appear, remove the coals which cover the iron, and let the ſlag run out of the veſſel; whereupon the metal will grow ſolid in a moment. Take it out while it is ſtill red hot, and give it a few ſtrokes with a hammer, to try if it be ductile. If it be not yet malleable, repeat the operation a ſecond time, in the ſame manner as before. Laſtly, when it is thus ſufficiently purified by the fire, work it for a long time on the anvil, extending it different ways, and making it red-hot as often as there is occaſion. Iron thus brought to the neceſſary degree of ductility, ſo as to yield to the hammer, and ſuffer itſelf to be extended every way, either hot or cold, without breaking to bits, or even cracking in the leaſt, is very good and very pure. If it cannot be brought to this degree by the method here preſcribed, it is a proof, that the ore from which this iron was extracted, ought to be mixed with other ores; but it frequently requires a great number of trials to obtain an exact knowledge of the quality and proportion of thoſe other ores with which it is to be mixed.

To convert Iron into Steel.

TAKE ſmall bars of the beſt iron; that is, of ſuch as is malleable both hot and cold; ſet them on their ends in a cylindrical earthen veſſel, whoſe depth is equal to the length of the bars, and in ſuch a manner that they may be an inch diſtant from each other, and from the ſides of the crucible. Fill the veſſel with a cement compounded of two parts of charcoal, on part of bones burnt in a cloſe veſſel till they become very black, and one half part of the aſhes of green wood; having firſt pulveriſed and thoroughly mixed the whole together. Take care to lift up the iron bars a little, to the end that the cement may cover the bottom of the veſſel, and ſo that there be about the depth of half an inch thereof under every bar: Cover the crucible and lute on the cover.

Set the crucible thus prepared in a furnace, ſo contrived, that the crucible may be ſurrounded with coals from top to bottom: For eight or ten hours keep up ſuch a degree of fire that the veſſel may be moderately red; after this take it out of the furnace; plunge your little iron bars into cold water, and you will find them converted into ſteel.

The principal difference between iron and ſteel conſiſts in this, that the latter is combined with a greater quantity of phlogiſton than the former.

It appears by this experiment, that, to make iron unite with an inflammable matter, it is neceſſary it ſhould be in fuſion; it is ſufficient that it be ſo red-hot as to be opened and ſoftened by the fire.

Every kind of charcoal is fit to be an ingredient in the compoſition of the cement employed to make ſteel, provided it contain no vitriolic acid. However, it hath been obſerved, that animal coals produce a ſpeedier effect than others: for which reaſon it is proper to mix ſomething of that kind with charcoal-duſt, as above directed.

The following ſigns ſhew that the operation hath ſucceeded, and that the iron is changed into good ſteel.

This metal being quenched in cold water as propoſed above, acquires ſuch an extraordinary degree of hardneſs, that it will by no means yield to any impreſſion of the file or hammer, and will ſooner break in pieces than ſtretch upon the anvil. And here it is proper to obſerve, that the hardneſs of ſteel varies with the manner in which it is quenched. The general rule is, that the hotter the ſteel is when quenched, and the colder the water is in which you quench it, the harder it becomes. It may be deprived of the temper thus acquired, by making it red-hot, and letting it cool ſlowly; for it is thereby ſoftened, rendered malleable, and the file will bite upon it. For this reaſon the artiſans who work in ſteel begin with untempering it, that they may with more eaſe ſhape it into the tool they intend to make. They afterwards new-temper the tool when finiſhed, and by this ſecond temper the ſteel recovers the ſame degree of hardneſs it had acquired by the firſt temper.

The colour of ſteel is not ſo white as that of iron, but darker, and the grains, facets, or fibres, which appear on breaking it, are finer than thoſe obſerved in iron.

If the bars of iron thus cemented, in order to convert them into ſteel, be too thick, or not kept long enough in cementation, they will not be turned into ſteel throughout their whole thickneſs: their ſurfaces only will be ſteel to a certain depth, and the centre will be mere iron; becauſe the phlogiſton will not have thoroughly penetrated them. On breaking a bar of this ſort, the difference in colour and grain between the ſteel and the iron is very viſible.

It is eaſy to deprive ſteel of the ſuperabundant quantity of phlogiſton which conſtitutes it ſteel, and thereby reduce it to iron. For this purpoſe it need only be kept red-hot for ſome time, obſerving that no matter approach it all the while that is capable of refunding to it the phlogiſton which the fire carries off. The ſame end is ſtill ſooner obtained by cementing it with meagre hungry matters, capable of abſorbing the phlogiſton; ſuch as bones calcined to whiteneſs, and cretaceous earths.

The Calcination of Iron. Sundry Saffrons of Mars.

Take filings of iron, what quantity you pleaſe; put them into a broad unglazed earthen veſſel, ſet under the muffle of a cupelling furnace: make it red-hot; ſtir the filings frequently; and keep up the ſame degree of fire till the iron be wholly turned into a red powder.

Iron eaſily loſes its phlogiſton by the action of fire. The calx that remains after its calcination is exceeding red; which makes this be thought the natural colour of the earth of that metal. It hath accordingly been obſerved, that all the earths and ſtones, which either are naturally red, or acquire that colour by calcination, are ferruginous.

The yellowiſh red colour which every calx of iron hath, in whatever manner it be prepared, hath procured the name of *crocus*, or *ſaffron*, to every preparation of this kind. That made in the manner above directed is called in medicine *crocus martis aſtringens*.

The ruſt produced on the ſurface of iron, is a ſort of calx of iron made by the way of diſſolution. The moiſture of the air acts upon the metal, diſſolves it, and robs it of ſome of its phlogiſton. This ruſt is called in medicine *crocus martis aperiens*; becauſe it is thought that the ſaline parts, by means whereof the humidity diſſolves the iron, remain united with the metal after its diſſolution, and give it an aperitive virtue. The apothecaries prepare this ſort of ſaffron of mars by expoſing iron filings to the dew till they be turned entirely to ruſt; which is then called *ſaffron of mars by dew*.

Another ſaffron of mars is alſo prepared in a much ſhorter manner, by mixing filings of iron with pulveriſed ſulphur, and moiſtening the mixture, which after ſome time ferments and grows hot. It is then ſet on the fire; the ſulphur burns away, and the maſs is kept ſtirring till it become a red matter. This ſaffron is nothing but iron diſſolved by the acid of ſulphur, which is known to be of the ſame nature with that of vitriol; and conſequently this ſaffron of mars is no way different from vitriol calcined to redneſs.

Iron diſſolved by the mineral Acids.

Put any mineral acid whatever into a matras with ſome water; ſet the matras on a ſand-bath gently heated; drop into the veſſel ſome filings of iron: the phenomena which uſually accompany metalline diſſolutions will immediately appear. Add more filings, till you obſerve the acid hath loſt all ſenſible action upon them: then remove your matras from the ſand-bath; you will find in it a ſolution of iron.

Of Tin.

To extract Tin from its Ore.

Break your tin ore into a coarſe powder, and by waſhing carefully, ſeparate from it all the heterogeneous matters and ores of a different kind that may be mixed therewith. Then dry it, and roaſt it in a ſtrong degree of fire, till no more arſenical vapour riſe from it. When the ore is roaſted, reduce it to a fine powder, and mix it thoroughly with twice its weight of the black flux well dried, a fourth part of its weight of clean iron filings, together with as much borax and pitch: put the mixture into a crucible; over all put ſea-ſalt to the thickneſs of four fingers, and cover the crucible cloſe.

Set the crucible thus prepared in a melting furnace: apply at firſt a moderate and ſlow degree of fire, till the flame of the pitch, which will eſcape through the joint of the cover, diſappear entirely. Then ſuddenly raiſe your fire, and urge it with rapidity to the degree neceſſary for melting the whole mixture. As ſoon as the whole is in fuſion, take the crucible out of the furnace, and ſeparate the regulus from the ſcoria.

All tin ores contain a conſiderable quantity of arſenic, and no ſulphur at all, or at moſt very little. Hence, though tin be the lighteſt of all metals, its ore is nevertheleſs much heavier than any other; arſenic being much heavier than ſulphur, of which the ores of every other kind always contain a pretty large proportion. This ore is moreover very hard, and is not brought to a fine powder with ſo much eaſe as the reſt.

Theſe properties of tin ore furniſh us with the means of ſeparating it eaſily by lotion, not only from earthy and ſtony parts, but even from the other ores which may be mixed with it. And this is of the greater advantage on two accounts, *viz.* becauſe tin cannot endure, without the deſtruction of a great part thereof, the degree of fire neceſſary to ſcorify the refractory matters which accompany its ore; and again, becauſe this metal unites ſo eaſily with iron and copper, the ores of which are pretty commonly blended with tin ore, that after the reduction it would be found adulterated with a mixture of theſe two metals, if they were not ſeparated from it before the fuſion.

Into an unvarniſhed earthen diſh put the quantity of tin you intend to calcine; melt it, and keep ſtirring it from time to time. Its ſurface will be covered with a greyiſh white powder: Continue the calcination till all your tin be converted into ſuch a powder, which is the *calx of tin*.

The diſſolution of Tin by Acids.

Put into a glaſs veſſel what quantity you pleaſe of fine tin cut into little bits. Pour on it thrice as much *aqua regis*, compounded of two parts *aqua fortis* weakened with an equal quantity of very pure water, and one part ſpirit of ſalt. An ebullition will ariſe, and the tin will be very rapidly diſſolved; eſpecially if the quantities of metal and of *aqua regis* be conſiderable.

To

To extract Lead from its Ore.

HAVING roaſted your lead-ore, reduce it to a fine powder; mix it with twice its weight of the black flux, and one fourth of its weight of clean iron filings and borax; put the whole into a crucible capable of containing at leaſt thrice as much; over all put ſea-ſalt four fingers thick; cover the crucible; lute the juncture; dry the whole with a gentle heat, and ſet it in a melting furnace.

Make the crucible moderately red: yon will hear the ſea-ſalt decrepitate, and after the decrepitation a ſmall hiſſing in the crucible. Keep up the ſame degree of fire till that be over.

Then throw in as many coals as are neceſſary to complete the operation entirely, and raiſe the fire ſuddenly, ſo as to bring the whole mixture into perfect fuſion. Keep up this degree of fire for a quarter of an hour, which is time ſufficient for the precipitation of the regulus.

When the operation is finiſhed, which may be known by the quietneſs of the matter in the crucible, and by a bright vivid flame that will riſe from it, take the crucible out of the furnace, and ſeparate the regulus from the ſcoria.

To ſeparate Lead from Copper.

WITH luting earth and charcoal-duſt make a flat veſſel, widening upwards, and large enough to contain your metalline maſs. Set it ſhelving downwards from the back towards the fore-part; and in the fore-part, at the bottom, make a little gutter communicating with another veſſel of the ſame nature, placed near the former and a little lower. Let the mouth of the gutter withinſide the upper veſſel be narrowed, by means of a ſmall iron plate fixed acroſs it, while the loam is yet ſoft; ſo as to leave a very ſmall appertnre in the lower part of this canal ſufficient to diſcharge the lead as it melts. Dry the whole by placing lighted coals round it.

When this apparatus is dry, put your mixed maſs of copper and lead into the upper veſſel: both in that, and in the other veſſel, light a very gentle fire of wood or charcoal, ſo as not to exceed the degree of heat neceſſary to melt lead. In ſuch a degree of heat the lead contained in the mixed maſs will melt, and you will ſee it run out of the upper veſſel into the lower; at the bottom of which it will unite into a regulus. When in this degree of heat no more lead flows, increaſe the fire a little, ſo as to make the veſſel moderately red.

When no more will run, collect the lead contained in the lower veſſel. Melt it over again in an iron ladle, with a degree of fire ſufficient to make the ladle red; throw into it a little tallow or pitch, and while it burns keep ſtirring the metal, in order to reduce any part of it that may be calcined. Remove the pellicle or thin cruſt which will form on the ſurface; ſqueeze out all the lead it contains, and then put it to the maſs of copper left in the upper veſſel. Check the fire, and in the ſame manner take off a ſecond ſkin that will form on the ſurface of the lead. Laſtly, when the metal is ready to fix, take off the ſkin that will then appear on it. The lead remaining after this will be very pure, and free from all alloy of copper.

With regard to the copper itſelf, you will find it in the upper veſſel covered with a thin coat of lead, and if the lead mixed with it was in the proportion of a fourth or a fifth part only, and the fire applied was gentle and ſlow, it will retain nearly the ſame form after the operation that the mixed maſs had before.

The Calcination of Lead.

TAKE what quantity of lead you pleaſe; melt it in one or more unglazed earthen pans: a dark grey powder will be found on its ſurface. Keep ſtirring the metal inceſſantly till it be wholly converted into ſuch a powder, which is the *calx of lead*.

In the calcination of all metals, and particularly in this of lead, there appears a ſingular phenomenon which is not eaſily accounted for. It is this: though theſe matters loſe a great deal of their ſubſtance, either by the diſſipation of their phlogiſton, or becauſe ſome of the metal perhaps exhales in vapours, yet, when the calcination is over, their calxes are found to be encreaſed in weight, and this increaſe is very conſiderable. An hundred pounds of lead, for example, converted into minium, which is nothing but a calx of lead brought to a red colour by continuing the calcination, are found to gain ten pounds weight; ſo that for an hundred pounds of lead we have one hundred and ten pounds of minium: a prodigious and almoſt incredible augmentation, if it be conſidered that, far from adding any thing to the lead, we have on the contrary diſſipated part of it.

To prepare Glaſs of Lead.

TAKE two parts of litharge, and one part of pure cryſtalline ſand; mingle them together as exactly as poſſible, adding a little nitre and ſea-ſalt: put this mixture into a crucible of the moſt ſolid and moſt compact earth. Shut the crucible with a cover that may perfectly cloſe it.

Set the crucible thus prepared in a melting furnace; fill the furnace with coals; light the fire gradually, ſo that the whole may be ſlowly heated: Then raiſe the fire ſo as to make the crucible very red, and bring the matter it contains into fuſion; keep it thus melted for a quarter of an hour.

Then take the crucible out of the furnace, and break it: In the bottom thereof you will moſt commonly find a ſmall button of lead, and over it a tranſparent glaſs of a yellow colour nearly reſembling that of amber. Separate this glaſs from the little button of metal, and from the ſaline matters which you will find above it.

Lead diſſolved by the Nitrous Acid.

PUT into a matras ſome *aqua fortis* precipitated like that uſed to diſſolve ſilver; weaken it by mixing therewith an equal quantity of common water; ſet the matras in a hot ſand-bath; throw into it, little by little, ſmall bits of lead, till you ſee that no more will diſſolve. *Aqua fortis* thus lowered will diſſolve about a fourth of its weight of lead.

There is gradually formed upon the lead, as it diſſolves, firſt a grey powder, and afterwards a white cruſt, which

which at laſt hinder the ſolvent from acting on the remaining part of the metal; and therefore the liquor ſhould be made to boil, and the veſſel ſhould be ſhaken to remove thoſe impediments, by which means all the lead will be diſſolved.

Of MERCURY.

To extract Mercury from its Ore, or to revivify it from Cinabar.

PULVERIZE the cinabar from which you would extract the mercury; with this powder mix an equal part of clean iron filings; put the mixture into a retort of glaſs or iron, leaving at leaſt one third part thereof empty. Set the retort thus prepared in a ſand-bath, ſo that its body may be quite buried in the ſand, and its neck decline conſiderably downwards: fit on a receiver half filled with water, and let the noſe of the retort enter about half an inch into the water.

Heat the veſſel ſo as to make the retort moderately red. The mercury will riſe in vapours, which will condenſe into little drops, and fall into the water in the receiver. When you ſee that nothing more comes over with this degree of heat, increaſe it, in order to raiſe what mercury may ſtill be left. When all the mercury is thus brought over, take off the receiver, pour out the water contained in it, and collect the mercury.

Mercury is never mineralized in the bowels of the earth by any thing but ſulphur: with which it forms a compound of a browniſh red colour, known by the name of *Cinabar*.

The oldeſt and richeſt mine of mercury is that of Almaden in Spain. It is a ſingular property of that mine, that though the mercury found in it is combined with ſulphur, and in the form of cinabar, yet no additament is required to procure the ſeparation of theſe two; the earthy and ſtony matter, with which the particles of the ore are incorporated, being itſelf an excellent abſorbent of ſulphur.

In the quick-ſilver works carried on at this mine they make no uſe of retorts. They place lumps of the ore on an iron grate, which ſtands immediately over the furnace. The furnaces which ſerve for this operation are cloſed at the top by a ſort of dome, behind which ſtands the ſhaft of a chimney that communicates with the fire-place, and gives vent to the ſmoke. Theſe furnaces have in their fore-ſide ſixteen apertures, to each of which is luted an aludel in a horizontal poſition, communicating with a long row of other aludels placed likewiſe in an horizontal direction; which aludels ſo connected together form one long pipe or canal, the further end whereof opens into a chamber deſtined to receive and condenſe all the mercurial vapours. Theſe rows of aludels are ſupported from end to end by a terraſs, which runs from the body of the building, wherein the furnaces are erected, to that where the chambers are built that perform the office of receivers.

This a very ingenious contrivance, and ſaves much labour, expence, and trouble, that would be unavoidable if retorts were employed.

That part of the furnace which contains the lumps of ore, ſerves for the body of the retort; the row of aludels for its neck; and the little chambers in which theſe canals terminate are actual receivers. The terraſs of of communication, which reaches from the one building to the other, is formed of two inclined planes, the lower edges of which, meeting in the middle of the terraſs, riſe from thence inſenſibly; the one quite to the building where the furnaces are, and the other to that which forms the recipient chambers. By this means, when any mercury eſcapes through the joints of the aludels, it naturally runs down along theſe inclined planes, and ſo is collected in the middle of the terraſs, where the inferior ſides of the planes meeting together form a ſort of canal, out of which it is eaſily taken up.

To give Mercury, by the action of Fire, the appearance of a Metalline Calx.

Put mercury into ſeveral little glaſs matraſſes with long and narrow necks. Stop the matraſſes with a little paper, to prevent any dirt from falling into them. Set them all in one ſand-bath, ſo that they may be ſurrounded with ſand as high as two thirds of their length. Apply the ſtrongeſt degree of heat that mercury can bear without ſubliming: continue this heat without interruption, till all the mercury be turned to a red powder. The operation laſts about three months.

Mercury thus converted to a red powder is known in chemiſtry and medicine by the name of *mercury precipitated per ſe*.

To diſſolve Mercury in the Vitriolic Acid. Turbith mineral.

Put mercury into a glaſs retort, and pour on it thrice its weight of good oil of vitriol. Set the retort in a ſand-bath; fit on a recipient; warm the bath by degrees till the liquor juſt ſimmer. With this heat the mercury will begin to diſſolve. Continue the fire in this degree till all the mercury be diſſolved.

The vitriolic acid diſſolves mercury pretty well: but for this purpoſe the acid muſt be very hot, or even boil; and then too it is a very long time before the diſſolution is completed. We have directed the operation to be performed in a retort; becauſe this ſolution is uſually employed to make another preparation called *turbith mineral*, which requires that as much as poſſible of the acid ſolvent be abſtracted by diſtillation. Having therefore diſſolved your mercury in the vitriolic acid, if you will now prepare the turbith, you muſt, by continuing to heat the retort, drive over all the liquor into the receiver, and diſtill till nothing remains but a white powdery matter: then break the retort; pulveriſe its contents in a glaſs mortar, and thereon pour common water, which will immediately turn the white matter of a lemon-colour; waſh this yellow matter in five or ſix warm waters, and it will be what is called in medicine *turbith mineral*; that is, a combination of the vitriolic acid with mercury, five or ſix grains whereof is a violent purgative, and alſo an emetic; qualities which it poſſeſſes in common with the vegetable turbith, whoſe name it hath therefore taken.

To combine Mercury with ſulphur. Æthiops Mineral.

MIX a dram of ſulphur with three drams of quickſilver, by triturating the whole in a glaſs mortar with a glaſs peſtle. By degrees, as you triturate, the mercury will diſappear, and the matter will acquire a black colour. Continue the triture till you cannot perceive the leaſt particle of running mercury. The black matter you will then have in the mortar is known in medicine by the name of *æthiops mineral*. An æthiops may alſo be made by fire in the following manner.

In a ſhallow unglazed earthen pan melt one part of flowers of ſulphur: add three parts of running mercury, making it fall into the pan in the form of ſmall rain, by ſqueezing it through chamoy leather. Keep ſtirring the mixture with the ſhank of a tobacco-pipe all the while the mercury is falling: you will ſee the matter grow thick and acquire a black colour. When the whole is thoroughly mixed, ſet fire to it with a match, and let as much of the ſulphur burn away as will flame.

To ſublime the combination of Mercury and Sulphur into Cinabar.

GRIND to powder æthiops mineral prepared by fire. Put it into a cucurbit; fit thereto a head; place it in a ſand-bath, and begin with applying ſuch a degree of heat as is requiſite to ſublime ſulphur. A black matter will riſe, and adhere to the ſides of the veſſel. When nothing more will riſe with this degree of heat, raiſe the fire ſo as to make the ſand and the bottom of the cucurbit red; and then the remaining matter will ſublime in the form of a browniſh red maſs, which is true *cinabar*.

To diſſolve Mercury in the Nitrous acid. Sundry Mercurial Precipitates.

PUT into a matras the quantity of mercury you intend to diſſolve: pour on it an equal quantity of good ſpirit of nitre, and ſet the matras in a ſand-bath moderately heated. The mercury will diſſolve with the phenomena that uſually attend the diſſolutions of metals in this acid. When the diſſolution is completed, let the liquor cool. You will know that the acid is perfectly ſaturated, if there remain at the bottom of the veſſel, notwithſtanding the heat, a little globule of mercury that will not diſſolve

Mercury diſſolves in the nitrous acid with much more facility, and in much greater quantity, than in the vitriolic; ſo that it is not neceſſary, on this occaſion, to make the liquor boil. This ſolution when cold yields cryſtals, which are a nitrous mercurial ſalt. If you deſire to have a clear limpid ſolution of mercury, you muſt employ an *aqua fortis* that is not tainted with vitriolic or marine acid: for, the affinity of theſe two acids with mercury being greater than that of the nitrous acid, they precipitate it in the form of a white powder, when they are mixed with the ſolvent.

Mercury thus precipitated in a white powder, out of a ſolution thereof in the ſpirit of nitre, is uſed in medicine. To obtain this precipitate, which is known by the name of the *white precipitate*, ſea-ſalt, diſſolved in water, together with a little ſal ammoniac is uſed; and the precipitate is waſhed ſeveral times in pure water, without which precaution it would be corroſive, on account of the great quantity of the marine acid which it would contain.

The preparation known by the name of *red precipitate*, is alſo obtained from our ſolution of mercury in ſpirit of nitre. It is made by abſtracting all the moiſture of the ſolution, either by diſtillation in a retort, or by evaporation in a glaſs baſon ſet on a ſand-bath. When it begins to grow dry, it appears like a white ponderous maſs. Then the fire is made ſtrong enough to drive off almoſt all the nitrous acid, which, being now concentrated, riſes in the form of red vapours. If theſe vapours be catched in a receiver, they condenſe into a liquor, which is a very ſtrong and vaſtly ſmoking ſpirit of nitre.

By degrees, as the nitrous acid is forced up by the fire, the mercurial maſs loſes its white colour, and becomes firſt yellow, and at laſt very red. When it is become entirely of this laſt colour, the operation is finiſhed. The red maſs remaining is a mercury that contains but very little acid, in compariſon of what it did while it was white: and indeed the firſt white maſs is ſuch a violent corroſive, that it cannot be uſed in medicine; whereas, when it is become red, it makes an excellent eſcharotic, which thoſe who know how to uſe it properly apply with very great ſucceſs, particularly to venereal ulcers.

To combine Mercury with the Acid of Sea-ſalt. Corroſive Sublimate.

EVAPORATE a ſolution of mercury in the nitrous acid till there remain only a white powder, as mentioned in our obſervations on the preceding proceſs. With this powder mix as much green vitriol calcined to whiteneſs, and decrepitated ſea-ſalt, as there was mercury in the ſolution. Triturate the whole carefully in a glaſs mortar. Put this mixture into a matras, ſo that two thirds thereof may remain empty, having firſt cut off the neck to half its length; or inſtead thereof you may uſe an apothecary's phial. Set your veſſel in a ſand-bath, and put ſand round it as high as the contents reach. Apply a moderate fire at firſt, and raiſe it by ſlow degrees. Vapours will begin to aſcend. Continue the fire in the ſame degree till they ceaſe. Then ſtop the mouth of the veſſel with paper, and increaſe the fire till the bottom of the ſand-bath be red-hot. With this degree of heat a ſublimate will riſe, and adhere to the inſide and upper part of the veſſel, in the form of white, ſemi-tranſparent cryſtals. Keep up the fire to the ſame degree till nothing more ſublimes. Then let the veſſel cool; break it, and take out what is ſublimed, which is *corroſive ſublimate*.

Sweet Sublimate.

TAKE four parts of corroſive ſublimate; pulveriſe it in a glaſs or marble mortar; add by little and little three parts of mercury revivified from cinabar; triturate the whole carefully, till the mercury be perfectly killed, ſo that no globule thereof can be perceived. The matter will then be grey. Put this powder into an apothecary's phial, or into a matras, whoſe neck is not above four or five inches long, leaving two thirds thereof empty. Set the veſſel in a ſand-bath, and put ſand round it to one third of its height. Apply a moderate fire at firſt; and afterwards raiſe it gradually till you perceive that the mixture ſublimes. Keep it up to this degree till nothing more will riſe, and then break the veſſel. Reject, as uſeleſs, a ſmall quantity of earth which you will find at the bottom; ſeparate alſo what adheres to the neck of the veſſel, and carefully collect the matter in the middle, which will be white. Pulveriſe it; ſublime it a ſecond time, in the ſame manner as before; and in the ſame manner ſeparate the earthy matter left at the bottom of the veſſel, and what you find ſublimed into the neck. Pulveriſe, and ſublime a third time, the white matter you laſt found in the middle. The white matter of this third ſublimation is the *ſweet ſublimate*, called alſo *aquila alba*.

The Panacea of Mercury.

PULVERISE ſome ſweet ſublimate, and ſublime it in the ſame manner as you did thrice before. Repeat this nine times. After theſe ſublimations it will make no impreſſion on the tongue. Then pour on it aromatic ſpirit of wine, and ſet the whole in digeſtion for eight days. After that decant the ſpirit of wine, and dry what remains, which is the *panacea of mercury*.

Of ANTIMONY.

To ſeparate Antimony from its Ore by Fuſion.

HAVING drilled ſome ſmall holes, of about two lines diameter, in the bottom of a crucible, put into it your antimonial ore broken into little bits, about the ſize of a hazel nut; lute on its cover; ſet the crucible thus prepared in the mouth of another crucible, and cloſe the joints with lute.

At the diſtance of half a foot from this compound veſſel place bricks all round, ſo as to form a furnace; the ſides of which muſt riſe as high as the brim of the uppermoſt crucible.

Let the bottom of this furnace be filled with aſhes, up to the top of the lower crucible, and the reſt of the furnace with lighted coals. Blow the fire, if it be neceſſary, with bellows, till the upper crucible become red. Keep it up in this degree for about a quarter of an hour. Then take your veſſels out of the furnace, and you will find the antimony collected in the bottom of the lower crucible, having run through the holes of the upper one.

The common Regulus of Antimony.

REDUCE crude antimony to powder. Mix it with three fourths of its weight of white tartar, and half its weight of refined ſalt-petre, both pulveriſed. Into a large crucible, made red-hot in the fire, throw a ſpoonfull of your mixture, and cover it. There will be a very conſiderable detonation. When it is over, throw in a ſecond ſpoonfull of your mixture, and cover the crucible as before: this will produce a ſecond detonation. Go on thus, till you have thrown in all your mixture.

When the whole has thus fulminated, increaſe the fire ſo as to bring the matter into fuſion; that being done, take the crucible out of the furnace, and immediately pour its contents into an iron cone heated and greaſed with tallow. Strike the floor and the cone ſome gentle blows with a hammer, to make the regulus precipitate; and when the matter is fixed and cold, invert the cone, and turn it out. You will ſee it conſiſt of two diſtinct ſubſtances; the uppermoſt of which is a ſaline ſcoria, and the undermoſt the reguline part. Strike this maſs a blow with a hammer, in the place where theſe ſubſtances join, and you will by this means ſeparate the ſcoria from the regulus; the latter of which will have the form of a metallic cone, on whoſe baſe you will obſerve the ſignature of a bright ſtar.

Regulus of Antimony precipitated by Metals.

PUT one part of ſmall iron nails into a crucible, and ſet it amidſt burning coals, in a melting furnace. When the iron is thoroughly red-hot, and begins to grow white, add thereto little by little, and at ſeveral times, two parts of crude antimony in powder. The antimony will immediately flow and unite with the iron. When the antimony is entirely melted, add thereto, at ſeveral times, the fourth of its weight of pulveriſed nitre: a detonation will enſue, and the whole mixture will be in fuſion.

After you have kept the matter in this condition for ſome minutes, pour it into an iron cone, firſt heated and tallowed. Strike the ſides of the cone with a hammer, that the regulus may fall to the bottom; and, when all is cold, ſeparate it from the ſcoria by a blow with a hammer. Melt this firſt regulus again in another crucible, adding a fourth part of its weight of crude antimony. Keep the crucible cloſe ſhut, and give no more heat than is neceſſary to melt the matter. When it is in perfect fuſion, add to it at ſeveral times, as you did before, the ſixth part of its weight of pulveriſed nitre; and, in half a quarter of an hour after this, pour the whole into a cone as you did the firſt time.

Laſtly, Melt your regulus over again a third or even a fourth time, always adding a little nitre, which will detonate as before. If after all theſe fuſions you pour the regulus into an iron cone, you will find it very beautiful, and the ſtar well formed: it will be covered with a ſemi-tranſparent, lemon-coloured ſcoria. This ſcoria is extremely acrid and cauſtic.

The Calcination of Antimony.

TAKE an unglazed earthen veſſel, wider at top than at bottom; put into it two or three ounces of crude antimony finely pulveriſed. Set this veſſel over a weak charcoal-fire, and increaſe the heat till you ſee the antimony begin to ſmoke a little. Continue the fire in this degree, and keep inceſſantly ſtirring the antimony with the ſhank of a tobacco-pipe all the while it is upon the fire.

The powder of antimony, which, before calcination, was of a brilliant colour inclining to black, will become dull, and look like an earth. When it comes to have this appearance, raiſe your fire till the veſſel be red-hot, and keep it up in this degree till the matter ceaſe entirely to ſmoke.

Calx of Antimony reduced to a Regulus.

Mix the calx of antimony, which you intend to reduce, with an equal quantity of black ſoap. This mixture will make a thin paſte. Put it little by little into a crucible, previouſly made red-hot amidſt live coals. Thus let the ſoap burn, till it ceaſe to emit an oily ſmoke. Then cover the crucible; make the fire ſtrong enough to melt the matter, and you will hear it efferveſce and boil. When this noiſe is over, let the crucible cool, and then break it: you will find in it a beautiful ſcoria, marked with circles of ſeveral colours; and under that a button of regulus, which is not yet quite pure, and muſt be purified in the following manner.

Pound this regulus, and mix it with half its weight of an antimonial calx as perfectly deſulphurated as poſſible. Put it into a crucible, and cover it: melt the whole, ſo that the ſurface of the melted matter may be ſmooth and uniform. Let the crucible cool, and then break it: you will find in it a beautiful button of very pure regulus, covered with a ſcoria, having the appearance of an opaque glaſs, or a kind of greyiſh enamel, moulded on the finely radiated ſurface of the regulus.

Antimony calcined with Nitre. Liver of Antimony.

Pulverise and mix perfectly together equal parts of nitre and antimony: put the mixture into an iron mortar, and cover it with a tile, which however muſt not ſhut it quite cloſe. With a live coal ſet fire to the matter in the mortar, and immediately withdraw it. The mixture will flame, with great detonation; which being over, and the mortar cooled, invert it, and ſtrike its bottom to make all the matter fall out. Then, by a blow with a hammer, ſeparate the ſcoria from the ſhining part, which is the *liver of antimony*.

Another Calcination of Antimony with Nitre. Diaphoretic Antimony.

Mix one part of antimony with three parts of nitre; project this mixture by ſpoonfulls into a crucible kept red hot in a furnace. Each projection will be attended with a detonation. Continue doing this till you have uſed all your mixture: then raiſe the fire, and keep it up for two hours; after which throw your matter into a pan full of hot water. Let it lie ſteeping in water kept hot for a whole day. Then pour off the liquor: waſh the white powder you find at bottom in warm water; and repeat the ablutions till the powder become inſipid. Dry it, and you have *diaphoretic antimony*.

Calx of Antimony vitrified.

Take any quantity you pleaſe of calx of antimony, made without addition; put it into a good crucible, which ſet in a melting furnace: kindle the fire gradually, and leave the crucible uncovered at the beginning.

A quarter of an hour after the matter is red-hot, cover the crucible, and excite the fire vigorouſly till the calx melt. You may know when it is thoroughly melted, by dipping into the crucible an iron wire, to the end of which a little knob of glaſs will adhere, if the matter be in perfect fuſion. Keep it in fuſion for a quarter of an hour, or rather longer if your crucible can bear it. Then take it out of the furnace, and immediately pour out the melted matter on a ſmooth ſtone, made very hot for the purpoſe: it will preſently fix into a yellow glaſs.

Kermes Mineral.

Break any quantity you will of Hungarian antimony into little bits: put it into a good earthen coffee-pot: pour on it twice its weight of rain-water, and a fourth part of its weight of well filtered liquor of nitre fixed by charcoal. Boil the whole briſkly for two hours, and then filter the liquor. As it cools it will acquire a red colour, grow turbid, and leave a red powder on the filter.

Return your antimony into the coffee-pot. Pour on it as much rain-water as before, and three fourths of the former quantity of the liquor of fixed nitre. Boil it again for two hours, and then filter the liquor. It will again depoſite a red ſediment. Return your antimony into the coffee pot: pour on it the ſame quantity of rain-water, and half the firſt quantity of the liquor of fixed nitre. Boil it again for two hours, and filter the liquor as formerly. Waſh all theſe ſediments with warm water, till they become inſipid; then dry them, and you have the *kermes mineral*.

Regulus of Antimony diſſolved in the Mineral Acids.

Compound an *aqua regis* by mixing together four meaſures of ſpirit of nitre, and one meaſure of ſpirit of ſalt: on a ſand-bath moderately heated place a matras, into which pour ſixteen times as much of this *aqua regis* as you have regulus to diſſolve. Break your regulus in little bits; and throw them ſucceſſively one after another into the matras, obſerving not to add a new one till that put in before is entirely diſſolved: continue this till your regulus be all uſed. By degrees, as the diſſolution advances, the liquor will acquire a beautiful golden colour; which however will inſenſibly diſappear, as the white fumes that continually aſcend from it evaporate.

Regulus of Antimony combined with the Acid of Sea-ſalt. Butter of Antimony. Cinabar of Antimony.

Pulverise and mix thoroughly ſix parts of regulus of antimony, and ſixteen parts of corroſive ſublimate. Put this mixture into a glaſs retort that hath a wide ſhort neck, and let one half of its body at leaſt be left empty. Set it in a reverberatory furnace, and having fitted a recipient thereto and luted the joint, make a very ſmall fire at firſt to heat it ſlowly. Increaſe it afterwards by degrees, till you ſee a liquor aſcend from the retort that grows thick as it cools. Keep up the fire to this degree as long as you ſee any of this matter come over.

When no more ariſes with this degree of fire, unlute your veſſels, take off the receiver, and in its place ſubſtitute another filled with water. Then increaſe your fire by degrees till the retort be red-hot. Some running mercury will fall into the water, which you may dry and keep for uſe; it being very pure.

Soon after mixing the regulus with the corroſive ſublimate, the matter ſometimes grows conſiderably hot: This is occaſioned by the marine acid's beginning to act on the reguline part, and to deſert its mercury.

The butter of antimony riſes with a very moderate heat; becauſe the acid of ſea-ſalt hath the property of volatilizing, and carrying up along with it, the metallic ſubſtances with which it is combined: And for this reaſon a very gentle heat only is required at the beginning of the operation.

It is abſolutely neceſſary that the neck of the retort be wide and ſhort: for otherwiſe, if the butter of antimony ſhould fix and be accumulated therein, it might ſtop up the paſſage entirely, and occaſion the burſting of the veſſels. By this operation we obtain eight parts and three quarters of fine butter of antimony, and ten parts of running mercury; there being left in the retort one part and a half of a rarefied matter, black, white, and red. This is probably the moſt earthy and moſt impure part of the regulus of antimony.

If crude antimony, inſtead of regulus of antimony, be mixed with corroſive ſublimate, a butter of antimony will be obtained in the ſame manner; but, inſtead of having a running mercury after the butter, you will find a cinabar ſublimed into the neck and upper concavity of the retort.

The reaſon of this difference is eaſily conceived: for, when the regulus is uſed, the mercury being deſerted by its acid, finds no other ſubſtance to unite with, and ſo riſes in the form of quick-ſilver; but when crude antimony is employed inſtead of its regulus, as the reguline part thereof cannot combine with the acid without quitting its ſulphur, ſo this ſulphur, being at liberty, unites with the mercury, which is ſo likewiſe, and therewith forms a cinabar; which from its origin is named *cinabar of antimony*.

Butter of Antimony decompounded by means of Water only. The Pulvis Algaroth, *or* Mercurius Vitæ.

MELT with a gentle heat as much butter of antimony as you pleaſe. When it is melted, pour it into a large quantity of warm water. The water will immediately grow turbid, but whitiſh, and let fall a great quantity of white powder. When all the precipitate is ſettled, decant the water: pour on freſh warm water; and having thus edulcorated it by ſeveral ablutions, dry it, and you have the *pulvis Algaroth*, or *mercurius vitæ*.

Bezoar Mineral.

MELT butter of antimony over warm aſhes, and put it into a phial or matras. Gradually pour on it good ſpirit of nitre, till the matter be entirely diſſolved. This uſually requires as much ſpirit of nitre as there is butter of antimony. During the diſſolution fumes will riſe, which muſt be carefully avoided. Pour your ſolution, which will be clear and of a reddiſh colour, into a glaſs cucurbit, or a pan of ſtone-ware; ſet it in a ſand-bath, and evaporate to dryneſs with a moderate heat. There will be left a white maſs, weighing a fourth part leſs than the whole quantity uſed, both of butter and the ſpirit of nitre. Let it cool, and again pour on it as much ſpirit of nitre as you uſed the firſt time. Place the veſſel again in the ſand-bath, and evaporate the moiſture as before. You will have a white maſs that hath neither gained nor loſt in weight. On this pour, for the third time, the ſame quantity of ſpirit of nitre as you did the firſt time. Again evaporate the moiſture to perfect dryneſs: then increaſe your fire, and calcine the matter for half an hour. You will have left a dry, friable, light, white matter, of an agreeable acid taſte; which will fall into a coarſe powder, and muſt be kept in a phial carefully ſtopt. This is Bezoar mineral: it is neither cauſtic nor emetic, and has only a ſudorific virtue. It obtained the name it bears, becauſe, like the animal bezoar, it was imagined to have the property of reſiſting poiſon.

Flowers of Antimony.

TAKE an unglazed earthen pot, having an aperture in its ſide, with a ſtopple to ſhut it cloſe. Set this pot in a furnace, the cavity whereof it may fit as exactly as poſſible; and fill up with lute the ſpace, if any, left between the veſſel and the furnace. Over this veſſel fix three aludels with a blind-head at the top; and light a fire in the furnace under the pot.

When the bottom of the pot is thoroughly red, throw into the lateral aperture a ſmall ſpoonful of powdered antimony. Stir the matter immediately with an iron ſpatula made a little bending, in order to ſpread it over the bottom of the veſſel, and then ſtop the hole. The flowers will riſe and adhere to the inſides of the aludels. Keep up the fire ſo that the bottom of the pot may always continue red; and, when nothing more ſublimes, put in a like quantity of antimony, and operate as before. In this manner go on ſubliming your antimony, till you have as many flowers as you want. Then let the fire go out; and when the veſſels are cold, unlute them. You will find flowers adhering all round the inſides of the aludels and the head, which you may collect with a feather.

Regulus of Antimony converted into Flowers.

PULVERISE your regulus of antimony: put the powder into an unglazed earthen port: three or four fingers breadth above the powder, fit into the pot a little cover, made of the ſame earth and having a ſmall hole in its middle, ſo that it may with eaſe be placed in the pot and taken out when there is occaſion: cover the mouth of the pot with a common lid; ſet it in a furnace, and kindle a fire under it ſufficient to make the bottom of the pot red and to melt the regulus. When it hath been thus kept in fuſion for about an hour, let the fire go out and the whole cool. Then remove the two covers. You will find adhering to the ſurface of the regulus, which will be in a maſs at the bottom of the pot, white flowers reſembling ſnow, intermixed with beautiful, brilliant, ſilver coloured needles. Take them out, and you will find them make about one part in ſixty-two of the whole regulus employed.

Put the covers again in their places, and proceed in the ſame manner as before: When the veſſels are cold, you will find half as many more flowers as you got the firſt time.

Proceed thus till you have converted all your regulus into flowers. This will require a conſiderable number of ſublimations, which, as you advance, will always yield you a greater portion of flowers; reſpect, however, being had to the quantity of regulus remaining in the pot.

Of BISMUTH.

To extract Biſmuth from its Ore.

BREAK the ore of biſmuth into ſmall pieces, and therewith fill a crucible either of earth or iron. Set the the crucible in a furnace, and light ſuch a fire that the bits of ore may become moderately red. Stir the ore from time to time; and if you perceive it crackle and fly, keep the crucible covered. At the bottom you will find a button of biſmuth.

Biſmuth diſſolved by Acids. Magiſtery of Biſmuth. Sympathetic Ink.

INTO a matras put biſmuth broken into little bits: pour on it, by little and little, twice as much *aqua fortis*. This acid will attack the ſemi-metal briſkly, and diſſolve it entirely, with heat, efferveſcence, vapours, and puffing up. The ſolution will be clear and limpid.

If you would have a magiſtery of biſmuth beautifully white, you muſt perform the diſſolution with an *aqua fortis* that is not tainted with any mixture of the vitriolic acid; for this gives the precipitate a dirty white colour, inclining to grey.

Biſmuth may alſo be precipitated by the means of fixed or volatile alkalis; but the precipitate is not of ſo fine a white as when procured by the means of pure water only.

A ſolution of biſmuth prepared with the proper quantity of *aqua fortis*, that is, with two parts of the acid to one of the ſemi-metal, coaleſces into little cryſtals almoſt as ſoon as made.

Aqua fortis not only acts on biſmuth when ſeparated from its ore, and reduced to a regulus, but attacks it even in its ore, and likewiſe diſſolves at the ſame time ſome portion of the ore itſelf. With this ſolution of the ore of biſmuth Mr Hellot makes a very curious ſympathetic ink, differing from all that were known before.

Mr Hellot prepares the liquor in the following manner: "He bruiſes the ore of biſmuth to a coarſe powder. On two ounces of this powder he pours a mixture of five ounces of common water with five ounces of *aqua fortis*. He does not heat the veſſel till the firſt ebullitions are over. He then ſets it in a gentle ſand-heat, and lets it digeſt there till he ſees no more air-bubbles riſe. When none appear in this heat, he increaſes it ſo as to make the ſolvent boil ſlightly for a full quarter of an hour. It takes up a tincture nearly of the colour of brown beer. The ore that gives the *aqua fortis* this colour is the beſt. He then lets the ſolution cool, laying the matras on its ſide, that he may decant the liquor more conveniently when all is precipitated that is not taken up by the ſolvent.

" The ſecond veſſel, into which the liquor is firſt decanted, he alſo lays declining, that a new precipitation of the undiſſolved matters may be obtained; after which he pours the liquor into a third veſſel. This liquor muſt not be filtered, if you would have the reſt of the proceſs ſucceed perfectly; becauſe the *aqua fortis* would diſſolve ſome of the paper, and that would ſpoil the colour of your liquor.

" When this ſolution, which Mr Hellot calls the *impregnation*, is thoroughly clarified by being decanted three or four times, he puts it into a glaſs baſon with two ounces of very pure ſea-ſalt. The fine white ſalt made by the ſun ſucceeded beſt with Mr Hellot. If that cannot be had, common bay-ſalt purified by ſolution, filtration, and cryſtalliſation, may be uſed inſtead of it. But as it is rare to meet with any of the ſort that is not a little tainted with iron, the white bay-ſalt is to be preferred. The glaſs baſon he ſets in a gentle ſand-heat, and keeps it there till the mixture be reduced by evaporation to an almoſt dry ſaline maſs.

" If you deſire to ſave the *aqua regis*, the impregnation muſt be put into a retort, and diſtilled with the gentle heat of a ſand-bath. But there is an inconvenience, as Mr Hellot obſerves, in employing a retort; which is, that, as the ſaline maſs cannot be ſtirred while it coagulates in the retort, it is reduced to a compact cake of coloured ſalt, which preſents but one ſingle ſurface to the water in which it muſt be diſſolved; ſo that the diſſolution thereof takes up ſometimes no leſs than five or ſix days. In the baſon, on the contrary, the ſaline maſs is eaſily brought to a granulated ſalt, by ſtirring it with a glaſs rod; and, when thus granulated, it has a great deal more ſurface; it diſſolves more eaſily, and yields its tincture to water in four hours time. Indeed one is more expoſed to the vapours of the ſolvent, which would be dangerous, if the operation were to be often performed, without proper precautions.

" When the baſon, or little veſſel containing the mixture of the impregnation and ſea-ſalt, is heated, the liquor, which was of an orange-coloured red, becomes a crimſon red; and, when all the phlegm of the ſolvent is evaporated, it acquires a beautiful emerald colour. By degrees it thickens, and turns of the colour of a maſs of verdegris. It muſt then be carefully ſtirred with the glaſs rod, in order to granulate the ſalt, which muſt not be kept over the fire till it be perfectly dry: becauſe you run a riſk of loſing irrecoverably the colour you are ſeeking. You may be ſure you have loſt it, if by too much heat the ſalt that was of a green colour turn to a dirty yellow. If it be once brought to this ſtate, it will continue without changing when cold: but if care be taken to remove it from the fire while it is ſtill green, you will ſee it gradually grow pale, and become of a beautiful roſe-colour as it cools.

" Mr Hellot ſeparates it from this veſſel, and throws it into another containing diſtilled rain-water: and this ſecond veſſel he keeps in gentle digeſtion, till he obſerves that the powder which falls to the bottom is perfectly white. If, after three or four hours digeſting, this powder ſtill continues tinged with a roſe colour, it is a proof that water enough was not added to diſſolve all the ſalt impregnated with the tincture of the ſolution. In this caſe, the firſt tinged liquor muſt be poured off, and freſh water added in proportion to the quantity of tinged ſalt that is ſuppoſed to remain mixed with the precipitate.

"When the ore is pure, and doth not contain a great deal of fuſible ſtone, commonly called *fluor*, or *quartz*, an ounce of it generally yields tincture enough for eight or nine ounces of water, and the liquor is of a beautiful colour, like that of the lilach or pipe-tree bloſſom. In order to prove the effect of this tincture, you muſt write with this lilach-coloured liquor on good well-gummed paper, that does not ſink: or you may uſe it to ſhade the leaves of ſome tree or plant, having firſt drawn the outlines thereof lightly with China ink or with a black lead pencil. Let this coloured drawing, or writing, dry in a warm air. You will perceive no colour while it is cold; but, if it be gently warmed before the fire, you will ſee the writing, or the drawing, gradually acquire a blue or greeniſh blue colour, which is viſible as long as the paper continues a little warm, and diſappears entirely when it cools."

The ſingularity of this ſympathetic ink conſiſts in its property of diſappearing entirely, and becoming inviſible, though it be not touched with any thing whatever: and this diſtinguiſhes it from all others; which, when once rendered viſible by the application of proper means, do not again diſappear, or at leaſt not without touching the ſtrokes on the paper with ſome other liquor.

Of ZINC.

To extract Zinc from its Ore, or from Calamine.

TAKE eight parts of calamine reduced to a powder; mix this powder accurately with one part of fine charcoal duſt, previouſly calcined in a crucible to free it from all moiſture: put this mixture into a ſtone retort coated with lute, leaving a third part of it empty: ſet your retort in a reverberatory furnace, capable of giving a very fierce heat. To the retort apply a receiver, with a little water in it. Kindle the fire, and raiſe it by degrees till the heat be ſtrong enough to melt copper. With this degree of fire the zinc being metalliſed will ſeparate from the mixture, and ſublime into the neck of the retort, in the form of metallic drops. Break the retort when it is cold, and collect the zinc.

Moſt of the zinc we have comes from an ore of difficult fuſion that is worked at Goſlar, and yields, at one and the ſame time, lead, zinc, and another metallic matter called *cadmia fornacum*, which alſo contains much zinc.

The furnace uſed for ſmelting this ore is cloſed on its fore-ſide with thin plates or tables of ſtone, not above an inch thick. This ſtone is greyiſh, and bears a violent fire.

In this furnace the ore is melted amidſt charcoal, by the help of bellows. Each melting takes twelve hours, during which time the zinc flowing with the lead is reſolved into flowers and vapours, great part of which adheres to the ſides of the furnace in the form of a very hard cruſt of earth. The workmen take care to remove this cruſt from time to time; for it would otherwiſe grow ſo thick at laſt, as to leſſen the cavity of the furnace very conſiderably.

There adheres moreover to the fore-part of the furnace, which is formed, as we ſaid before, of thin plates of ſtone, a metallic matter, which is the zinc, and is carefully collected at the end of each melting, by removing from this part all the live coals. A quantity of ſmall coal is laid unlighted at the bottom; and on this ſmall-coal, by ſtriking the ſtone-plates gently with a hammer, the zinc is made to fall out of the other matter, known by the Latin name of *cadmia fornacum*, among which it appears fixed in a radiated form. To this other matter we may properly enough give the name of *furnace-calamine*. The zinc falls in the form of a melted metal, all on fire, and in a bright flame. It would ſoon be entirely burnt and reduced to flowers, if it were not extinguiſhed, and eaſily cooled and fixed, by being hid under the unlighted ſmall-coal placed below on purpoſe to receive it.

The zinc adheres to the fore-part of the furnace preferably to any other, becauſe that being the thinneſt, is therefore the cooleſt: and, in order further to promote its fixing on this part, they take care to keep the thin ſtone-plates cool during the operation, by throwing water on them.

Hence it appears that zinc is not extracted from its ore by fuſion and the precipitation of a regulus, like other metallic ſubſtances. This is owing to the great volatility of our ſemi-metal, which cannot, without ſubliming, bear the degree of fire neceſſary to melt its ore. It is at the ſame time ſo combuſtible, that a great part of it riſes in flowers which have not the metalline form.

To ſublime Zinc into Flowers.

TAKE a very deep, large crucible: place this crucible in a furnace, ſo that it may ſtand inclining in an angle of forty-five degrees nearly. Throw ſome zinc into it, and kindle a fire in the furnace ſomewhat ſtronger than would be neceſſary to keep lead in fuſion. The zinc will melt. Stir it with an iron wire, and there will appear on its ſurface a very bright white flame: two inches above this flame a thick ſmoke will be formed, and with this ſmoke exceeding white flowers will riſe, and remain ſome time adhering to the ſides of the crucible, in the form of a very fine light down. When the flame ſlackens, ſtir your melted matter again with the iron wire: you will ſee the flame renewed, and the flowers begin again to appear in greater abundance. Go on thus till you obſerve that the matter will not flame, nor any more flowers riſe.

To combine Zinc with Copper. Braſs. Prince's Metal, &c.

POUND one part and an half of calamine, and an equal quantity of charcoal: mingle theſe two powders together, and moiſten them with a little water. Put this mixture into a large crucible, or ſome other earthen veſſel that will bear a melting heat. Amongſt and over this mixture put one part of very pure copper in thin plates, and then put freſh charcoal-duſt over all: cloſe the crucible; ſet it in a melting furnace; put coals all round it, and let them kindle gradually. Raiſe the fire ſo as to make the crucible very red hot. When you obſerve that the flame hath acquired a purple or blueiſh-green colour, uncover the crucible, and dip into it an iron wire, to examine whether or no the copper be in fuſion under the charcoal-duſt. If you find it is, moderate the force of the fire a little, and let your crucible remain in the furnace for a few minutes. Then take it out and let it cool: you will find your copper of a gold colour, increaſed in weight a fourth, or perhaps a third part, and yet very malleable.

The *lapis calaminaris* is not the only ſubſtance with which copper may be converted into braſs: all other ores containing zinc, the furnace-calamine that ſublimes where ſuch ores are worked, tutty, zinc in ſubſtance, may be ſubſtituted for it, and, like it, will make very fine braſs; but, in order to ſucceed, ſundry precautions are neceſſary.

This proceſs is a ſort of cementation; for the calamine doth not melt; only the zinc is converted into vapours, and then combines with the copper. On this the ſucceſs of the operation partly depends, as it is the means of the copper's preſerving its purity and malleability; becauſe the other metallic ſubſtances that may be united with the ore of zinc, or with the zinc itſelf, not having the ſame volatility, cannot be reduced to vapours. If you are appriſed that the calamine, or other ore of zinc uſed on this occaſion, is contaminated with a mixture of any other metallic matter, you muſt mingle luting earth with the charcoal-duſt and the matter containing the zinc; make it into a ſtiff paſte with water; of this make a bed at the bottom of your crucible, and ram it hard down; lay the copper-plates thereon, cover them with charcoal-duſt, and then proceed as before. By this means, when the copper melts, it cannot fall to the bottom of the crucible, nor mix with the ore; but is borne up by the mixture, and cannot combine with any thing but the zinc, that riſes in vapours, and, paſſing through the lute, fixes in the copper.

Lapis Calaminaris, or other ore of zinc, may be alſo purified before it be uſed for making braſs; eſpecially if adulterated with lead ore, which is often the caſe. For this purpoſe the ore muſt be roaſted in a fire ſtrong enough to give a ſmall degree of fuſion to the leaden matter; which will thereby be reduced into larger, heavier, and tougher maſſes. The moſt ſubtile particles are diſſipated in the torrefaction, together with ſome of the calamine. The calamine, on the contrary, is by roaſting made more tender, lighter, and much more friable. When it is in this condition, put it into a waſhing tray or fan; dip the tray in a veſſel full of water, and bruiſe the matter it contains. The water will carry off the lighteſt powder, which is the calamine, and leave nothing at the bottom of the tray but the heavieſt ſubſtance; that is, the leaden matter, which is to be rejected as uſeleſs. The powder of the calamine will ſettle at the bottom of the veſſel, where, after pouring off the water, it may be found, and uſed as above directed.

In this operation the charcoal-duſt ſerves to prevent both the copper and the zinc from being calcined: and for this reaſon, when you work on a great quantity of materials at once, it is not neceſſary to uſe ſo much charcoal-duſt, in proportion, as when you work but on a ſmall quantity; becauſe, the greater the maſs of metal, the leſs eaſily will it calcine.

Though the copper melts in this operation, yet it is far from being neceſſary to apply ſuch a ſtrong fire as copper uſually requires to melt it: for the acceſſion of the zinc, on this occaſion, communicates to it a great degree of fuſibility. The increaſe of its weight is alſo owing to the quantity of zinc combined with it. Copper acquires ſtill another advantage by its aſſociation with this ſemi-metal; for it remains longer in the fire without calcining.

Braſs well prepared ought to be malleable when cold. But in whatever manner it be made, and whatever proportion of zinc there be in it, it is conſtantly found quite unmalleable when red-hot.

Braſs melted in a crucible, with a fierce heat, takes fire almoſt like zinc, and from its ſurface many white flowers aſcend, dancing about in flakes like the flowers of zinc. They are indeed the flowers of zinc, and the flame of braſs urged by a ſtrong fire is no other than the flame of the zinc that is united with the copper, and then burns. If braſs be thus kept long in fuſion, it will loſe almoſt all the zinc it contains. It will alſo loſe much of its weight, and its colour will be nearly that of copper. It is therefore neceſſary, towards performing this operation aright, to ſeize the moment when the copper is ſufficiently impregnated with zinc, when it hath acquired the moſt weight and the fineſt colour, with the leaſt detriment to its ductility, that is poſſible, and that inſtant to put out the fire; becauſe, if the copper be left longer in fuſion, it will only loſe the zinc already united with it. Skill acquired by much practice, and an acquaintance with the particular calamine employed, are neceſſary to guide the artiſt ſurely through this operation; for there are very conſiderable differences between the ſundry ores of zinc. Some of them contain lead, and in others there is iron. When theſe heterogeneous metals come to be mixed with the copper, they do indeed augment its weight, but they render it at the ſame time pale, and make it very harſh. Some calamines require to be roaſted before they can be uſed for this purpoſe, and in the torrefaction emit vapours of a volatile alkali, ſucceeded by vapours of a ſulphureous ſpirit: others exhale no vapours while roaſting, and may be employed without any antecedent preparation. Theſe different qualities muſt evidently produce great differences in the operation.

Braſs may alſo be made, as prince's metal and other imitations of gold are actually made, by uſing zinc in ſubſtance, inſtead of the ores that contain it. But theſe compoſitions have not, when cold, the ductility of braſs prepared with *lapis calaminaris*, becauſe zinc is ſeldom pure, or free from a mixture of lead. Perhaps alſo the different manner in which the zinc unites with the copper may contribute to this variation.

To obviate this inconvenience, the zinc muſt be refined from all alloy of lead. The property of being indiſſoluble by ſulphur, which this ſemi-metal poſſeſſes, points out a very practicable method of doing it. The zinc muſt be melted in a crucible, and ſtirred briſkly with a ſtrong iron wire, while tallow and mineral ſulphur are alternately projected upon it; but ſo that the quantity of ſulphur may greatly exceed that of the tallow. If the ſulphur do not burn entirely away, but form a kind of ſcoria on the ſurface of the zinc, it is a ſign that your ſemi-metal contains lead. In this caſe you muſt continue throwing in more ſulphur, and keep ſtirring the zinc inceſſantly, till you perceive that the ſulphur ceaſes to unite any more with a metallic ſubſtance, but burns freely on the ſurface of the zinc. The ſemi-metal is then refined; becauſe the ſulphur, which cannot diſſolve it, unites very readily with the lead, or other metallic ſubſtance, contained in it.

If zinc thus refined be mixed with pure copper, in the proportion of a fourth or a third part, and the mixture be kept in fuſion and conſtantly ſtirring for ſome time, the braſs produced will be as ductile, when cold, as that made by cementation with the *lapis calaminaris*.

With regard to prince's metal, and other imitations of gold, they are made either with copper or braſs recombined with more zinc. As it is neceſſary, for giving them a fine golden colour, to mix with them other proportions of zinc than that required to make braſs only, they are generally much leſs ductile.

Zinc diſſolved in the Mineral Acids.

WEAKEN concentrated oil of vitriol by mixing with it an equal quantity of water. Into a matras put the zinc you intend to diſſolve, firſt broken to ſmall pieces. Pour on it ſix times its weight of the vitriolic acid, lowered as above directed, and ſet the matras in a ſand-bath gently heated. The zinc will diſſolve entirely, without any ſediment. The neutral metallic ſalt reſulting from this diſſolution ſhoots into cryſtals, which go by the name of *white vitriol*, or *vitriol of zinc*.

Zinc is diſſolved by the nitrous and marine acids, much in the ſame manner as by the vitriolic; except that the marine acid does not touch a black, ſpungy, rarefied matter, which it ſeparates from the zinc. M. Hellot found upon trial that this matter is not mercury, and that it cannot be reduced to a metallic ſubſtance.

A ſolution of zinc in the marine acid, being diſtilled to dryneſs, yields a ſublimate on applying a violent heat to it.

All the acids diſſolve with eaſe; not only zinc, but its flowers alſo; and that nearly in the ſame quantity, and with almoſt all the ſame phenomena.

Of ARSENIC.

To extract Arſenic from its Matrices. Zaffre or Smalt.

POWDER ſome cobalt, white pyrites, or other arſenical matters. Put this powder into a retort with a ſhort wide neck, leaving a full third thereof empty. Set your retort in a reverberating furnace; lute on a receiver; heat your veſſel by degrees, and increaſe the fire till you ſee a powder ſublime into the neck of the retort. Keep up the fire in this degree as long as the ſublimation continues: when this begins to ſlacken, raiſe your fire, and make it as ſtrong as the veſſels will bear. When nothing more aſcends, let it go out. On unluting the veſſels, you will find in the receiver a little arſenic in the form of a fine light *farina*. The neck of the retort will be full of white flowers, not quite ſo fine, ſome of which will appear like little cryſtals; and if a good deal of arſenic be ſublimed, a ponderous matter, like a white, ſemi-tranſparent glaſs, will be found adhering to that part of the neck of the retort which is next its body.

When all the arſenic the cobalt will yield is thus ſeparated, the earthy fixed matter left behind is mixed with divers fuſible matters and vitrified, and produces a glaſs of beautiful blue colour. It is called *ſmalt*. This glaſs is to be prepared in the following manner.

Take four parts of fine fuſible ſand, an equal quantity of any fixed alkali perfectly depurated, and one part of cobalt from which the arſenic hath been ſublimed by torrefaction. Pulveriſe theſe different ſubſtances very finely, and mix them thoroughly together; put the mixture into a good crucible, cover it, and ſet it in a melting furnace. Make a ſtrong fire, and keep it up conſtantly in the ſame degree for ſome hours. Then dip an iron wire into the crucible; to the end of which a glaſſy matter will ſtick, in the form of threads, if the fuſion and vitrification be perfect. In this caſe take the crucible out of the fire; cool it by throwing water on it, and then break it. You will find in it a glaſs, which will be of an exceeding deep blue, and almoſt black, if the operation hath ſucceeded. This glaſs, when reduced to a fine powder, acquires a much brighter and more lively blue colour.

If you find after the operation that the glaſs hath too little colour, the fuſion muſt be repeated a ſecond time, with twice or thrice the quantity of cobalt. If, on the contrary, the glaſs be too dark, leſs cobalt muſt be uſed.

In order to make the eſſay of a particular cobalt, with a view to know what quantity of blue glaſs it will yield, it is not neceſſary to perform the operation in the manner here ſet down; a great deal of time and trouble may be ſaved by melting one part of cobalt with two or three parts of borax. This ſalt is very fuſible, and turns, when melted, into a ſubſtance which, for a time, poſſeſſes all the properties of glaſs. In this trial the glaſs of borax will be nearly of the ſame colour as the true glaſs, or ſmalt, made with the ſame cobalt.

The ores of biſmuth, as well as cobalt, yield a matter that colours glaſs blue; nay, the ſmalt made with thoſe ores is more beautiful than that procured from the ore of pure arſenic. Some cobalts yield both arſenic and biſmuth. When ſuch cobalts are uſed, it is common to find at the bottom of the crucible a little button of metallic matter, which is called *regulus of cobalt*. This regulus is a ſort of biſmuth, generally adulterated with a mixture of ferruginous and arſenical parts.

The heavieſt and moſt fixed flowers of arſenic, procured from cobalt, have likewiſe the property of giving a blue colour to glaſs. But this colour is faint: it is owing to a portion of the colouring matter carried up along with the arſenic. Theſe flowers may be made an ingredient in the compoſition of blue glaſs, not only becauſe of the colouring principle they contain, but alſo becauſe they greatly promote fuſion; arſenic being one of the moſt efficacious fluxes known.

In ſhort, all thoſe blue glaſſes, or ſmalts, contain a certain quantity of arſenic; for a portion of this ſemi-metal always remains united with the fixed matter of the cobalt, though roaſted for a long time, and in a very hot fire. The portion of arſenic that is thus fixed vitrifies with the colouring matter, and enters into the compoſition of the ſmalt.

The blue glaſs made with the fixed part of cobalt hath ſeveral names, according to the condition in which it is.

When it hath undergone the firſt imperfect degree of fuſion only, it is called *zaffre.* It takes the name of *ſmalt* when perfectly vitrified: and this again being pulveriſed is called *powder blue*; or, if finely levigated, *blue enamel*; becauſe it is uſed in enamelling, as well as in painting earthen ware and porcelain.

To ſeparate Arſenic from Sulphur.

POWDER the yellow or red arſenic which you intend to ſeparate from its ſulphur. Moiſten this powder with a fixed alkali reſolved into a liquor. Dry the mixture gently; put it into a very tall glaſs cucurbit, and fit on a blind-head. Set this cucurbit in a ſand-bath; warm the veſſels gently, and increaſe the fire by degrees, till you perceive that no more arſenic ſublimes. The arſenic, which before was yellow and red, riſes into the head partly on white flowers, and partly in a compact, white, ſemi-tranſparent matter, which looks as if it were vitrified. The ſulphur combined with the fixed alkali remains at the bottom of the cucurbit.

To give Arſenic the Metalline Form. Regulus of Arſenic.

Take two parts of white arſenic in fine powder, one part of the black flux, half a part of borax, and as much clean iron filings. Rub the whole together, in order to mix them thoroughly. Put this mixture into a good crucible, and over it put ſea-ſalt three fingers thick. Cover the crucible; ſet it in a melting furnace; and begin with a gentle fire to heat the crucible equally.

When arſenical vapours begin to aſcend from the crucible, raiſe the fire immediately ſo as to melt the mixture. Examine whether or no the matter be thoroughly melted, by introducing an iron wire into the crucible; and if the fuſion be perfect, take the crucible out of the furnace. Let it cool; break it; and you will find in it a regulus of a white and livid metallic colour, very brittle, ſcarcely hard, but rather friable.

To diſtil the Nitrous Acid by the Interpoſition of Arſenic. Blue Aqua Fortis.

PULVERISE finely any quantity you pleaſe of refined ſalt-petre. Mix it accurately with an equal weight of white cryſtalline arſenic well pulveriſed, or elſe with very white and very fine flowers of arſenic. Put this mixture into a glaſs retort, leaving one half of it empty. Set your retort in a reverberating furnace; apply a receiver, having a ſmall hole drilled in it, and containing a little filtered rain-water; lute the receiver to the retort with ſtiff lute. Begin with putting two or three ſmall live coals in the aſh-hole of the furnace, and replace them with others when they are ready to go out. Go on thus warming your veſſels by inſenſible degrees, and put no coals in the fire-place till the retort begin to be very warm. You will ſoon ſee the receiver filled with vapours of a dark red, inclining to a ruſſet colour. With a bit of lute ſtop the little hole of the receiver. The vapours will be condenſed in the water of this veſſel, and give it a very fine blue colour, that will grow deeper and deeper as the diſtillation advances. If your ſalt-petre was not very dry, ſome drops of acid will alſo come over, and falling from the noſe of the retort mix with the water in the receiver. Continue your diſtillation, increaſing the fire little by little as it advances, but exceeding ſlowly, till you ſee that when the retort is red-hot nothing more comes off; and then let your veſſels cool.

When the veſſels are cold, unlute the receiver, and as expeditiouſly as you can pour the blue *aqua fortis* it contains into a cryſtal bottle; which you muſt ſeal hermetically, becauſe this colour diſappears in a ſhort time when the liquor takes air. You will find in the retort a white ſaline maſs moulded in its bottom, and ſome flowers of arſenic ſublimed to its upper cavity, and into its neck.

Pulveriſe the ſaline maſs, and diſſolve it in warm water. Filter the ſolution, in order to ſeparate ſome arſenical parts that will be left on the filter. Let the filtered liquor evaporate of itſelf in the open air; when it is ſufficiently evaporated, cryſtals will ſhoot in it repreſenting quadrangular priſms terminated at each extremity by pyramids that are alſo quadrangular. Theſe cryſtals will be in confuſed heaps at the bottom of the veſſel: Over them will be other cryſtals in the form of needles; a ſaline vegetation creeping along the ſides of the veſſel; and the ſurface of the liquor will be obſcured by a thin duſty pellicle.

To alkaliſate Nitre by Arſenic.

MELT in a crucible the nitre you intend to alkaliſate. When it is melted, and moderately red, project upon it two or three pinches of pulveriſed arſenic. A conſiderable efferveſcence and ebullition will immediately be produced in the crucible, attended with a noiſe like that which nitre makes when it detonates with an inflammable matter. At the ſame time a thick ſmoke will riſe, which at firſt will ſmell like garlick, the odour peculiar to arſenic; it will alſo ſmell afterwards like ſpirit of nitre. When the efferveſcence in the crucible is over, throw again upon the nitre as much pulveriſed arſenic as you did the firſt time; and all the ſame phenomena will be repeated. Continue thus throwing in arſenic in ſmall parcels, till it produce no more effervescence; taking care to ſtir the matter at every projection with an iron wire, the better to mix the whole together. Then increaſe your fire, and melt what remains. Keep it thus in fuſion for a quarter of an hour, and then take the crucible out of the fire. It will contain a nitre alkaliſed by arſenic.

Of

Of Vegetables.

Of the Subſtances obtained from Vegetables by Expreſſion only.

To expreſs and depurate the Juice of a Plant, containing its Eſſential Salt. The Cryſtalliſation of that Salt.

Before ſun-riſe, gather a good quantity of the plant, from which you deſign to expreſs the juice, in order to obtain its ſalt. Waſh it well in running water, to clear it of earth, inſects, and other adventitious matters. Bruiſe it in a marble mortar; put it into a bag of new, ſtrong, thick linen cloth; tie the bag tight, and commit it to a preſs. By preſſing it ſtrongly you will ſqueeze out a great quantity of green, thick juice, which will have the ſame taſte as the plant. Dilute this juice with ſix times as much pure rain water, and filter it repeatedly through a woolen bag, till it paſs clear and limpid. Evaporate the filtered juice with a gentle heat, till it be almoſt as thick as before it was mixed with water. Put this inſpiſſated juice into a jar, or other veſſel of earth or glaſs; on its ſurface pour olive oil to the depth of a line, and ſet it in a cellar. Seven or eight months after this pour off gently the liquor contained in the veſſel, the inſide of which you will find covered with a cryſtalliſed ſalt. Separate the cryſtals gently; waſh them quickly with a little fair cold water, and dry them: this is the eſſential oil of the plant.

Every plant is not equally diſpoſed to yield its eſſential ſalt by the method here propoſed. Succulent vegetables only, whoſe juices are aqueous and not too viſcous, are fit for this purpoſe. Such, for example, as ſorrel, brook-lime, ſuccory, fumitory, water-creſſes, plantain, *&c.* An eſſential ſalt cannot be procured from thoſe that yield thick, viſcid, mucilaginous juices, ſuch as the ſeeds of flea-wort, unleſs their juices be previouſly attenuated by fermentation, and that viſcoſity deſtroyed which obſtructs the cryſtalliſation of this ſalt.

Nor can the eſſential ſalt be obtained in any quantity from vegetable matters abounding in oil. Moſt kernels and ſeeds are of this ſort: they all contain a great quantity of fat oil, which ſo entangles and clogs this ſalt, that the particles thereof cannot ſhoot away from the tenacious juices into cryſtals.

The ſame is to be ſaid of dry aromatic plants; becauſe they contain much eſſential oil, or reſinous matters that produce the ſame effect. It is true, the eſſential ſalt itſelf contains a certain portion of oil; for it is no other than the acid of the plant incorporated and cryſtalliſed with part of its oil and of its earth: but then the oil muſt not be in too great a quantity; becauſe it ſheaths the acid, renders it clammy, as it were, and hinders it from extricating itſelf ſo as to be able to exert its qualities, and appear in the form of ſalt.

The juice of plants obtained by expreſſion is very thick; becauſe it contains many particles of the bruiſed plant that are unavoidably ſqueezed out along with it. In order to clear it of theſe ſuperfluous parts it is proper to filter it: but as that would be difficult, on account of the thickneſs of the juice, it muſt be thinned, by diluting it with a quantity of water, ſufficient to give it the requiſite degree of fluidity.

Inſtead of thus diluting the expreſſed juice, the plant may be ground with water before it is put into the preſs; it will by this means furniſh a more fluid juice, that will eaſily paſs through the filter. This method may be employed with ſucceſs on dry plants, or ſuch as are not very ſucculent. For this operation rain-water is to be preferred to any other; becauſe it is the pureſt.

The juice of the plant, when diluted with the quantity of water ſufficient to facilitate its filtration, is too aqueous to let the ſalt it contains unite into cryſtals: It muſt therefore be evaporated till it hath recovered a ſomewhat thicker conſiſtence. The heat applied for that purpoſe muſt be gentle; leſt the acid and oily parts that are to form the ſalt, be ſpoiled or diſſipated, as they are not very fixed.

The oil poured on the liquor prevents its fermenting, putrefying, or growing mouldy, during the long ſpace of time required for the cryſtalliſation of the eſſential ſalt.

Theſe ſalts are excellent medicines, being endued with the ſame virtues as the plants from which they were obtained.

To draw the Oils out of Kernels, Seeds, and Fruits, by Expreſſion.

Pound in a marble mortar, or grind in a mill, the kernels, ſeeds, or fruits, out of which you intend to expreſs the oil. If your matters be meagre, and grind to meal, ſuſpend that meal in the ſteam of boiling water, in order to moiſten it a little, and then dry it.

Tie up your matters thus prepared in a new, ſtrong, thick canvaſs bag, and put it into a preſs, between two iron plates previouſly heated in boiling water: ſqueeze it ſtrongly, and you will ſee the oil run in ſtreams into the receiving veſſel.

To draw the Eſſential Oil of certain Fruits by Expreſſion.

Take the rind of a citron, lemon, orange, Bergamot-pear, or other fruit of that kind; cut it in ſlices, and doubling the ſlices ſqueeze them between your fingers over againſt a poliſhed glaſs ſet upright, with its lower end in a veſſel of earth or porcelain. Every time you ſqueeze the peel in a new ply, there will ſquirt out of it ſeveral fine jets of liquor, which, meeting with the ſurface of the glaſs, will be condenſed into drops, and trickle down in ſmall ſtreams into the recipient. This liquor is the eſſential oil of the fruit.

Of the Subſtances obtained from Vegetables by Trituration.

To make the Extracts of a Plant by Trituration.

Bruise the vegetable ſubſtance of which you intend to make the extracts; or, if it be hard and dry, grind it to a powder: put the matter thus prepared, together with ſeven or eight times as much rain-water, into an earthen veſſel; and into this veſſel fit a churning-ſtaff, ſo that it may be continually whirled round with a rotatory motion, by means of a cord, a wheel, and a winch. Ply this machine for ten or twelve hours; and then filter the liquor through two linen cloths ſpread on a hair-ſieve. Let your filtered liquor ſtand quiet for twelve hours more: Then pour it off by inclination from the ſediment you will find at bottom; and filter it a ſecond time through a flannel bag.

Pour freſh water, but in a ſmaller quantity, on the maſs left after trituration with the machine. Triturate it again for four or five hours. Treat the liquor of this ſecond triture juſt as you did that of the firſt, and mix them both together. Diſtribute all the liquor you now have among a ſufficient number of ſhallow earthen plates, and evaporate it by a gentle heat, ſuch as that of the ſun, or of a vapour-bath, to the conſiſtence of an extract, or even to dryneſs, as you think proper.

To extract from Seeds and Kernels, by Trituration, the Matter of Emulſions.

BLANCH the kernels of which you deſire to make an emulſion; put them into a marble mortar; add a very little water; and pound them with a wooden peſtle. Continue pounding and triturating till the matter become like a white paſte. From time to time pour on it, by little and little, more fair water warmed, ſtill continuing the trituration; by which means the paſte will grow thinner. Go on thus till every particle of your kernels be cruſhed to pap. Then add, ſtill rubbing the mixture, enough of water to make the whole an actual fluid; and you will have a liquor of a dead-white colour, reſembling milk. Strain it through a clean linen cloth: it will leave on the filter ſome coarſe parts, which muſt be returned to thoſe left in the mortar. Again triturate and rub the remainder of the kernels, with the addition of water as before. This ſecond liquor will not be ſo white nor ſo rich as the former: filter it in the ſame manner, and again grind with water the ſolid parts remaining. In this manner proceed, repeatedly rubbing and adding freſh water, till it appear no longer milky, but come off clear. The white milky waters thus obtained go by the name of an *emulſion*.

All the matters, from which a fat oil is obtainable by expreſſion, produce emulſions when triturated with water.

An emulſion conſiſts chiefly of two ſubſtances. One of theſe is mucilaginous, and ſoluble in water. This ſubſtance by itſelf would not give a milky appearance to the emulſion, which, with it alone, would be limpid. The other is a fat oil, which of itſelf is not ſoluble in water; but being divided by the means of trituration into very ſmall globules, it is diſperſed through the whole liquor, and ſuſpended therein by the aid of the mucilaginous part. It is this oily part that gives the emulſion its dead-white milky colour; becauſe it is not actually diſſolved in the water, but only diffuſed through it.

If oil be mixed with water in a phial, and the mixture ſtrongly ſhaken for ſome time, with a rapid and continued motion, the oil will be divided into a vaſt number of little globules, which intervening between the parts of the water will deſtroy its tranſparency, and give it a dead-white colour, like that of our emulſion. But, as the oil is not ſo minutely divided by this means as by triturating the matters containing it; and again, there being no mucilage in this liquor, as there is in emulſions, the oil ſoon ſeparates from the water when it is left at reſt, re-unites into round globules, and theſe joining together riſe to the ſurface of the liquor, which then recovers its tranſparency.

The caſe is not exactly the ſame with emulſions; but ſomething like it happens to them alſo. If they be left to ſtand quiet in a long bottle, the liquor, which at firſt appeared homogeneous, ſeparates into two manifeſtly different parts. The upper part retains its dead-white colour, but is thicker and more opaque; while the lower part becomes perfectly tranſparent. This is the beginning of an entire ſeparation of the oily from the aqueous parts. The former, being the lighter, aſcend and gain the upper part of the liquor; while the lower, being freed from that which obſtructed its tranſlucence, recovers its proper limpidity: but the oily parts do not re-unite into maſſes large enough to form one homogeneous whole, with the appearance and limpidneſs of oil; their being minutely divided and entangled in the mucilage impeding their natural tendency.

Emulſions firſt begin to ſpoil, as they grow old, not by turning rancid and acrimonious like the fat oils drawn by expreſſion, but by turning ſour; which is owing to the great quantity of mucilage they contain. As there is a fat oil in their compoſition, they have the ſame virtues with that ſort of oil: but they are moreover incraſſating, cooling, and emollient; qualities which render them extremely uſeful in acute and inflammatory diſorders. They grow ſour in a very ſhort time, eſpecially in the heat of ſummer; nay, they ſometimes do ſo in two hours: and therefore they ought to be prepared from time to time as they are to be uſed.

The matter that is left when all the ſubſtance of the emulſion is extracted, and from which the water comes off clear and limpid, is ſcarce any thing but the earthy part of the ſeed or kernel that was triturated; which, however, ſtill retains a portion of tenacious and groſs oil, adhering to it ſo firmly as not to be ſeparable by water.

The chyle and milk of animals reſemble an emulſion in ſeveral reſpects, and particularly in their dead-white colour; which ariſes, in the ſame manner, from the very minute particles of oil contained in them, and diſtributed through an aqueous gelatinous fluid, but not diſſolved therein. In general, whenever any oil of any kind happens to be lodged in this manner between the parts of an aqueous liquor, it always makes the whole of an opaque white: for oil will not mix with water, ſo as to produce a liquor that ſhall appear homogeneous and tranſparent, unleſs it be intimately diſſolved in the water; which cannot be effected but by means of an union previouſly contracted between it and ſome ſaline matter; as is the caſe of mucilages, certain ſaponaceous matters, and ſome other combinations of which we ſhall have occaſion to treat in the ſequel.

The methods we have hitherto propoſed, for extracting from vegetable ſubſtances all that they will yield without the aſſiſtance of fire, are not capable of analyſing thoſe ſubſtances accurately; ſince by expreſſion and trituration we obtain only the liquid parts, impregnated indeed with almoſt all the principles of plants, which however are ſtill combined with each other, and barely ſeparated from the groſſeſt earthy and oily parts. We muſt therefore neceſſarily have recourſe to a more effectual expedient for carrying our analyſis further. This expedient conſiſts in making them undergo the action of fire, ſucceſſively graduated, from the gentleſt to the moſt violent heat.

But, before we enter on this analyſis of vegetables, it is proper to deſcribe the different operations that may be performed on oils, the only pure principle we have been able to obtain without the help of fire.

Of Operations on Fat Oils.

To attenuate Fat Oils, and change their Nature, by expoſing them to the Action of Fire, and diſtilling them.

Mix thoroughly three or four pounds of any fat oil whatever with twice its weight of lime ſlaked in the air. Put this mixture into a large earthen retort, leaving a third part of it empty. Set it in a reverberating furnace, and lute on a receiver. Heat the veſſel with a very gentle fire. A little flame will riſe firſt, and will ſoon be followed by an oil that will fall in drops from the noſe of the retort. Continue the diſtillation very ſlowly, till you perceive the oil that comes over begin to be not quite ſo fluid as before, but rather a little thicker.

Then unlute your receiver, and put another in its place. Continue the diſtillation, increaſing your fire by degrees. The oil that comes over will grow thicker and thicker, its fluidity will decreaſe, and it will acquire a dark-brown colour, which at laſt will become blackiſh. The oil will then be very thick. Puſh the operation till nothing more will come off, though the retort be red-hot. During the whole time this diſtillation laſts, there riſes a good deal of water in company with the oil. Keep the ſecond thick oil by itſelf.

Mix the oil that came over firſt in this operation with an equal part of freſh lime ſlaked in the air. Put the mixture into an earthen or glaſs retort, of a ſize ſo proportioned to the quantity, that a third part thereof may remain empty. Diſtill as before. The ſame phenomena will appear: a clear oil will firſt come over, and be ſucceeded by one a little thicker. Then ſhift your receiver, and diſtill off all the reſt of the oil with an increaſed fire. The firſt oil obtained by this ſecond diſtillation will be clearer and thinner than that of the firſt diſtillation; and the ſecond oil will not be ſo thick nor of ſo deep a colour as before.

Diſtill over again in the ſame manner the thin oil of this ſecond diſtillation, and go on thus repeatedly diſtilling, till the firſt clear oil come over with a degree of heat not exceeding that of boiling water. Then, inſtead of mixing your oil with lime, put it with ſome water into a glaſs retort, or into a body with its head fitted on, and diſtill it, keeping the water juſt in a ſimmer. Your oil will be more and more attenuated, and, after being thus diſtilled twice or thrice with water, will be ſo limpid, ſo thin, and ſo clear, that you will ſcarce be able to diſtinguiſh it from water itſelf.

To combine Fat Oils with Acids.

Put any fat oil whatever into a glaſs baſon, and ſet it in a ſand-bath very moderately heated. Pour on this oil an equal quantity of concentrated oil of vitriol, which will immediately diſſolve it with violence; a conſiderable ebullition and efferveſcence will ariſe, attended with great heat, and a prodigious quantity of black thick vapours, in which may be eaſily perceived the ſmell of burnt oil, together with that of a ſulphureous acid. The mixture will become of a deep-red, black, and thick. Stir it with a ſmall ſtick, till you obſerve that all is quiet.

To combine Fat Oils with Fixed Alkalis. Hard and Soft Soap. The Decompoſition of Soap.

Take a lixivium of Alicant kelp made more cauſtic by lime, as we ſhall ſhew when we come to ſpeak of alkalis. Evaporate this lye till it be capable of bearing a new-laid egg. Divide it into two parts; and to one of theſe put juſt water enough to weaken it ſo that a new laid egg will not ſwim in it, but fall to the bottom. With the lye thus weakened, mix an equal quantity of freſh-drawn olive oil. Stir and agitate the mixture well till it become very white. Set it over a gentle fire, and continue ſtirring it inceſſantly, that the two ingredients of which it is compounded may gradually combine together, as part of the water evaporates. When you perceive they begin to unite, pour into the mixture thrice as much of the firſt ſtrong lye as you took of olive oil. Continue the coction with a gentle fire, always ſtirring the matter, till it become ſo thick that a drop of it fixes, as it cools, into the conſiſtence that ſoap ought to have. By diſſolving a little of this ſoap in water, you will diſcover whether or no it contains more oil than ought to be in the compoſition. If it diſſolve therein wholly and perfectly, without the appearance of the leaſt little drop of oil floating on the water, it is a ſign that it doth not contain too much oil. If, on the contrary, you perceive any of theſe little globules, you muſt pour into the veſſel containing your matter a little more of the ſtrong lye, to abſorb the redundant oil. If there be too much of the alkali, it may be diſcovered by the taſte. If the ſoap leave on your tongue the ſenſation of an alkaline ſalt, and produce an urinous ſavour, it is a ſign that there is too much ſalt in proportion to the oil. In this caſe a little oil muſt be added to the mixture, to ſaturate the ſuperabundant alkali. An exceſs in the quantity of alkali diſcovers itſelf likewiſe by the ſoap's growing moiſt in the air, on being expoſed to it for ſome time.

Fixed alkalis, even when reſolved into a liquor, that is, when loaded with much water, unite eaſily with fat oils, as appears from the experiment juſt recited, and require but a moderate heat to perfect that union. This combination may even be completely effected without the aid of fire, and by the heat of the ſun only, provided ſufficient time be allowed for that purpoſe. It only requires the mixture of the oil and alkali to be kept five or ſix days in digeſtion, and ſtirred from time to time. A lixivium of pure alkali, not acuated by lime, may alſo be uſed to make ſoap: but it is obſerved, that the combination ſucceeds better, and that the alkali unites ſooner and more perfectly with the oil, when it is ſharpened by lime.

The oil is firſt mixed with a weaker and more aqueous lye, to the end that the combination may not take place too haſtily, but that all the particles of the two ſubſtances to be compounded together may unite equally. But as ſoon as the alkali begins to diſſolve the oil gradually and quietly, the diſſolution may then be accelerated; and that is done by adding the remaining lye, which is ſtronger and leſs diluted than the other.

Soap made with olive oil is white, hard, and hath not a very diſagreeable ſmell: but as that oil is dear, others, even the fat and oils of animals, are ſometimes ſubſtituted for it. The ſoaps made with moſt of theſe other matters are neither ſo hard, nor ſo white, as that made of olive oil: they are called *ſoſt ſoaps*.

Oils thus aſſociated with fixed alkalis are by that means rendered ſoluble in water; becauſe the alkaline ſalts, having a great affinity with water, communicate part thereof to the oils with which they are now incorporated. Yet the oil is not for all that rendered thoroughly miſcible with water, or perfectly ſoluble therein; for the water in which ſoap is diſſolved hath always a milky caſt: now there is no other criterion of a perfect ſolution but tranſparency.

Alkalis alſo loſe part of their affinity with water, by the union they thus contract with oils: for, when the combination is properly made, they no longer attract the moiſture of the air, nor doth water diſſolve them in ſuch quantities as before. The compoſition of ſoap is plainly a ſaturation of an alkali with an oil; and, in order to make perfect ſoap, we are forced, as was ſaid in the proceſs, to grope, in a manner, by repeated trials, for this point of ſaturation; juſt as when we prepare a neutral ſalt by ſaturating an alkali with an acid. The union which the oil contracts with the alkali makes it loſe, in part, the readineſs with which it naturally takes fire; becauſe the ſalt is not inflammable: the water alſo, which enters, in pretty conſiderable quantities, into the compoſition of ſoap, contributes a good deal to hinder the accenſion of the oil.

Soap may be decompounded either by diſtilling it, or by mixing it with ſome ſubſtance that hath a greater affinity than oil with alkalis.

If we decompound it by diſtillation, a phlegm, or tranſparent ſpirit, of a ſomewhat yellowiſh colour, firſt comes over. This liquor is the aqueous part of the ſoap, quickened by a little of its alkali, which gives it an acrid taſte. It is followed by a red oil, which at firſt is pretty thin and limpid, but thickens as the diſtillation advances, grows black, and has a very diſagreeable empyreumatic ſmell. This oil is ſoluble in ſpirit of wine.

When the diſtillation is finiſhed, that is, when the retort being kept red-hot for ſome time will diſcharge no more, there is left in it a ſaline maſs; which is the alkali of the ſoap, cruſted over with ſome of the moſt fixed parts of the oil, that are charred to a coal. This ſalt may be reſtored to the ſame degree of purity it had before its combination with the oil, by calcining it in a crucible with a naked fire, that may conſume this burnt part of the oil, and reduce it to aſhes.

It is plain, that the oil contained in ſoap is affected by diſtillation, much in the ſame manner as that which we mixed with lime and diſtilled.

Mr Geoffroy, by analyſing ſoap with care, diſcovered that two ounces thereof contain ninety-ſix grains of ſalt of kelp, freed from all oil and moiſture; or two drams and forty-eight grains of that ſalt, as it is uſed in manufacturing ſoap; that is, containing water enough to make it cryſtalliſe; one ounce three drams twenty grains of olive oil; and about two drams four grains of water.

As acids have a greater affinity than any other ſubſtance with alkalis, they may be very effectually employed to decompound ſoap.

If you propoſe to decompound ſoap by means thereof, you muſt firſt diſſolve it in a ſufficient quantity of water. Mr Geoffroy, who made this experiment likewiſe, diſſolved two ounces thereof in about three gallons of warm water, and to the ſolution added oil of vitriol, which he let fall into it drop by drop. Every time a drop of acid falls into it, a *coagulum* is formed in the liquor. The veſſel in which the ſolution is contained muſt then be ſhaken, that the acid may equally attack all the alkali diffuſed in it. When no new coagulation is produced by a drop of the acid, it is a ſign you have added enough. The liquor then begins to grow clear: and if another quart of water be added, in order to facilitate the ſeparation of the oily particles, you will ſee them riſe and unite together on the ſurface of the liquor.

This is a pure, clear, true olive oil, hath its taſte, its ſmell, and, like it, is fluid in warm weather, and becomes fixed by cold. Yet it differs in ſome reſpects from that which never hath been united with an alkali in order to form a ſoap; for it burns more vividly and more rapidly, and is ſoluble in ſpirit of wine. We ſhall account for theſe differences when we come to treat of ardent ſpirits.

Not only the vitriolic acid, but all others, even thoſe obtained from vegetables, are capable of decompounding ſoap, and ſeparating the oil from the alkali. In the liquor wherein ſoap is thus decompounded, is found a neutral ſalt, conſiſting of the acid made uſe of, united with the alkali of the ſoap. If the vitriolic acid be uſed, you will have a Glauber's ſalt; a quadrangular nitre, if the nitrous acid be uſed; and ſo of the reſt.

The facility with which acids decompound ſoap is the reaſon that no water, but what is very pure, will diſſolve it, or is fit to be uſed in waſhing with it.

Water that doth not diſſolve ſoap well is uſually called hard water. Such waters contain a certain quantity of ſaline matters, waſhed out of the earths through which they paſs. The hardneſs of water is generally occaſioned by ſelenitic particles.

The hardneſs of moſt well-waters is owing to a conſiderable quantity of ſelenitic gypſum with which the ſoil abounds. The ſelenites are neutral ſalts conſiſting of the vitriolic acid united with an earthy baſis. If, therefore, ſoap be put into water in which a ſalt of this kind is diſſolved,

ſolved, it is evident that the vitriolic acid in the ſelenites, having a greater affinity with the fixed alkali of the ſoap than with its own earthy baſis, will quit the latter to unite with the former; and thus the ſoap will be decompounded inſtead of being diſſolved. Accordingly we ſee, that, when we attempt to diſſolve ſoap in our well-water, the ſurface of the liquor is in a ſhort time covered with a fat oily pellicle. However, this decompoſition of ſoap is not complete; at leaſt but a ſmall part of it is perfectly decompounded; becauſe the great quantity of ſelenites, with which the water is impregnated, hinders the ſoap from mixing ſo thoroughly with it, as is requiſite to produce a total decompoſition thereof.

All mineral waters are likewiſe hard, with regard to ſoap; for, as moſt of them owe their virtues to the effloreſcencies they have waſhed off, from pyrites that have grown hot and begun to be decompoſed, they are impregnated with the ſaline matters produced by pyrites in that ſtate; that is, with aluminous, vitriolic, and ſulphureous ſubſtances, which have the ſame effect on ſoap as the ſelenites hath.

Mineral waters containing neutral ſalts only, ſuch as ſea-ſalt, Epſom ſalt, Glauber's ſalt, are nevertheleſs hard with regard to ſoap, though the acids of thoſe ſalts, being united with fixed alkalis, are incapable of decompounding it. The reaſon is, that thoſe neutral ſalts are more ſoluble in water than ſoap is; ſo much indeed as even to exclude it: becauſe each of the two principles that compoſe them hath a very great affinity with water; whereas only one of the principles of ſoap, namely, its alkali, hath that affinity; the other, *viz.* the oily principle, having none at all. Thus water impregnated with an acid, or with any neutral ſalt, is hard with regard to ſoap, and incapable of diſſolving it; and hence it follows, that ſoap is a ſort of touchſtone for trying the purity of water.

Wine diſſolves ſoap; but imperfectly, becauſe it contains an acid or tartarous part. Spirit of wine alſo diſſolves it: but neither is this diſſolution perfect; becauſe it contains too little water: for its ſpirituous part can diſſolve nothing but the oil of the ſoap; and the alkali is not at all, or at leaſt in a very ſmall quantity, ſoluble in this menſtruum. The true ſolvent of ſoap is therefore a liquor that is partly ſpirituous, partly aqueous, and not acid.

Brandy has theſe qualities: and accordingly it is the ſolvent that unites beſt with ſoap, diſſolves the greateſt quantity, and makes the moſt limpid ſolution thereof. Yet even this ſolution hath ſomething of a milky caſt, occaſioned by its not being entirely free from an acid, or the tartarous principle. This fault may be eaſily corrected, by mixing with it a little alkali to abſorb the acid. A dram of cryſtalliſed ſalt of kelp mixed with three ounces and a half of good brandy, renders it capable of diſſolving an ounce and two drams of good hard ſoap into a perfectly limpid liquor.

Some years ago it was diſcovered that ſoap might be uſed with great ſucceſs in medicine, and that it poſſeſſes the property of diſſolving the ſtony concretions that form in ſeveral parts of the body, particularly in the kidneys and bladder. Soap is the baſis of the compoſition known by the name of *Mrs Stephen's remedy*; and in this one ingredient its whole virtue reſides.

From what hath been ſaid on the nature of this compound, as well as on the cauſe and phenomena of its diſſolution, it plainly appears to be of the laſt conſequence, in adminiſtering it to a patient, that his conſtitution be conſidered, and a proper regimen ordered. All acids ſhould be abſolutely forbid him; as we know they hinder the ſoap from diſſolving, and decompound it: and if the patient have any acidities in the firſt paſſages, matters capable of neutraliſing them ſhould be preſcribed him; as prepared crabs eyes, and other abſorbents known in medicine: In ſuch caſes thoſe with which the ſoap is compounded in Mrs Stephen's remedy may be of uſe.

To combine Fat Oils with Sulphur.

Put any fat oil whatever into an earthen veſſel; add to it about a fourth part of its weight of flower of ſulphur, and ſet the veſſel in a furnace, with lighted coals under it. When the oil hath acquired a certain degree of heat, the ſulphur will melt, and you will ſee it fall immediately to the bottom of the oil, in the form of a very red fluid. The two ſubſtances will remain thus ſeparated, without mixing together, while the heat is no greater than is neceſſary to keep the ſulphur in fuſion. Increaſe it therefore; but ſlowly, and with circumſpection, leſt the matter take fire. When the oil begins to ſmoke, the two liquors will begin to mix and look turbid: at laſt they will unite ſo as to appear one homogeneous whole. If you keep up the heat, ſo that the mixture ſhall always continue ſmoking and ready to boil, you may add more ſulphur, which will perfectly incorporate with it: and thus may a pretty conſiderable quantity thereof be introduced into this compoſition.

To combine Fat Oils with Lead, and the Calxes of Lead. The Baſis of Plaſters. The Decompoſition of this Combination.

Into an earthen veſſel put granulated lead, litharge, ceruſe, or minium; and pour thereon twice its weight of any fat oil whatever. If you ſet the veſſel over a briſk fire, the lead at bottom will melt before the oil begin to boil. When it boils, ſtir the matter with a ſtick: the lead, or the calx of lead, will gradually diſappear, and at laſt be totally diſſolved by the oil, to which it will give a very thick conſiſtence.

Fat oils diſſolve not only lead, but its calxes alſo: nay, they diſſolve the latter more readily than lead in ſubſtance; probably becauſe they are more divided. The reſult of a combination of theſe matters is a thick, tenacious maſs, that grows in ſome degree hard in the cold, and ſoft by heat. This compoſition is known in pharmacy by the name of *plaſter*. It is made up with ſeveral drugs into plaſters, which partake of the virtues of thoſe drugs; ſo that it is the baſis of almoſt all plaſters.

Lead itſelf is ſeldom uſed to make plaſters: ceruſe, litharge, or minium, are preferred to it; becauſe theſe matters unite more readily with oils.

Of

Of the Subſtances obtained from Vegetables with a Degree of heat not exceeding that of boiling Water.

To obtain from Plants, by diſtilling them with the mean Degree of heat between freezing and boiling Water, a Liquor impregnated with their Principle of Odour.

IN the morning, before ſun-riſe, gather the plant from which you deſign to extract its odoriferous water. Chuſe the plant in its full vigour, perfectly ſound, and free from all adventitious matters, except dew. Put this plant, without ſqueezing it, into the body of a tinned copper alembic, and ſet it in a water-bath. Fit on its head, and to the noſe thereof lute a glaſs receiver with wet bladder.

Warm the bath to the mean degree between freezing and boiling water. You will ſee a liquor diſtill and fall drop by drop into the receiver. Continue the diſtillation with this degree of heat, till no more drops fall from the noſe of the alembic. Then unlute the veſſels; and if you have not as much liquor as you want, take out of the cucurbit the plant already diſtilled, and put a freſh one in its place. Diſtill as before, and go on thus till you have a ſufficient quantity of odoriferous liquor. Put it into a bottle; ſtop it cloſe; and ſet it in a cool place.

The liquor obtained from plants, with the degree of heat here preſcribed, conſiſts of the dew that was on the plant, and ſome of the phlegm of the plant itſelf, together with its odorous principle. Mr Boerhaave, who examined this odoriferous part of plants with great care, calls it the *ſpiritus rector*. The nature of this ſpirit is not yet thoroughly aſcertained; becauſe it is ſo very volatile, that it cannot eaſily be ſubjected to the experiments that are neceſſary to analiſe it, and to diſcover all its properties. If the bottle containing the liquor, which may be conſidered as the vehicle of this ſpirit, be not exceeding carefully ſtopped, it flies quite off: ſo that in a few days nothing will be found but an inſipid inodorous water.

Great part of the virtue of plants reſides in this their principle of odour; and to it muſt be aſcribed the moſt ſingular and the moſt wonderful effects we every day ſee produced by them. Every body knows that a great number of odorous plants affect, in a particular manner, by their ſcent only, the brain and the *genus nervoſum*, of ſuch eſpecially whoſe nerves are very ſenſible, and ſuſceptible of the ſlighteſt impreſſion; ſuch as hypochondriacal or melancholy men, and hyſterical women. The ſmell of the tuberoſe, for inſtance, is capable of throwing ſuch perſons into fits, ſo as to make them drop down and ſwoon away. The ſmell of rue again, which is equally ſtrong and penetrating, but of a different kind, is a ſpecific remedy againſt the ill effects of the tuberoſe; and brings thoſe perſons to life again, with as quick and as ſurpriſing an efficacy as that by which they were reduced to a ſtate not unlike death. This is Mr Boerhaave's obſervation.

The odorous exhalations of plants muſt be conſidered as a continual emanation of their *ſpiritus rector*: but as growing plants are in a condition to repair, every inſtant, the loſſes they ſuſtain by this means, as well as by tranſpiration, it is not ſurpriſing that they are not ſoon exhauſted while they continue in vigour. Thoſe, on the contrary, which we diſtill, having no ſuch reſource, are very ſoon entirely exhauſted of this principle.

The ſeparation of the *ſpiritus rector* from plants requires but a very gentle heat, equally diſtant from the freezing point, and from the heat of boiling water. Accordingly the heat of the ſun in ſummer is ſufficient to diſſipate it almoſt entirely. This ſhews why it is dangerous to ſtay long in fields, or woods, where many noxious plants grow. The virtues of plants reſiding chiefly in their exhalations, which the heat of the ſun increaſes conſiderably, a ſort of atmoſphere is formed round them, and carried by the air and the wind to very great diſtances.

For the ſame reaſon the air of a country may be rendered ſalutary and medicinal, by the exhalations of wholeſome plants growing therein. From the facility with which the odorous principle of plants evaporates, we learn what care ought to be taken in drying thoſe intended for medical uſes, ſo as to preſerve their virtues. They muſt by no means be expoſed to the ſun, or laid in a warm place: a cool, dry place, into which the rays of the ſun never penetrate, is the propereſt for drying plants with as little loſs of their virtue as poſſible.

Though there is reaſon to believe that every vegetable matter hath a *ſpiritus rector*, ſeeing each hath its particular ſcent, yet this principle is not very perceptible in any but thoſe which have a very manifeſt odour: and accordingly it is extracted chiefly from aromatic plants, or the moſt odoriferous parts of plants.

To extract the Fat Oils of Plants by the Decoction in boiling Water. Cacao-Butter.

POUND or bruiſe in a marble mortar your vegetable ſubſtances abounding with the fat oil which you intend to extract by decoction: tie them up in a linen cloth: put this packet into a pan, with ſeven or eight times as much water, and make the water boil. The oil will be ſeparated by the ebullition, and float on the ſurface of the water. Skim it off carefully with a ladle, and continue boiling till no more oil appear.

The heat of boiling water is capable of ſeparating the fat oils from vegetable matters that contain any: but this is to be effected by actual decoction only, and not by diſtillation; becauſe theſe oils will not riſe in an alembic with the heat of boiling water. We are therefore neceſſitated to collect them from the ſurface of the water, as above directed.

The water uſed in this coction generally becomes milky, like an emulſion. Nevertheleſs this way of obtaining the fat oils is not generally practiſed; becauſe the heat, to which they are expoſed in the operation, occaſions their being leſs mild than they generally are: but it is an excellent method, and indeed the only one that can be employed, for extracting from particular vegetables certain concrete oily matters, in the form of butter or wax;

which matters are no other than fat oils in a fixed ſtate. The cacao yields, by this means, a very mild butter; and in the ſame manner is a wax obtained from a certain ſhrub in America.

To extract the Eſſential Oils of Plants by diſtillation with the heat of boiling water. Diſtilled waters.

Put into a cucurbit the plant from which you deſign to extract the eſſential oil. Add as much water as will fill two thirds of your veſſel, and diſſolve therein half an ounce of ſea-ſalt for every quart of water you uſe. To this body fit on an alembic-head, and to the noſe thereof lute a receiver with ſized paper or wet bladder. Set it in a furnace, and let the whole digeſt together, in a very gentle warmth, for twenty-four hours.

This being done, light a wood-fire under your veſſel, briſk enough to make the water in it boil immediately. Then ſlacken your fire, and leave it juſt ſtrong enough to keep the water ſimmering. There will come over into the receiver a liquor of a whitiſh colour, ſomewhat milky; on the ſurface of which, or at the bottom, will be found an oil, which is the eſſential oil of the vegetable you put into the cucurbit. Continue your diſtillation with the ſame degree of heat, till you perceive the liquor come off clear, and unaccompanied with an oil.

When the diſtillation is finiſhed, unlute the receiver; and, if the eſſential oil be of that ſort that is lighter than water, fill the veſſel up to the top with water. On this occaſion a long-necked matras ſhould be uſed for a receiver; that the oil which floats on the water may collect together in its neck, and riſe up to its mouth. Then in the neck of this veſſel put the end of a thread of cotton twine, ſo that the depending part without the veſſel may be longer than that in the oil, and the extremity thereof hang within the mouth of a little phial, juſt big enough to contain your quantity of oil. The oil will riſe along the yarn as in a ſiphon, filter through it, and fall drop by drop into the little phial. When all the oil is thus come over, ſtop your little bottle very cloſe, with a cork coated over with a mixture of wax and a little pitch.

If your oil be ponderous, and of the ſort that ſinks in water, pour the whole contents of the receiver into a glaſs funnel, the pipe of which muſt terminate in a very ſmall aperture that may be ſtopped with your fore-finger. All the oil will be collected in the lower part of the funnel: then remove your finger, and let the oil run out into a little bottle through another ſmall funnel. When you ſee the water ready to come, ſtop the pipe of the funnel, and cork the bottle containing your oil.

To extract the Eſſential Oils of Plants by Diſtillation per deſcenſum.

Reduce to a powder, or a paſte, the vegetable ſubſtances from which you intend to extract the eſſential oil by the method propoſed. Lay this matter about half an inch thick on a fine, cloſe, linen cloth. If it be dry and hard, expoſe the cloth containing it to the ſteam of boiling water, till the matter become moiſt and ſoft. Then lay the cloth, with its contents, over the mouth of a very tall cylindrical glaſs veſſel, which is to do the office of a receiver in this diſtillation; and, by means of a pieee of ſmall pack-thread, faſten down the extremities of the cloth, by winding the thread ſeveral times over them and round the veſſel; in ſuch a manner, however, that the cloth be not tight, but may yield to a ſmall weight, and ſink about five or ſix lines deep into the veſſel over which it is faſtened. Set this recipient in a larger veſſel, containing ſo much cold water as will reach half way up the cylindrical veſſel, which, having little in it but air, muſt be ballaſted with as much lead as will ſink it to the bottom of the water.

On the cloth, containing the ſubſtance to be diſtilled, ſet a flat pan of iron or copper, about five or ſix lines deep, that may juſt fit the mouth of the glaſs veſſel over which the cloth is faſtened, ſo as to ſhut it quite cloſe. Fill this pan with hot aſhes, and on theſe lay ſome live coals. Soon after this you will ſee vapours deſcend from the cloth, which will fill the recipient, and drops of liquor will be formed on the under ſide of the cloth, from whence they will fall into the veſſel. Keep up an equal gentle heat, till you preceive nothing more diſcharged. Then uncover the recipient: you will find in it two diſtinct liquors; one of which is the phlegm, and the other the eſſential oil of the ſubſtance diſtilled.

Infuſions, Decoctions, and Extracts of Plants.

Make ſome water boiling-hot, and then take it off the fire. When it ceaſes to boil, pour it on the plant of which you deſire to have the infuſion; taking care there be enough of it to cover the plant entirely. Cover the veſſel, and let your plant lie in the hot water for the ſpace of half an hour, or longer if it be of a firm cloſe texture. Then pour off the water by inclination: it will have partly acquired the colour, the ſmell, the taſte, and the virtues of the plant. This liquor is called an *infuſion*.

To make the decoction of a vegetable ſubſtance, put it into an earthen pan, or into a tinned copper veſſel, with a quantity of water ſufficient to bear being boiled for ſeveral hours without leaving any part of the plant dry. Boil your plant more or leſs according to its nature; and then pour off the water by inclination. This water is impregnated with ſeveral of the principles of the plant.

If the infuſions and decoctions of plants be filtered, and evaporated in a gentle heat, they become extracts, that may be kept for whole years, eſpecially if they be evaporated to a thick conſiſtence; and better ſtill if they be evaporated to dryneſs.

Of Operations on Eſſential Oils.

The Rectification of Eſſential Oils.

Put into a cucurbit the eſſential oil you propoſe to rectify. Set the cucurbit in a *balneum mariæ*; fit to it a head of tin, or of copper tinned, together with its refrigeratory; and lute on a receiver. Make the water in the bath boil, and keep up this degree of heat till nothing more will come over. When the diſtillation is finiſhed,

niſhed, you will find in the receiver a rectified eſſential oil, which will be clearer, thinner, and better ſcented than before it was thus before re-diſtilled; and in the bottom of the cucurbit will be left a matter of a deeper colour, more tenacious, more reſinous, and of a leſs grateful ſmell.

Eſſential oils, even the pureſt, the beſt prepared, and the thinneſt, ſuffer great changes, and are much impaired by growing old: they gradually turn thick and reſinous; their ſweet, grateful ſcent is loſt, and ſucceeded by a more diſagreeable ſmell, ſomewhat like that of turpentine. The cauſe of theſe changes is, that their fineſt and moſt volatile part, that which contains moſt of the odorous principle, is diſſipated and ſeparated from that which contains leaſt of it; which therefore grows thicker, and comes ſo much the nearer to the nature of a reſin, as the quantity of acid, that was diſtributed through the whole oil before the diſſipation of the more volatile part, is, after ſuch diſſipation, united and concentrated in the heavieſt part; the acid in oils being much leſs volatile than the odorous part, to which alone they owe their levity.

Hence it appears what precautions are to be uſed for preſerving eſſential oils as long as poſſible without ſpoiling. They muſt be kept in a bottle perfectly well ſtopped, and always in a cool place, becauſe heat quickly diſſipates the volatile parts. Some authors direct the bottle to be kept under water.

To fire Oils by combining them with highly concentrated Acids: inſtanced in Oil of Turpentine.

Mix together in a glaſs equal parts of concentrated oil of vitriol, and highly ſmoking freſh-drawn ſpirit of nitre: pour this mixture at ſeveral times, but ſuddenly, on three parts of oil of turpentine, ſet for that purpoſe in a glaſs baſon. By a part here muſt be underſtood a dram at leaſt. A moſt violent commotion, accompanied with ſmoke, will immediately be raiſed in the liquors, and the whole will take fire in an inſtant, flame, and be conſumed.

There is not in chemiſtry a phenomenon more extraordinary, and more ſurpriſing, than the firing of oils by mixing them with acids. It could never have been ſuſpected, that a mixture of two cold liquors would produce a ſudden, violent, bright, and laſting flame, like that we are at preſent conſidering.

To combine Eſſential Oils with Mineral Sulphur. Balſam of Sulphur.

Put into a matras one part of flowers of ſulphur; pour on them ſix parts of the eſſential oil of turpentine, for inſtance; ſet the matras in a ſand-bath, and heat it gradually till the oil boil. The ſulphur, which at firſt lay at the bottom of the matras, will begin to melt, and appear to diſſolve in the oil. When it hath boiled in this manner for about an hour, take the matras from the fire, and let the liquor cool. A great deal of the ſulphur that was diſſolved therein will ſeparate from it as it cools, and fall to the bottom of the veſſel in the form of needles, much like a ſalt ſhooting in water.

When the liquor is perfectly cold, decant it from the ſulphur that lies at the bottom of the veſſel: to that ſulphur put freſh oil of turpentine, and proceed as before: the ſulphur will again diſappear, and be diſſolved in the oil; but when the mixture is cold you will find new cryſtals of ſulphur depoſited at the bottom. Decant once more this oil from the cryſtals, and pour on freſh oil to diſſolve them: continue the ſame method, and you will find, that about ſixteen parts of eſſential oil are required to keep one part of ſulphur diſſolved when cold. This combination is called *balſamum ſulphuris terebinthinatum*, if made with oil of turpentine; *aniſatum*, if with oil of aniſe-ſeeds; and ſo of others.

To combine Eſſential Oils with fixed Alkalis. Starkey's Soap.

Take ſalt of tartar, or any other alkali, thoroughly calcined. Heat it in a crucible till it be red, and in that condition throw it into a hot iron mortar: rub it quickly with a very hot iron peſtle; and as ſoon as it is powdered, pour on it, little by little, nearly an equal quantity of oil of turpentine. The oil will enter into the ſalt, and unite intimately with it, ſo as to form a hard paſte. Continue rubbing this compoſition with a peſtle, in order to complete the union of the two ſubſtances; and, as your oil of turpentine diſappears, add more, which will unite in the ſame manner, and give a ſofter conſiſtence to the ſoapy maſs. You may add ſtill more oil, according to the conſiſtence you intend to give your ſoap.

Starkey, the firſt chemiſt who found the means of making ſoap with an eſſential oil, and by whoſe name this kind of ſoap is therefore called, made uſe of a much more tedious method than that propoſed in our proceſs. He began with mixing a very ſmall quantity of oil with his ſalt, and waited till all the oil united therewith of its own accord, ſo as to diſappear entirely, before he added any more; and thus protracted his operation exceedingly, though in the main it was the ſame with ours. The method here propoſed is more expeditious, and was invented by Dr Geoffroy.

Starkey's ſoap diſſolves in water much as common ſoap does, without any ſeparation of the oil: and by this mark it is known to be well made. It may alſo be decompounded, either by diſtillation, or by mixing it with an acid: and its decompoſition, in either of theſe ways, is attended with nearly the ſame phenomena as the decompoſition of common ſoap.

Of the Subſtances obtained from Vegetables by means of a graduated Heat, from that of boiling Water, to the ſtrongeſt that can be applied to them in cloſe Veſſels.

To analiſe Vegetable Subſtances that yield neither a Fat nor an Eſſential Oil. Inſtanced in Guaiacum-wood.

Take thin ſhavings of Guaiacum-wood, and put them into a glaſs or ſtone retort, leaving one half thereof empty. Set your retort in a reverberating furnace, and lute on a large glaſs receiver having a ſmall hole drilled in it, ſuch as is uſed for diſtilling the mineral acids. Put a live coal or two in the furnace, to warm the veſſels gently and ſlowly.

With a degree of heat below that of boiling water, you will ſee drops of a clear inſipid phlegm fall into the receiver. If you raiſe the fire a little, this water will come ſlightly acid, and begin to have a pungent ſmell. With a degree of fire ſomewhat ſtronger, a water will continue to riſe which will be ſtill more acid, ſmell ſtronger, and become yellowiſh. When the heat comes to exceed that of boiling water, the phlegm that riſes will be very acid, high coloured, have a ſtrong pungent ſmell, like that of matters long ſmoked with wood in a chimney, and will be accompanied with a red, light oil, that will float on the liquor in the receiver.

And now it is neceſſary, that the operation be carried on very cautiouſly, and vent frequently given to the rarefied air by opening the ſmall hole in the receiver; ſuch an incredible quantity thereof ruſhing out of the wood, with this degree of heat, as may burſt the veſſels to pieces, if not diſcharged from time to time.

When this red, light oil is come over, and the air ceaſes to ruſh out with impetuoſity, raiſe your fire gradually, till the retort begin to redden. The receiver will be filled with denſe vapours; and together with the watery liquor, which will then be extremely acid, there will riſe a black, thick, ponderous oil, which will fall to the bottom of the receiver and lie under the liquor.

Then give the utmoſt degree of heat; that is, the greateſt your furnace will allow, and your veſſels bear. With this exceſſive heat a little more oil will riſe, which will be very ponderous, as thick and black as pitch; and the veſſels will continue full of vapours that will not condenſe.

At laſt, when you have kept the retort exceeding red for a long time in this extremity of heat, ſo that it begins to melt if it be of glaſs, and you perceive nothing more come over, let the fire go out and the veſſel cool. Then take off your receiver: from the black oil at bottom decant the acid liquor with the red oil floating on it, and pour them both into a glaſs funnel, lined with brown filtering paper, and placed over a bottle. The acid liquor will paſs through the filter into the bottle, and the oil will be left behind, which muſt be kept by itſelf in a ſeparate bottle. Laſtly, into another funnel, prepared as the former, pour the thick oil remaining with a little of the acid liquor at the bottom of the receiver. This liquor will filter off in the ſame manner, and thus be ſeparated from the heavy oil.

In the retort you will find your Guaiacum ſhavings not in the leaſt altered as to their figure, but light, friable, very black, ſcentleſs and taſteleſs, eaſily taking fire, and conſuming without flame or ſmoke: in ſhort you will find them charred to a perfect coal.

Hitherto we have examined the ſubſtances that may be obtained from vegetables, either without the help of fire, or with a degree of heat not exceeding that of boiling water. The analyſis of plants can be carried no further without a greater degree of heat: for, when the principle of odour and the eſſential oil of an aromatic plant are wholly extracted by the preceding proceſſes, if the diſtillation be afterward continued without increaſing the heat, nothing more will be obtained but a little acid; which will ſoon ceaſe, as a ſmall part only of the quantity contained in the plant will be elevated; the reſt being either too ponderous, or too much entangled with the other principles of the body, to riſe with ſo ſmall a degree of heat.

In order therefore to carry on the decompoſition of a plant, from which you have, by the methods before propoſed, extracted all the principles it is capable of yielding when ſo treated; or, in order to analiſe a vegetable matter, which affords neither an expreſſed nor an eſſential oil, it muſt be diſtilled in a retort with a naked fire, as directed in the proceſs, and be made to undergo all the degrees of heat ſucceſſively, from that of boiling water to the higheſt that can be raiſed in a reverberating furnace.

A heat inferior to that of boiling water, with which we muſt begin in order to warm the veſſel gradually, brings nothing over, but an inſipid water, deſtitute of all acidity. By increaſing it nearly to the degree of boiling water, the diſtilled water comes to be ſlightly acid.

When the heat is made a little ſtronger than that which is neceſſary for the elevation of an eſſential oil, the acidity of the water that comes off is much more conſiderable. It hath now both colour and ſmell, and there riſes with it a red, light oil, that floats on the liquor in the receiver. This is not an eſſential oil; it hath none of the odour of the plant. Though ſo light as to float on water, yet it will not riſe with the degree of heat that raiſes eſſential oils, even thoſe that much ſurpaſs it in gravity, and will not ſwim on water as they do. This proves, that the eaſe or difficulty with which a particular degree of heat raiſes any ſubſtance in diſtillation doth not depend altogether on its gravity: its dilatability, or the volatile nature of the matters with which it is ſo cloſely united as not to be ſeparated from them by diſtillation, may probably contribute greatly to produce this effect.

It is very ſurpriſing, that a ſubſtance ſo hard, ſo compact, ſo dry in appearance, as Guaiacum-wood, ſhould yield ſuch a large quantity of water by diſtillation; and it is equally ſo, that it ſhould diſcharge ſo much air, and with ſo much impetuoſity, as nothing but experience could render credible.

It hath been remarked, that the heavieſt and moſt compact woods yield the moſt air in diſtillation: and accordingly Guaiacum-wood, as exceeding almoſt all others in hardneſs and weight, diſcharges a vaſt quantity of air when analiſed.

The thick, burnt, empyreumatic oil, that comes over laſt in this diſtillation, is heavier than water; on account, probably, of the great quantity of acid with which it is replete. The two kinds of oil obtained in this analyſis may be rectified, by diſtilling them a ſecond time, or rather ſeveral times; by which means they will become lighter and more fluid. In general, all thick, heavy oils conſtantly owe theſe qualities to an acid united with them; and it is by being freed from ſome of that acid in diſtillation, that they always acquire a greater er degree of lightneſs and fluidity from that operation.

The analyſis of a vegetable ſubſtance, ſhews what may be obtained from them when diſtilled in cloſe veſſels, with a graduated heat, from that of boiling water, to that which converts the mixt to a perfect coal; viz. phlegm, an acid, a light oil, much air, and a thick oil. But this analyſis is far from being a complete one: it may be carried much farther, and made more perfect.

None of the principles obtained by this analyſis are pure, ſimple, and thoroughly ſeparated from the reſt. They are ſtill in ſome meaſure blended all together: their ſeparation is but begun; and each requires a ſecond and more accurate analyſis, to reduce it to the greateſt degree of purity of which it is capable. The oil and the acid chiefly merit ſo much pains.

A great deal of the acid of the plant remains, combined with the two ſorts of oil here obtained; which we have reaſon to think differ no otherwiſe from one another, than as there is more or leſs acid united with each. The beſt way of freeing theſe oils from their redundant acid is to diſtill them frequently from alkalis and abſorbents.

The acid is in the ſame circumſtances nearly as the oil. The firſt that riſes is mortified with much water, to which it owes a good deal of its volatility. That which comes over laſt is much more concentrated, and conſequently heavier; yet it is ſtill very aqueous. It might be freed in a great meaſure from this adventitious water, and ſo rendered much ſtronger; which would give us a better opportunity to diſcover its nature and properties, of which we know but very little.

Water is not the only heterogeneous ſubſtance that diſguiſes the vegetable acid: a pretty conſiderable quantity of the oil of the plant is alſo combined with it, and contaminates its purity. The proof of this is, that when theſe acids are kept, in the ſame condition in which they firſt come over, for any length of time, in a glaſs veſſel, they gradually depoſite, on the bottom and ſides of the veſſel, an oily incruſtation, which grows thicker and thicker the longer it ſtands; and, as this oily matter ſeparates from it, the acid liquor appears leſs unctuous and ſaponaceous.

A very good way to ſeparate this oil more effectually from the acid is to combine the whole with abſorbents, and abſtract the oil again by diſtillation. By this means a very ſenſible quantity of oil may be ſeparated that was not perceived before.

The air, that is diſcharged with impetuoſity in the operation, and muſt be let out, is loaded with many particles of acid and oil reduced to vapours, which it carries off; and by this means the quantity of the principles extracted from the mixt cannot be accurately determined: nor are the vapours, of which the veſſels remain full after the operation, any other than particles of acid and oil, which the violence of the fire hath rarefied exceedingly, and which do not eaſily condenſe.

If we diſtill in this manner a vegetable aromatic ſubſtance, which of courſe contains an eſſential oil, provided it hath not been previouſly extracted by the appropriated proceſs, this eſſential oil will riſe firſt, as ſoon as the diſtilling veſſel acquires the heat of boiling water: but its ſcent will not be near ſo ſweet or grateful, as if it were diſtilled in the manner before directed as propereſt for it. On the contrary, it will have an empyreumatic ſmell: becauſe in this way it is impoſſible to avoid ſcorching, and half-burning ſome of the matter diſtilled; eſpecially that part of it which touches the ſides of the retort. Moreover, the very ſame equable degree of heat can hardly be kept up with a naked fire. The eſſential oil therefore, though it riſes firſt, will not be pure, but contaminated with a mixture of the empyreumatic oil that firſt comes over, and will be confounded therewith.

Moſt vegetable ſubſtances, when diſtilled with a ſtrong fire, yield the ſame principles with that which we have choſen for an inſtance. Entire plants of this kind, thoſe from which the odorous principle, the eſſential oil, or the fat oil, hath been drawn, thoſe of which extracts have been made by infuſion or decoction, or the extracts themſelves; all ſuch matter being diſtilled yield a phlegm, an acid, a thin oil, air, and a thick oil; and the products of their ſeveral analyſes differ from each other, only on account of the different quantity or proportion that each contains of the principles here enumerated.

But there are many other plants, which, beſides theſe ſubſtances, yield alſo a conſiderable quantity of a volatile alkaline ſalt. This property is poſſeſſed chiefly by that tribe of plants which is diſtinguiſhed by having cruciform flowers; among which there are ſome that, being analiſed, greatly reſemble animal-matters. We ſhall now analiſe one of theſe; muſtard-ſeed, for inſtance.

To analiſe a Vegetable Subſtance which yields the ſame Principles as are obtained from Animal-matters: inſtanced in Muſtard-ſeed.

With an apparatus like that of the preceding proceſs, and with the ſame fire, diſtill muſtard-ſeed. With a degree of heat, inferior to that of boiling water, there will come over a phlegm ſomewhat coloured, and impregnated with a volatile alkaline ſalt. With a degree of heat, greater than that of boiling water, the ſame kind of phlegm, impregnated with the ſame ſalt, will continue to come over; but it will be much higher coloured, and will be accompanied with a light oil. At this time a conſiderable quantity of air is diſcharged; with regard to which the ſame precautions muſt be taken as in diſtilling Guaiacum.

If the fire be gradually raiſed, there will come over a black thick oil, lighter however than water; and at the ſame time vapours will riſe, and, condenſing on the ſides of the receiver, form into ſprings or ramifications. This is a volatile alkaline ſalt, in a concrete form, like that of animals, as we ſhall hereafter ſee. Theſe vapours are much whiter than thoſe of Guaiacum.

When you have thus drawn off, with a very ſtrong fire, all the volatile alkali and thick oil contained in the ſubject, there will be nothing left in the retort but a ſort of coal, from which a ſmall quantity of phoſphorus may be obtained, provided the retort you employ for that purpoſe be good enough to ſtand a very violent heat.

Muſtard-ſeed furniſhes us with an inſtance of a vegetable, from which we obtain, by analiſing it, the very ſame principles that animal-matters yield. Inſtead of getting an acid from it, we obtain only a volatile alkali.

We ſhall not here ſpeak of the manner of ſeparating and depurating the principles obtained by this proceſs; but reſerve it for the analyſis of animals, which is abſolutely the ſame. We ſhall content ourſelves with obſerving, that the firſt volatile alkali, which riſes at the beginning of the operation together with the phlegm, in a degree of heat below that of boiling water, differs from that which doth not come over till towards the end of the diſtillation, when the laſt thick oil aſcends. The different times, and different degrees of heat, in which theſe two alkalis riſe, ſhew that the former exiſts actually and perfectly in the plant; but that the latter is generated during the diſtillation, and is the product of the fire, which combines together the materials whereof it is compoſed.

Vegetables, that thus yield a volatile alkali with a heat leſs than that of boiling water, irritate the organ of ſmelling, affecting it with a ſenſation of acrimony; and the effluvia, which riſe from them when bruiſed, make the eyes ſmart ſo as to draw tears from them in abundance. Several of theſe matters, being only bruiſed, efferveſce with acids: effects producible only by a very volatile alkaline principle.

This is that alkali, the lighteſt of all the principles that can be extracted from bodies, which riſes firſt in our diſtillation along with the phlegm, and with a degree of heat much inferior to that of boiling water. As the phlegm with which it riſes is very copious, it is diſſolved thereby; which is the reaſon it doth not appear in a concrete form. To this water it gives a ſlight yellowiſh tinge, becauſe it is impure and oily. The ſaline alkaline properties of this liquor have procured it the title of a volatile ſpirit. This volatile alkali, which exiſts naturally and perfectly formed in muſtard-ſeed, onions, garlick, creſſes, and other ſuch vegetables, conſtitutes a difference between them and animal ſubſtances, which contain only the materials requiſite to form a volatile alkali, but none ready formed, unleſs they have undergone the putrid fermentation.

The ſecond volatile alkali, which riſes in our diſtillation, but not without a very ſtrong degree of fire, and at the ſame time with the laſt thick oil, ſeems to be a production of the fire; for, if it were already formed in the mixt, as the other is, it would riſe with the ſame heat, and at the ſame time, being equally volatile.

Of the Subſtances obtained from Vegetables by Combuſtion.

To procure a fixed Cauſtic Alkaline Salt from a Vegetable Subſtance, by burning it in the open Air.

TAKE any vegetable matter whatever; ſet it on fire, and let it burn in the open air till it be wholly reduced to aſhes. On theſe aſhes pour a quantity of boiling water ſufficient to drench them thoroughly. Filter the liquor, in order to ſeparate the earthy parts; and evaporate your lye to dryneſs, ſtirring it inceſſantly; and you will have a yellowiſh-white ſalt.

Put this ſalt in a crucible; ſet it in a melting furnace, and make a moderate fire, ſo as not to fuſe the ſalt. It will turn firſt of a blue-grey colour, afterwards of a blue-green, and at laſt reddiſh. Put on the dome of the furnace; fill it with coals; make your fire ſtrong enough to melt the ſalt, and keep it in fuſion for an hour, or an hour and half. Then pour it into a heated metal mortar; pound it while it is red-hot; put it as ſoon as poſſible into a glaſs bottle, firſt made very hot and dry, and ſhut it up cloſe with a glaſs ſtopple rubbed with emery. By this means you will have the pure fixed alkali of the vegetable ſubſtance you burnt.

Burning a vegetable ſubſtance in the open air is a kind of violent and rapid analyſis made by fire, which ſeparates, reſolves, and decompoſes ſeveral of its principles.

When any wood or plant is laid on a quick fire, there aſcends from it immediately an aqueous ſmoke, which conſiſts of little more than phlegm; but this ſmoke ſoon becomes thicker and blacker; it is then pungent, draws tears from one's eyes, and excites a cough if drawn into the lungs with the breath. Theſe effects ariſe from its being replete with the acid, and ſome of the oil, of the vegetable converted into vapours. Soon after this the ſmoke grows exceeding black and thick; it is now ſtill more acrid, and the plant turns black. Its ſtrongeſt acid and laſt thick oil are now diſcharged with impetuoſity.

This rarefied oil being heated red-hot ſuddenly takes fire and flames. The vegetable burns and deflagrates rapidly, till all its oil is conſumed. Then the flame ceaſes; and nothing remains but a coal, like that found in a retort after all the principles of a plant have been extracted by the force of fire. But this coal having a free communication with the air, which is abſolutely neceſſary to keep a combuſtible burning, continues to be red, ſparkles, and waſtes till all its phlogiſton is diſſipated and deſtroyed. After this nothing remains but the earth and fixed ſalt of the vegetable; which, mixed together, form what we call the aſhes. Water, which is the natural ſolvent of ſalts, takes up every thing of that kind that is contained in the aſhes; ſo that by lixiviating them, as directed, all the ſalt is extracted, and nothing left but the pure earth of the mixt which is thus decompoſed.

The phenomena obſerved in the burning of a vegetable ſubſtance, and the production thereby of a fixed alkali, ſeem to prove that this ſalt is the work of the fire; that it did not exiſt in the plant before it was burnt; that the plant only contained materials adapted to form this ſalt; and that this ſalt is no other than a combination of ſome of the acid, united with a portion of earth, by means of the igneous motion.

The alkali obtained from the aſhes of burnt plants is not perfectly pure: it is contaminated with a ſmall mixture of fatty matters, which were probably defended thereby againſt the action of the fire, and which render it ſomewhat ſaponaceous. In order to free it from this extraneous matter, and to render it very cauſtic, it muſt be calcined a long time in a crucible, but without melting it at firſt; becauſe it is with this ſalt as with moſt metallic matters, which are ſooner and more eaſily deprived of their phlogiſton by being calcined without melting, provided they be comminuted into ſmall particles, than when they are in fuſion; all melted matters having but a ſmall ſurface expoſed to the air, by the contact of which the evaporation of any thing whatever is exceedingly promoted.

To procure the fixed Salt of a Plant, by burning it after the manner of Tachenius.

INTO an iron pot put the plant whoſe ſalt you deſire to obtain in the manner of Tachenius, and ſet it over a fire, ſtrong enough to make its bottom red-hot; at the ſame time cover your plant with a plate of iron, that may lie immediately upon it in the pot. The plant will grow black, and ſmoke conſiderably; but will not flame, becauſe it hath not a ſufficient communication with the air. The black ſmoke only will eſcape through the interſtice left between the ſide of the pot and the rim of the plate; which, for that purpoſe, ſhould be made ſo as not to fit exactly into the pot. From time to time take up the iron plate, ſtir the plant, and cover it again immediately, to prevent its taking fire, or to ſmother it if it ſhould happen to flame: go on thus till the black ſmoke ceaſe.

Then take off the iron plate: the upper part of the half-burnt plant will take fire as ſoon as the air is admitted, conſume gradually, and be reduced to a white aſh. Stir your matter with an iron wire, that the undermoſt parts, which are ſtill black, may be ſucceſſively brought uppermoſt, take fire, and burn to white aſhes.

Go on thus as long as you perceive the leaſt blackneſs remaining. After this, leave your aſhes ſome time longer on the fire; but ſtir them frequently, to the end that, if any black particles ſhould ſtill be left, they may be entirely conſumed.

Your aſhes being thus prepared, lixiviate them with ſeven times their quantity of water, made to ſimmer over the fire, and keep ſtirring it with an iron ladle. Then filter the liquor, and evaporate it to dryneſs in an iron pot, ſtirring it inceſſantly towards the end, leſt the matter, when it grows ſtiff, ſhould adhere too cloſely to the veſſel. When all the humidity is evaporated, you will have a ſalt of a darkiſh colour and alkaline nature; which you may melt in a crucible, and mould into cakes. This is the fixed ſalt of plants, prepared in the manner of Tachenius.

To render Fixed Alkalis very cauſtic by means of Lime. The Cauſtic Stone.

TAKE a lump of newly burnt quick-lime, that hath not yet begun to ſlake in the air: put it into a ſtone pan, and cover it with twice its weight of the unwaſhed aſhes of ſome plant that are full of the ſalt you deſign to render cauſtic. Pour on them a great quantity of hot water; let them ſteep in it five or ſix hours, and then boil them gently. Filter the liquor through a thick canvas bag, or through brown filtering paper ſupported by a linen cloth.

Evaporate the filtered liquor in a copper baſon ſet over the fire; and there will remain a ſalt, which muſt be put into a crucible ſet in the fire. It will melt, and boil for ſome time; after which it will be ſtill, and look like an oil, or melted fat. When it comes to this condition, pour it out on a very hot copper plate, and cut it into oblong tapering ſlips, before it grow hard by cooling. Put theſe ſlips, while they are ſtill hot, into a very dry glaſs bottle, and ſeal it hermetically. This is the *cauſtic ſtone*, or *common cauſtic*.

The Analyſis of Soot.

TAKE wood-ſoot from a chimney under which no animal matter hath been dreſſed or burnt: put it into a glaſs retort ſet in a reverberating furnace; lute on a receiver, and begin to diſtill with a degree of heat ſomewhat leſs than that of boiling water. A conſiderable quantity of limpid phlegm will come over. Keep the fire in the ſame degree as long as any of this phlegm riſes, but increaſe it when the drops begin to come ſlow; and then there will aſcend a good deal of a milky water. When this water ceaſes to run, change the receiver, and increaſe your fire a little: a yellow volatile ſalt will riſe, and ſtick to the ſides of the receiver. The fire ought now to be very fierce, and if ſo, will force up at the ſame time a very thick black oil. Let the veſſels cool: you will find a ſaline matter riſen into the neck of the retort, which could not paſs over into the receiver: in the bottom of the retort will be a *caput mortuum*, or black charred ſubſtance, the upper part of which will be cruſted over with a ſaline matter, like that in the neck of the retort.

As we are at preſent inquiring into the nature of vegetables only, it is evidently neceſſary that we chuſe a ſoot produced by burning vegetables alone. Soot, though dry in appearance, contains nevertheleſs much humidity, as appears from this analyſis; ſeeing there comes over at firſt a conſiderable quantity of phlegm, that doth not ſeem to be impregnated with any principle, except perhaps an extremely ſubtile, ſaline, and oily matter, that communicates to it a diſagreeable ſmell, from which it cannot by any means be entirely freed.

The volatile alkali obtained from ſoot is, in a double reſpect, the product of the fire. In the firſt place, though it derives its origin wholly from wood, or other vegetables, which, when diſtilled in cloſe veſſels, yield no volatile alkali at all, yet it produces ſuch a ſalt when analyſed in the preſent manner: whence it muſt be inferred, that the principles of thoſe vegetables are metamorphoſed into a volatile alkali, by being burnt in the open air, and ſublimed in the form of ſoot. Secondly, though ſoot, when analyſed, yields a great deal of this ſalt, yet this ſalt doth not formally pre-exiſt therein; for it doth not riſe till after the phlegm, nor without a very conſiderable degree of heat: therefore ſoot contains only the materials neceſſary to form this ſalt; therefore the perfect combination of this ſalt requires that the force of fire be applied a ſecond time; therefore it is, as was ſaid, doubly the product of the fire.

The ſaline matter which we find ſublimed into the neck of the retort, and which alſo forms the cruſt that covers the *caput mortuum* of the ſoot, appears by all chemical trials to be an ammoniacal ſalt; that is, a neutral ſalt, conſiſting of an acid and a volatile alkali. This ammoniacal ſalt riſes only into the neck of the retort, and doth not come over into the receiver; becauſe it is but ſemi-volatile. We ſhall treat more at large of the production of a volatile alkali, and of this ammoniacal ſalt, when we come to the analyſis of animals, and the article of ſal ammoniac.

The Analyſis of ſome particular Subſtances belonging to the Vegetable Kingdom.

Analyſis of the natural Balſams: inſtanced in Turpentine.

INTO a cucurbit put as much rain-water as will fill about a fourth part of its cavity, and pour into it the turpentine you intend to analyſe. Cover the cucurbit with its head, and lute it on with ſlips of ſized paper or wet bladder. Set your alembic in a ſand-heat; lute on a long-necked receiver; and give a gradual fire till the water in the cucurbit boil. There will come over into the receiver a good deal of phlegm, which, by little and little, will become more and more acid; and at the ſame time there will riſe a great quantity of an æthereal oil, extremely light, fluid, and as limpid and colourleſs as water.

When you obſerve that no more oil comes off, unlute your veſſels; and in the receiver you will find an acidulated water, and the æthereal oil floating on it. Theſe two liquors may be eaſily ſeparated from each other, by means of a glaſs funnel.

In the cucurbit will be left ſome of the water you put in, together with the remainder of your turpentine; which, when cold, inſtead of being fluid, as it was before diſtillation, will be ſolid, and of the conſiſtence of a reſin, and is then called *roſin*.

Put this reſiduum into a glaſs retort, and diſtill it in a reverberatory with a naked fire, gradually increaſed according to the general rule for all diſtillations. At firſt, with a degree of heat a little greater than that of boiling water, you will ſee two liquors come over into the recipient; one of which will be aqueous and acid, the other will be a tranſparent, limpid, yellowiſh oil, floating on the acid liquor.

Continue your diſtillation, increaſing your fire from time to time, by ſlow degrees. Theſe two liquors will continue to come off together; and the nearer the operation draws to its end, the more acid will the aqueous liquor become, and the thicker and deeper coloured will the oil grow. At laſt the oil will be very thick, and of a deep reddiſh-yellow colour. When nothing more aſcends, unlute your veſſels: in the retort you will find only a very ſmall quantity of a charred, light, friable ſubſtance.

All natural balſams, as well as turpentine, are oily, aromatic matters, which flow in great quantities from the trees containing them, either ſpontaneouſly, or thro' inciſions made on purpoſe. As theſe matters have a ſtrong ſcent, it is not ſurpriſing that they ſhould greatly abound with eſſential oils. They may even be conſidered as eſſential oils, that naturally, and of their own accord, ſeparate from the vegetables in which they exiſt.

Natural balſams, and eſſential oils grown thick with age, are exactly one and the ſame thing. Accordingly we ſee that fire and diſtillation produce the ſame effects on both. The rectification of an eſſential oil, thickened by keeping, is nothing but a decompoſition thereof, by ſeparating, with the heat of boiling water, all thoſe parts that are light enough to riſe with that degree of heat, from what is ſo loaded with acid as to remain fixed therein.

The newer natural balſams are, the thinner they are, and the more eſſential oil do they yield; and this eſſential oil, like all others, grows thick in time, and at laſt turns again to an actual balſam.

Theſe balſams, by being long expoſed to the heat of the ſun, acquire ſuch a conſiſtence as to become ſolid. They then take another name, and are called *reſins*. Reſins yield much leſs eſſential oil when diſtilled, than balſams do. Hence it follows, that reſins are to balſams, what balſams are to eſſential oils.

The Analyſis of Reſins: inſtanced in Benjamin. The Flowers and Oil of Benjamin.

INTO a pretty deep earthen pot, having a border or rim round its mouth, put the benjamin you intend to analyſe. Cover the pot with a large conical cap of very thick white paper, and tie it on under the rim. Set your pot in a ſand-bath, and warm it gently till the benjamin melt. Continue the heat in this degree for an hour and half. Then untie the paper cap and take it off, ſhaking it as little as poſſible. You will find all the inſide of the cap covered with a great quantity of beautiful, white, ſhining flowers, in the form of little needles. Bruſh them off gently with a feather, put them into a bottle, and ſtop it cloſe.

As ſoon as you take off the firſt cap, cover your pot immediately with a ſecond like the former. In this manner go on till you perceive the flowers begin to grow yellowiſh; and then it is proper to deſiſt.

The matter left in the pot will be blackiſh and friable when cold. Pulveriſe it; mix it with ſand; and diſtill it in a glaſs retort with a graduated heat. There will come over a light oil, of a fragrant ſcent, but in very ſmall quantity; a little of an acid liquor, and a great quantity of a red thick oil. There will be left in the retort a charred, ſpungy ſubſtance.

Of the Nature and Properties of Camphor.

WE do not propoſe to give an analyſis of this ſingular body; becauſe hitherto there is no proceſs known in chemiſtry by which it can be decompoſed. We ſhall therefore content ourſelves with reciting its principal properties, and making a few reflections on its nature.

Camphor is an oily concrete ſubſtance; a kind of reſin, brought to us from the iſland of Borneo, but chiefly from Japan. This ſubſtance reſembles reſins, in being inflammable, and burning much as they do; it is not ſoluble in water, but diſſolves entirely and perfectly in ſpirit of wine; it is eaſily ſeparated again from this menſtruum, as all other oily matters are, by the addition of water; it diſſolves both in expreſſed and in diſtilled oils; it hath a very ſtrong aromatic ſmell. Theſe are the chief properties which camphor poſſeſſes in common with reſins: but in other reſpects it differs totally from them; eſpecially in the following particulars.

Camphor takes fire and flames with vaſtly more eaſe than any other reſin. It is ſo very volatile, that it vaniſhes entirely in the air, without any other heat than that of the atmoſphere. In diſtillation it riſes entire, without any decompoſition, or even the leaſt alteration. It diſſolves in concentrated mineral acids; but with circumſtances very different from thoſe that attend other oily or reſinous ſubſtances. The diſſolution is accompanied with no effervеſcence, no ſenſible heat; and conſequently can produce no inflammation. Acids do not burn, blacken, or thicken it, as they do other oily matters; on the contrary, it becomes fluid, and runs with them into a liquor that looks like oil.

Camphor doth not, like other oily matters, acquire a diſpoſition to diſſolve in water by the union it contracts with acids; though its union with them ſeems to be more intimate than that of many oily matters with the ſame acids. On the contrary, if a combination of camphor and an acid be diluted with water, theſe two ſubſtances inſtantly ſeparate from each other: the acid unites with the water, and the camphor, being entirely diſengaged from it, ſwims on the ſurface of the liquor. Neither volatile alkalis, nor the moſt cauſtic fixed alkalis, can be brought into union with it; for it always eludes their power.

Notwithſtanding theſe wide differences between camphor and all other oily and reſinous ſubſtances, the rule, that acids thicken oils, ſeems to be ſo univerſal, and ſo conſtantly obſerved by nature, that we cannot help thinking this ſubſtance, like all the reſt, is an oil thickened by an acid. But what oil? what acid? and how are they united? This is a ſubject for very curious inquiries.

With a yellow oil drawn from wine, and an acid vinous ſpirit, Mr Hellot made a kind of artificial camphor; a ſubſtance having the odour, ſavour, and inflammability of camphor; an imperfect camphor. True camphor hath the levity, the volatility, and the inflammability of æther. Can it be a ſubſtance of the ſame nature with æther, a kind of ſolid æther, an æther in a concrete form?

The Analyſis of Bitumens: inſtanced in Amber. The Volatile Salt and Oil of Amber.

Into a glaſs retort put ſome ſmall bits of amber, ſo as to fill but two thirds of the veſſel. Set your retort in a furnace covered with its dome; fit on a large glaſs receiver; and beginning with a very gentle heat, diſtill with degrees of fire. Some phlegm will firſt come off, which will gradually grow more acid, and be ſucceeded by a volatile ſalt, figured like fine needles, that will ſtick to the ſides of the receiver.

Keep the fire up to this degree, in order to drive over all the ſalt. When you perceive that little or none riſes, change the receiver, and increaſe your fire a little. A light, clear, limpid oil will aſcend. As the diſtillation advances, this oil will grow higher coloured, leſs limpid, and thicker; till at laſt it will be opaque, black, and have the conſiſtence of turpentine.

When you perceive that, though the retort be red-hot, nothing more comes off, let the fire go out. You will have in the retort a black, light, ſpungy coal. If you have taken care to ſhift the receiver, from time to time, during the diſtillation of your oil, you will have ſundry ſeparate portions thereof, each of which will have a different degree of tenuity or thickneſs, according as it came over at the beginning, or towards the end of the diſtillation.

The ſubſtance of which we have here given the analyſis, together with all others of the ſame, that is, of the bituminous kind, is, by moſt chemiſts and naturaliſts, claſſed with minerals: and ſo far they are right, that we actually get theſe mixts, like other minerals, out of the bowels of the earth, and never procure them immediately from any vegetable or animal compound. Yet we have our reaſons for acting otherwiſe, and for thinking that we could not, in this work, place them better, than immediately after thoſe vegetable ſubſtances which we call *reſins*.

Several motives determine us to proceed in this manner. The analyſis of bitumens demonſtrates, that, with regard to the principles of which they conſiſt, they are totally different from every other kind of mineral; and that, on the contrary, they greatly reſemble vegetable reſins in almoſt every reſpect. In ſhort, though they are not immediately procured from vegetables, there is the greateſt reaſon for believing that they were originally of the vegetable kingdom, and that they are no other than reſinous and oily parts of trees or plants, which by lying long in the earth, and there contracting an union with the mineral acids, have acquired the qualities that diſtinguiſh them from reſins.

Mineralogiſts know very well that we find, every where in the earth, many vegetable ſubſtances, that have lain very long buried under it, and frequently at a conſiderable depth. It is not uncommon to find, under ground, vaſt beds of foſſile trees, which ſeem to be the remains of immenſe foreſts: and bitumens, particularly amber, are often found among this ſubterraneous wood.

Theſe conſiderations, joined to proofs drawn from their analyſis, make this opinion more than probable: nor are we ſingular in maintaining it, as it is adopted by many able modern chemiſts.

The analyſis of amber, above deſcribed, may ſerve as a general ſpecimen of the decompoſition of other bitumens: with this ſingle difference, that amber is the only one among them which yields the volatile ſalt aforeſaid; and this determined us to examine it preferably to any other. As for the reſt, they all yield a phlegm, an acid liquor, and an oil; which is thin at firſt, but grows thicker and thicker as the diſtillation draws towards an end. It muſt be underſtood, however, that theſe acids and theſe oils may differ, according to the nature of the bitumens from which they are drawn; juſt as the phlegm, the acid, and the oil, reſulting from the decompoſition of reſins, differ in quantity and quality, according to the nature of the reſins from which they are procured.

The principal differences obſerved between reſins and bitumens are theſe: the latter are leſs ſoluble in ſpirit of wine; have a peculiar ſcent, which cannot be accurately deſcribed, and of which the ſenſe of ſmelling only can judge; and their acid is ſtronger and more fixed. This laſt property is one of the motives which induce us to think, that beſides the vegetable acid, originally combined with the reſinous or oily matter now become a bitumen, a certain quantity of mineral acid hath, in a courſe of time, been ſuperadded to conſtitute this mixt. We ſhall preſently ſee that the fact is certainly ſo, in the caſe of amber at leaſt.

The Analyſis of Bees-wax.

MELT the wax you intend to analyſe, and mix with it as much fine ſand as will make it into a ſtiff paſte. Put this paſte in little bits into a retort, and diſtil as uſual, with a graduated fire, beginning with a very gentle heat. An acid phlegm will come over, and be followed by a liquor which at firſt will look like an oil, but will ſoon congeal in the receiver, and have the appearance of a butter or greaſe. Continue the diſtillation, increaſing the fire by inſenſible degrees, till nothing more will come off. Then ſeparate the butter from the acid phlegm in the receiver, mix it with freſh ſand, and diſtil it again juſt as you did the wax before. Some acid phlegm will ſtill come off, and an oil will aſcend, which will not fix in the receiver, though it be ſtill thick. Continue the diſtillation, with a fire ſo governed that the drops may ſucceed each other at the diſtance of ſix or ſeven ſeconds of time. Do not increaſe it, till you perceive the drops fall more ſlowly; and then increaſe it no more than is neceſſary to make the drops follow each other as above directed. When the diſtillation is finiſhed, you will find in the receiver the oil come wholly over, and a little acid phlegm. Separate the oil from this liquor; and, if you deſire to have it more fluid, rediſtil it a third time in the ſame manner.

The Saccharine Juices of Plants analyſed: inſtanced in Honey.

PUT into a ſtone cucurbit the honey you intend to diſtil; ſet it in a moderate ſand-heat, and evaporate the greateſt part of its humidity, till you perceive the phlegm to be acid. Then take out the matter remaining in the cucurbit, put it into a retort, leaving a full third thereof empty, and diſtil in a reverberatory with degrees of fire. An acid amber-coloured liquor will come over. As the operation advances, this liquor will continually become deeper coloured and more acid, and at the ſame time a little black oil will aſcend. When the diſtillation is over, you will find in the retort a pretty large charred maſs, which being burnt in the open air, and lixiviated, affords a fixed alkali.

Sugar, manna, and the ſaccharine juices of fruits and plants, are of the ſame nature as honey, yield the ſame principles, and in the ſame proportions. All theſe ſubſtances muſt be conſidered as native ſoaps; becauſe they conſiſt of an oil rendered miſcible with water, by means of a ſaline ſubſtance. They differ from the common artificial ſoaps in ſeveral reſpects; but chiefly in this, that their ſaline part is an acid, whereas that of common ſoap is an alkali. The natural ſoaps are not for that reaſon the leſs perfect: on the contrary, they diſſolve in water without deſtroying its tranſparency, and without giving it a milky colour; which proves, that acids are not leſs proper than alakalis, or rather that they are more proper additaments, for bringing oils into a ſaponaceous ſtate.

Gummy Subſtances analyſed: inſtanced in Gum Arabic.

DISTIL gum arabic in a retort with degrees of fire. A limpid, ſcentleſs, and taſteleſs phlegm will firſt come over; and then a ruſſet coloured acid liquor, a little volatile alkali, and an oil, which will firſt be thin and afterwards grow thick. In the retort will be left a good deal of a charred ſubſtance, which, being burnt and lixiviated, will give a fixed alkali.

Gums have at firſt ſight ſome reſemblance of reſins; which hath occaſioned many reſinous matters to be called gums, though very improperly: for they are two diſtinct ſorts of ſubſtances, of natures abſolutely different from each other. It hath been ſhewn, that reſins have an aromatic odour; that they are indiſſoluble in water, and ſoluble in ſpirit of wine; that they are only an eſſential oil grown thick. Gums, on the contrary, have no odour, are ſoluble in water, indiſſoluble in ſpirit of wine, and by being analyſed as in the proceſs, are converted almoſt wholly into a phlegm and an acid. The ſmall portion of oil contained in them is ſo thoroughly united with their acid, that it diſſolves perfectly in water, and the ſolution is clear and limpid. In this reſpect gums reſemble honey, and the other vegetable juices analogous to it. They are all fluid originally; that is, when they begin to ooze out of their trees. At that time they perfectly reſemble mucilages, or rather they are actual mucilages, which grow thick and hard in time by the evaporation of a great part of their moiſture: juſt as reſins are true oils, which, loſing their moſt fluid parts by evaporation, at laſt become ſolid. Infuſions or ſlight decoctions of mucilaginous plants, when evaporated to dryneſs, become actual gums

Some trees abound both in oil and in mucilage: theſe two ſubſtances often mix and flow from the tree blended together. Thus they both grow dry and hard together in one maſs, which of courſe is at the ſame time both gummy and reſinous: and accordingly ſuch mixts are named *gum reſins*.

Of Operations on FERMENTED VEGETABLE SUBSTANCES.

Of the Product of Spirituous Fermentation.

To make Wine of Vegetable Subſtances that are ſuſceptible of Spirituous Fermentation.

LET a liquor ſuſceptible of, and prepared for, the ſpirituous fermentation, be put into a caſk. Set this caſk in a temperately warm cellar, and cover the bung-hole with a bit of linen cloth only. In more or leſs time, according to the nature of the liquor to be fermented, and to the degree of heat in the air, the liquor will begin to ſwell, and be rarefied. There will ariſe an inteſtine motion, attended with a ſmall hiſſing and efferveſcence, throwing up bubbles to the ſurface, and diſcharging vapours; while the groſs, viſcous, and thick parts, being driven up by the fermenting motion, and rendered lighter by little bubbles of air adhering to them, will riſe to the top, and there form a kind of ſoft ſpungy cruſt, which will cover the liquor all over. The fermenting motion ſtill continuing, this cruſt will, from time to time, be lifted up and cracked by vapours making their eſcape through it; but thoſe fiſſures will preſently cloſe again, till, the fermentation gradually going off, and at laſt entirely ceaſing, the cruſt will fall in pieces to the bottom of the liquor, which will inſenſibly grow clear. Then ſtop the caſk cloſe with its bung, and ſet it in a cooler place.

Matters that are ſuſceptible of the ſpirituous fermentation are ſeldom ſo perfectly prepared for it by nature as they require to be. If we except the juices that flow naturally from certain trees, but oftener from inciſions made on purpoſe in them, all other ſubſtances require ſome previous preparation.

Boerhaave divides the ſubſtances that are fit for ſpirituous fermentation into five claſſes. In the firſt he places all the meally ſeeds, the legumens, and the kernels of almoſt all fruits. The ſecond claſs includes the juices of all fruits that do not tend to putrefaction. In the third claſs ſtand the juices of all the parts of plants which tend rather to acidity than to putrefaction; and conſequently thoſe which yield much volatile alkali are to be excluded. The fourth claſs comprehends the juices or ſaps that ſpontaneouſly diſtil from ſeveral trees and plants, or flow from them when wounded. He forms his fifth and laſt claſs of the ſaponaceous, ſaccharine, and concrete or thick juices of vegetables. Reſinous or purely gummy matters are excluded, as not being fermentable.

Theſe five claſſes may be reduced into two; one comprehending all the juices, and another all the meally parts of vegetables that are ſuſceptible of fermentation. The juices want nothing to fit them for fermentation, but to be expreſſed out of the ſubſtances containing them, and to be diluted with a ſufficient quantity of water. If they be very thick, the beſt way is to add ſo much water as ſhall render the mixed liquor juſt capable of bearing a new-laid egg. With reſpect to farinaceous ſubſtances, as they are almoſt all either oily or mucilaginous, they require a little more management. The method of brewing malt liquors will furniſh us with examples of ſuch management. See **Brewing**.

Beſides the preparations relating chiefly to malt liquors, there are many other things to be obſerved relating to ſpirituous fermentation in general, and to all matters ſuſceptible of that fermentation. For example; all grains and fruits deſigned for that fermentation muſt be perfectly ripe; for otherwiſe they will not ferment without difficulty, and will produce little or no inflammable ſpirit. Such matters as are too auſtere, too acrid, or aſtringent, are for the ſame reaſon unfit for ſpirituous fermentation; as well as thoſe which abound too much in oil.

In order to make the fermentation ſucceed perfectly, ſo as to produce the beſt wine that the fermented liquor is capable of affording, it is neceſſary to let it ſtand quiet without ſtirring it, leſt the cruſt that forms on its ſurface ſhould be broken to little fragments, and mix with the liquor. This cruſt is a kind of cover, which hinders the ſpirituous parts from exhaling as faſt as they are formed. The free acceſs of the air is another condition neceſſary to fermentation: and for this reaſon the veſſel that contains the fermenting liquor muſt not be cloſe ſtopped; the bung-hole is only to be covered with a linen cloth, to hinder dirt and inſects from falling into it. Nor muſt the bung-hole be too large, leſt too much of the ſpirituous parts ſhould eſcape and be loſt.

Laſtly, a juſt degree of warmth is one of the conditions moſt neceſſary for fermentation: for in very cold weather there is no fermentation at all; and too much heat precipitates it in ſuch a manner that the whole liquor becomes turbid, and many fermenting and fermented particles are diſſipated.

If, notwithſtanding the exacteſt obſervance of every particular requiſite to excite a ſucceſsful fermentation, the liquor cannot, without difficulty, be brought to efferveſce, which ſcarce ever happens but to malt-liquor, it may be accelerated by mixing therewith ſome matter that is very ſuſceptible of fermentation, or actually fermenting. Such matters are called *ferments*. The cruſt that forms on the ſurface of fermenting liquors is a moſt efficacious ferment, and on that account very much uſed.

It ſometimes happens, that there is occaſion to check the fermentation excited in the liquor, before it ceaſes of itſelf. To effect this, ſuch means muſt be uſed as are directly oppoſite to thoſe mentioned above for promoting fermentation. The ſame end is obtained by mixing with the liquor a quantity of alkali, ſufficient to abſorb the acid contained therein: but this method is ſeldom made uſe of, becauſe it ſpoils the liquor; which, after being thus treated, is incapable of any ſpirituous fermentation, but on the contrary will certainly putrefy.

Spirituous fermentation may alſo be ſtopped by mixing with the liquor a great quantity of ſome mineral acid. But this likewiſe alters its nature; becauſe theſe acids, being fixed, always remain confounded therewith, and never ſeparate from it.

The beſt method yet found out for checking this fermentation, without injury to the fermenting liquor, is to impregnate it with the fumes of burning ſulphur. Theſe fumes are known to be acid, and it is that quality in them which ſuſpends the fermentation. But at the ſame time this acid is extremely volatile; ſo that it ſeparates ſpontaneouſly from the liquor, after ſome time, and leaves it in a condition to continue its fermentation.

For this reaſon, when a wine is deſired that ſhall be but half fermented, and ſhall partly retain the ſweet taſte it had in the ſtate of *muſt*, (the proper name for the unfermented juice of the grape), it is put into caſks in which ſulphur hath been previouſly burnt, and the vapours thereof confined by ſtopping the bung-hole. Theſe are called *matched wines*. If the ſame operation be performed on muſt, its fermentation will be abſolutely prevented: it will retain all its ſaccharine taſte, and is then called *ſtum*. As the ſulphureous acid evaporates ſpontaneouſly, in no long ſpace, it is neceſſary to fumigate matched wines or ſtums from time to time, when they are intended to be kept long without fermenting.

To draw an Ardent Spirit from Subſtances that have undergone the Spirituous Fermentation. The Analyſis of Wine.

Fill a large copper cucurbit half full of wine. Fit on its head and refrigeratory. Lute on a receiver with wet bladder, and diſtill with a gentle fire; yet ſo that the drops which fall from the noſe of the alembic may ſucceed one another pretty quick, and form a ſort of ſmall continued ſtream. Go on thus till you perceive that the liquor which comes over ceaſes to be inflammable; and then deſiſt. You will find in the receiver a clear liquor, ſomewhat inclining to an amber-colour, of a pleaſant quick ſmell, and which being thrown into the fire inſtantly flames. The quantity thereof will be nearly a fourth part of the wine you put into the alembic; and this is what is called *brandy*; that is, the ardent ſpirit of wine loaded with much phlegm.

In order to rectify it, and reduce it to ſpirit of wine, put it into a long-necked matras, capable of holding double the quantity. Fit a head to the matras, and lute on a receiver: place your matras over a pot half full of water: ſet this pot over a moderate fire; and with this vapour-bath diſtil your ſpirit, which will riſe pure. Continue this degree of heat till nothing more will come over. You will find in the receiver a very clear colourleſs ſpirit of wine, of a quick but agreeable ſmell, which will catch fire at once by the bare contact of any flaming ſubſtance.

To dephlegmate Spirit of Wine by the Means of Fixed Alkalis.

Into a glaſs cucurbit pour the ſpirit of wine you intend to dephlegmate, and add to it about a third part of its weight of fixed alkali, newly calcined, perfectly dry, heated, and pulveriſed. Shake the veſſel, that the two matters may be mixed and blended together. The ſalt will gradually grow moiſt, and, if the ſpirit of wine be very aqueous, melt into a liquor, that will always lie at the bottom of the veſſel, without uniting with the ſpirit of wine which will ſwim at top.

When you perceive that the alkali attracts no new moiſture, and that no more of it melts, decant your ſpirit of wine from the liquor beneath it, and add to your ſpirit freſh ſalt thoroughly dried as before. This ſalt alſo will imbibe a little moiſture; but it will not grow liquid, becauſe the alkali, with which it was mixed before, hath left too little phlegm to melt this. Decant it from this ſalt as at firſt, and continue to mix and ſhake it in the ſame manner with freſh ſalt, till you obſerve that the ſalt remains as dry after as it was before mixing it with the ſpirit of wine. Then diſtil your ſpirit in a ſmall alembic with a gentle heat, and you will have it as much dephlegmated as it can be.

Spirit of Wine combined with different Subſtances.

To combine Spirit of Wine with the Vitriolic Acid. This Combination decompounded. Æther.

Into an Engliſh glaſs retort put two pounds of ſpirit of wine perfectly dephlegmated, and pour on it at once two pounds of highly concentrated oil of vitriol: ſhake the retort gently ſeveral times, in order to mix the two liquors. This will produce an ebullition, and conſiderable heat; vapours will aſcend, with a pretty loud hiſſing noiſe, which will diffuſe a very aromatic ſmell, and the mixture will be of a deeper or lighter red colour, according as the ſpirit of wine was more or leſs oily. Set the retort on a ſand-bath made nearly as hot as the liquor; lute on a tubulated ballon, and diſtil the mixture with a fire ſtrong enough to keep the liquor always boiling; a very aromatic ſpirit of wine will firſt come over into the ballon, after which the æther will riſe. When about five or ſix ounces of it are come off, you will ſee in the upper concavity of the retort a vaſt number of little points in a veined form, which will appear fixed, and which are nevertheleſs ſo many little drops of æther, rolling over one another, and trickling down into the receiver. Theſe little points continue to appear and ſucceed each other to the end of the operation. Keep up the ſame degree of fire, till upon opening the little hole in the ballon you perceive that the vapours, which inſtantly fill the receiver, have the ſuffocating ſmell of volatile ſpirit of ſulphur.

Then unlute the ballon, pour the liquor it contains into a cryſtal bottle, and ſtop it cloſe: there will be about eighteen ounces of it. Lute on your receiver again, and continue the diſtillation with a greater degree of fire. There will come over an aqueous, acid liquor, ſmelling ſtrong of a ſulphureous ſpirit, which is not inflammable. It will be accompanied with undulating vapours; which being condenſed will form an oil, moſt commonly yellow, one part of which will float on the ſurface of the liquor, and another will ſink to the bottom.

Towards the end of the diſtillation of this acid liquor, and of the yellow oil of which it is the vehicle, that part of the mixture, which is left in the retort and grown black, will begin to riſe in froth. Then ſuppreſs your fire at once: ſtop the diſtillation, and change your receiver once more. When the veſſels are grown pretty cool, finiſh your diſtillation with a lamp-heat kept up for twelve or fifteen days, which in all that time will raiſe but a very little ſulphureous ſpirit. Then break your retort, in which you will find a black, ſolid maſs, like a bitumen. It will have an acid taſte, ariſing from a remainder of the acid imperfectly combined with oil.

This artificial bitumen may be freed from its redundant acid, by waſhing it in ſeveral waters. Then put it into a glaſs retort, and diſtil it with a ſtrong reverberated fire. You will obtain a reddiſh oil that will ſwim on water, much like the oil obtained by diſtilling the natural bitumens. This oil alſo will be accompanied with an aqueous acid liquor. In the retort will be left a charred matter, which, being put into an ignited crucible in the fire, burns for ſome time, and, when well calcined, leaves a white earth.

The liquors that riſe firſt in this diſtillation, and which we directed to be kept by themſelves, are a mixture conſiſting, 1. of a highly dephlegmated ſpirit of wine, of a moſt fragrant ſmell; 2. of æther, which the ſpirit of wine wherewith it is united renders miſcible with water; 3. of a portion of oil, which commonly riſes with the æther towards the end of the operation; 4. and ſometimes of a little ſulphureous acid, if the receiver be not changed ſoon enough.

In order to ſeparate the æther from theſe other ſubſtances, put the whole into an Engliſh retort, with a little oil of tartar *per deliquium* to abſorb the ſulphureous acid, and diſtil very ſlowly in a ſand bath heated by a lamp, till near half the liquor be come over. Then ceaſe diſtilling; put the liquor in the receiver into a phial with ſome water, and ſhake it; you will ſee it riſe with rapidity to the upper part of the phial, and float on the ſurface of the water: this is the æther.

Spirit of Wine combined with Spirit of Nitre.
Sweet Spirit of Nitre.

INTO an Engliſh retort of cryſtal glaſs put ſome highly rectified ſpirit of wine; and, by means of a glaſs funnel with a long pipe let fall into your ſpirit of wine a few drops of the ſmoking ſpirit of nitre. There will ariſe in the retort an effervеſcence attended with heat, red vapours, and a hiſſing noiſe like that of a live coal quenched in water. Shake the veſſel a little, that the liquors may mix thoroughly, and that the heat may be equally communicated to the whole. Then add more ſpirit of nitre, but in a very ſmall quantity, and with the ſame precautions as before. Continue thus adding ſpirit of nitre, by little and little at a time, till you have put into the retort a quantity equal to a third part of your ſpirit of wine. Let this mixture ſtand quiet, in a cool place, for ten or twelve hours; then ſet it to digeſt in a very gentle warmth for eight or ten days, having firſt luted on a receiver to the retort.

During this time a ſmall quantity of liquor will come over into the receiver, which muſt be poured back into the retort. Then diſtill with a ſomewhat ſtronger degree of heat, but ſtill very gently, till nothing be left in the retort but a thick matter. In the receiver you will find a ſpirituous liquor, of a quick grateful ſmell, which will excite a very ſmart ſenſation on the tongue, but without any corroſive acrimony. This is the *ſweet ſpirit of nitre*.

Spirit of Wine combined with the Acid of Sea-ſalt.
Dulcified Spirit of Salt.

MIX together, little by little, in a glaſs retort, two parts of ſpirit of wine with one part of ſpirit of ſalt Set this mixtnre to digeſt for a month in a gentle heat, and diſtill it, till nothing remain in the retort but a thick matter.

The acid of ſea-ſalt is much leſs diſpoſed to unite with inflammable matters than the other two mineral acids; and therefore, though it be ever ſo highly concentrated when mixed with ſpirit of wine, it never produces effervеſcence comparable to that which is produced by the ſpirit of nitre. Neither the proportion nor ſtrength of the ſpirit of ſalt, requiſite to prepare the ſweet ſpirit of ſalt, are unanimouſly agreed upon by authors. Some direct equal parts ot the two liquors; while others preſcribe from two to four or five parts of ſpirit of wine to one part of ſpirit of ſalt. Some uſe only common ſpirit of ſalt; others require the ſmoking ſpirit diſtilled by means of ſpirit of vitriol. Laſtly, ſome order the mixture to be diſtilled, after ſome days digeſtion; and others content themſelves with barely digeſting it. The whole depends on the degree of ſtrength which the ſweet ſpirit of ſalt is intended to have. This compoſition, as well as the ſweet ſpirit of nitre, is eſteemed in medicine to be very aperitive and diuretic.

When the mixture of ſpirit of ſalt and ſpirit of wine is diſtilled, there comes over but one liquor, which appears homogeneous. This is the *ſweet ſpirit of ſalt*. The nature of the marine acid is not changed in this combination: the acid is only weakened and rendered more mild; but in other reſpects it retains its characteriſtic properties.

Oils, or Oily matters, that are ſoluble in Spirit of Wine, ſeparated from Vegetables, and diſſolved by means of that Menſtruum. Tinctures; Elixirs; Varniſhes. Aromatic ſtrong waters.

PUT into a matras the ſubſtances from which you intend to extract a tincture, having firſt pounded them, or pulveriſed them if they are capable of it. Pour upon them ſpirit of wine to the depth of three fingers breadth. Cover the matras with a piece of wet bladder, and tie it on with packthread. Make a little hole in this bit of bladder with a pin, leaving it in the hole to keep it ſtopped. Set the matras in a ſand-bath very gently heated. If the ſpirit of wine diſſolve any part of the body, it will accordingly acquire a deeper or lighter colour. Continue the digeſtion till you perceive that the ſpirit of wine gains no more colour. From time to time pull out the pin, to give vent to the vapours, or rarefied air, which might otherwiſe burſt the matras. Decant your ſpirit of wine, and keep it in a bottle well corked. Pour on ſome freſh ſpirit in its ſtead: digeſt as before; and go on in this manner, pouring on and off freſh ſpirit of wine, till the laſt come off colourleſs.

Spirit of wine impregnated with ſuch parts of any vegetable ſubſtance as it is capable of diſſolving, is commonly called a *tincture*. Several tinctures mixed together, or a tincture drawn from ſundry vegetable ſubſtances at the ſame time, and in the ſame veſſel, take the name of an *elixir* Tinctures of elixirs impregnated with reſinous matters only, are true *varniſhes*. All theſe preparations are made in the ſame manner; to wit, as directed in our proceſs. We ſhall only add here, that if the ſubſtances from which a tincture or elixir is to be made contain too much moiſture, it is proper to free them from it by gentle deſiccation; eſpecially if you deſign that the tincture ſhould be well impregnated with the oily and reſinous parts: for their exceſs of moiſture uniting with the ſpirit of wine would weaken it, and render it unable to act on thoſe matters, which it cannot diſſolve when it is aqueous.

If your tinctures or elixirs be not ſo ſtrong or ſo ſaturated as you deſire, you may by diſtillation abſtract part of the ſpirit of wine which they contain, and by that means give them ſuch a degree of thickneſs as you judge proper. But the ſpirit of wine thus drawn off conſtantly carries along with it a good deal of the aromatic principle. It is a truly *aromatic ſtrong water*. This ſpirit of wine alſo carries up with it a portion of thin oil, which is ſo much the more conſiderable as the degree of heat employed is greater: and this is the reaſon why it becomes of a milky colour when mixed with water.

If you intend to make an aromatic ſtrong water only, you need not previouſly extract a tincture from the vegetable ſubſtance with which you mean to prepare your water: you need only put it in a cucurbit, pour ſpirit of wine upon it, and diſtil with a gentle heat. By this means you will obtain a ſpirit of wine impregnated with all the odour of the plant.

Of TARTAR.

Tartar analyſed by diſtillation. The Spirit, Oil, and Alkaline Salt of Tartar.

INTO a ſtone retort, or a glaſs one coated with lute, put ſome white tartar broken into ſmall bits; obſerving that one half, or at leaſt a full third, of the veſſel be left empty. Set your retort in a reverberating furnace. Fit on a large ballon, having a ſmall hole drilled in it; lute it exactly with fat lute, and ſecure the joint with a linen cloth ſmeared with lute made of quick-lime and the white of an egg. Apply at firſt an exceeding gentle heat, which will raiſe a limpid, ſouriſh, pungent water, having but little ſmell, and a bitteriſh taſte.

When this firſt phlegm ceaſes to come off, increaſe your fire a little, and make the degree of heat nearly equal to that of boiling water. A thin, limped oil will riſe, accompanied with white vapours, and with a prodigious quantity of air, which will iſſue out with ſuch impetuoſity, that if you do not open the little hole in the receiver time enough to give it vent, it will burſt the veſſels with exploſion. An acid liquor will riſe at the ſame time. Continue the diſtillation, increaſing the heat by inſenſible degrees, and frequently unſtopping the little hole of the receiver, till the elaſtic vapours ceaſe to iſſue, and the oil to diſtil.

Then raiſe your fire more boldly. The acid ſpirit will continue to riſe, and will be accompanied with a black, fetid, empyreumatic, ponderous, and very thick oil. Urge the fire to the utmoſt extremity ſo that the retort may be of a perfect red heat. This violent fire will raiſe a little volatile alkali, beſides a portion of oil as thick as pitch. When the diſtillation is finiſhed, you will find in the retort a black, ſaline, charred matter, which grows hot when wetted, attracts the moiſture of the air, runs *per deliquium*, and hath all the properties of a fixed alkali.

The maſs, being expoſed to a naked fire in the open air, burns, conſumes, and is reduced to a white aſh, which is a fiery, cauſtic, fixed alkali.

The lees of wine reſemble tartar, in as much as they contain, and yield when analiſed, the ſame principles; but they differ from it in this, that they contain, moreover, a greater quantity of earth, of phlegm, and a little ardent ſpirit, which are only mixed, but not united, with its tartarous acid.

The Depuration of Tartar. Cream and Cryſtals of Tartar.

REDUCE to a fine powder the tartar you intend to purify, and boil it in twenty five or thirty times as much water. Filter the boiling liquor through a flannel bag, and then gently evaporate ſome part of it: there will ſoon form on its ſurface a ſaline cruſt, which is the *cream of tartar*. Let your liquor cool, and there will adhere to the ſides of the veſſel a great quantity of a cryſtalliſed ſaline matter, which is *cryſtal of tartar*.

Cryſtal of Tartar combined with ſeveral Subſtances.

Cryſtal of Tartar combined with Abſorbent Earths. Soluble Tartars.

BOIL an abſorbent earth, ſuch as chalk, in a pan with water; and, when you perceive the earth thoroughly divided and equally diſtributed through the water, throw into the pan, from time to time, ſome pulveriſed cryſtal of tartar, which will excite a conſiderable efferveſcence. Continue theſe projections, till you obſerve no efferveſcence excited thereby. All the abſorbent earth, which obſcured the tranſparency of the water, and gave it an opaque white colour, will gradually diſappear as the cryſtal of tartar combines with it; and when the combination is perfected, the liquor will be clear and limpid. Then filter it, and there will be left on the filter but a very ſmall quantity of earth. Evaporate all the filtered liquor with a gentle heat; and then ſet it in a cool place to ſhoot. Cryſtals will form therein, having the figure of flat quadrangular priſms, with almoſt always one, ſometimes two, of the angles of the priſm ſhaved down, as it were; and then the ſurfaces at each end are oblique anſwering to thoſe depreſſed angles. Theſe cryſtals are a neutral ſalt which readily diſſolves in water; a true *ſoluble tartar*.

Cryſtal of Tartar combined with fixed Alkalis. The Vegetable Salt. Saignette's Salt. The decompoſition of Soluble Tartars.

IN eight parts of water diſſolve one part of a very pure alkaline ſalt, perfectly freed from the phlogiſton by calcination. Heat this lixivium in a ſtone pan ſet on a ſand-bath, and from time to time throw into it a little powdered cream or cryſtal of tartar. Each projection will excite a great efferveſcence, attended with many bubbles, which will riſe to a conſiderable height one over the other. Stir the liquor when the efferveſcence ceaſes, and you will ſee it begin again.

When no efferveſcence appears upon ſtirring the liquor, add a little more cream of tartar, and the ſame phenomena will be renewed. Go on thus till you have obtained the point of perfect ſaturation.

Then filter your liquor. If the alkali you made uſe of was the ſalt of Soda, evaporate your liquor quickly to a pellicle, and there will ſhoot in it cryſtals of nine ſides reſembling a coffin; the bottom part thereof being concave, and ſtreaked with a great many parallel lines; and this is *Saignette's ſalt*. If you have employed any other alkali but ſoda, or the baſis of ſea-ſalt, evaporate your liquor ſlowly to the conſiſtence of a ſyrup: let it ſtand quiet, and there will form in it cryſtals having the figure of flatted parallelopipeds; and this is the *vegetable ſalt*, or *tartariſed tartar*.

All ſoluble tartars are eaſily decompounded, by means of a certain degree of heat. They yield in diſtillation the ſame principles as tartar; and the alkali that remains, when they are perfectly calcined, conſiſts of that which the tartar naturally affords, and of the alkaline matter with which it was converted into a neutral ſalt.

Cryſtal of Tartar combined with Iron. Chalybeated Tartar. Tincture of Steel with Tartar. Soluble Chalybeated Tartar.

MIX four ounces of iron in filings with one pound of white tartar finely pulveriſed, Boil the mixture in about twelve times as much water as you took of tartar. When the ſaline part of the tartar is diſſolved, filter the liquor boiling-hot through a flannel bag, and then ſet it in a cool place. In a very little time cryſtals of a ruſſet colour will ſhoot therein. Decant the liquor from theſe cryſtals; evaporate it to a pellicle, and ſet it again to cryſtalliſe. Go on in this manner till it will ſhoot no more. Collect all the ſalt you have thus obtained, and keep it under the name of *chalybeated tartar*.

To make the tincture of ſteel with tartar, mix together ſix ounces of clean iron filings, and one pound of white tartar in powder. Put this mixture into a large iron kettle, and pour thereon as much rain-water as will moiſten it. Make a paſte of this matter, and leave it thus in a maſs for twenty-four hours. Then pour on it twelve pounds of rain-water, and boil the whole for twelve hours at leaſt, ſtirring the mixture frequently, and adding from time to time ſome hot water, to ſupply the place of what evaporates. When you have thus boiled the liquor, let it ſtand quiet for ſome time, and then pour it off from the ſediment at bottom. Filter, and evaporate to the conſiſtence of a ſyrup; and you have the *tincture of Mars with tartar*. The diſpenſatories generally order an ounce of rectified ſpirit of wine to be poured on this tincture, in order to preſerve it, and to keep it from growing mouldy, as it is very apt to do.

Soluble chalybeated tartar is prepared by mixing four ounces of tartariſed tartar with one pound of the tincture of Mars with tartar, and evaporating them together in an iron veſſel to dryneſs; after which it is kept in a well ſtopped phial to prevent its growing moiſt in the air.

Cryſtal of Tartar combined with the reguline part of Antimony. Stibiated or Emetic tartar.

PULVERISE and mix together equal parts of the glaſs and of the liver of antimony. Put this mixture, with the ſame quantity of pulveriſed cream of tartar, into a veſſel capable of containing as much water as will diſſolve the cream of tartar. Boil the whole for twelve hours, from time to time adding warm water, to replace what is diſſipated by evaporation. Having thus boiled your liquor, filter it while boiling hot; evaporate to dryneſs; and you will have a ſaline matter, which is *emetic tartar*.

Of the Product of Acetous Fermentation.

Subſtances ſuſceptible of the Acetous Fermentation turned into Vinegar.

THE wine, the cyder, or the malt-liquor, you intend to convert into vinegar, being firſt thoroughly mixed with its lees, and with the tartar it may have depoſited, put your liquor into a fat uſed before either for making or for holding vinegar. This veſſel muſt not be quite full, and the external air muſt have acceſs to the liquor contained in it. Set it where the air may have a degree of warmth anſwering nearly to the twentieth degree above 0 in Mr de Reaumur's thermometer. Stir the liquor from time to time. There will ariſe in it a new fermentative motion, accompanied with heat: its vinous odour will gradually change, and turn to a ſour ſmell, which will become ſtronger and ſtronger till the fermentation be finiſhed and ceaſe of itſelf. Then ſtop your veſſel cloſe; the liquor it contains will be found converted into vinegar.

All ſubſtances that have undergone the ſpirituous fermentation are capable of being changed into an acid by paſſing through this ſecond fermentation, or this ſecond ſtage of fermentation. Spirituous liquors, ſuch as wine, cyder, beer, being expoſed to a hot air, grow ſour in a very ſhort time. Nay, theſe liquors, though kept with all poſſible care, in very cloſe veſſels, and in a cool place, degenerate at laſt, change their natures, and inſenſibly turn ſour. Thus the product of ſpirituous fermentation naturally and ſpontaneouſly degenerates to an acid.

For this reaſon it is of great importance, in making wine, or any other vinous liquor, to ſtop the fermentation entirely, if you deſire the wine ſhould contain as much ſpirit as poſſible. It is even more advantageous to check the fermentation a little before it come to the height than afterwards: becauſe the fermentation, tho' ſlackened and in appearance totally ceaſed, ſtill continues in the veſſels; but in a manner ſo much the leſs perceptible as it proceeds more ſlowly. Thus thoſe liquors, in which the fermentation is not quite finiſhed, but checked, continue for ſome time to gain more ſpirit; whereas, on the contrary, they degenerate and gradually turn ſour, if you let the ſpirituous fermentation go on till it be entirely finiſhed.

The production of the ſecond fermentation, which we are now to conſider, is an acid of ſo much the greater ſtrength, the ſtronger and more generous the ſpirituous liquor in which it is excited originally was. The ſtrength of this acid, commonly called *vinegar*, depends likewiſe in a great meaſure on the methods uſed in fermenting the vinous liquor, in order to convert it into vinegar: for if it be fermented in broad, flat veſſels, and left to grow ſour of itſelf, the ſpirituous parts will be diſſipated, and the liquor be ſour indeed, but vapid and effete.

The vinegar-makers, to increaſe the ſtrength of their vinegar, uſe certain methods of which they make a myſtery, keeping them very ſecret. However, Mr. Boerhaave give us, from ſome authors, the following deſcription of a proceſs for making vinegar:

"Take two large oaken vats or hogſheads, and in each of theſe place a wooden grate or hurdle, at the diſtance of a foot from the bottom. Set the veſſel upright, and on the grates place a moderately cloſe layer of green twigs, or freſh cuttings of the vine. Then fill up the veſſel with the foot-ſtalks of grapes, commonly called the *rape*, to within a foot of the top of the veſſel, which muſt be left quite open.

"Having thus prepared the two veſſels, pour into them the wine to be converted into vinegar, ſo as to fill one of them quite up, and the other but half full. Leave them thus for twenty-four hours, and then fill up the half-filled veſſel with liquor from that which is quite full, and which will now in its turn be left only half full. Four and twenty hours afterwards repeat the ſame operation, and go on thus, keeping the veſſels alternately full and half full during every twenty-four hours, till the vinegar be made. On the ſecond or third day there will ariſe, in the half-filled veſſel, a fermentative motion, accompanied with a ſenſible heat, which will gradually increaſe from day to day. On the contrary, the fermenting motion is almoſt imperceptible in the full veſſel; and as the two veſſels are alternately full and half full, the fermentation is by that means, in ſome meaſure, interrupted, and is only renewed every other day, in each veſſel.

"When this motion appears to be entirely ceaſed, even in the half-filled veſſel, it is a ſign that the fermentation is finiſhed; and therefore the vinegar is then to be put into common caſks cloſe ſtopped, and kept in a cool place.

"A greater or leſs degree of warmth accelerates or checks this, as well as the ſpirituous fermentation. In France it is finiſhed in about fifteen days, during the ſummer; but if the heat of the air be very great, and exceed the twenty-fifth degree of Mr de Réaumur's thermometer, the half-filled veſſel muſt be filled up every twelve hours; becauſe if the fermentation be not ſo checked in that time, it will become ſo violent, and the liquor will be ſo heated, that many of the ſpirituous parts, on which the ſtrength of the vinegar depends, will be diſſipated; ſo that nothing will remain, after the fermentation, but a vapid waſh, ſour indeed, but effete. The better to prevent the diſſipation of the ſpirituous parts, it is a proper and uſual precaution to cloſe the mouth of the half-filled veſſel, in which the liquor ferments, with a cover made alſo of oak wood. As to the full veſſel, it is always left open, that the air may act freely on the liquor it contains: for it is not liable to the ſame inconveniences, becauſe it ferments but very ſlowly."

The vine-cuttings and grape-ſtalks, which the vinegar-makers put into their veſſels, ſerve to increaſe the ſtrength of the liquor. Theſe matters contain a very manifeſt and perceptible acid. They alſo ſerve as a ferment; that is, they diſpoſe the wine to become eager more expeditiouſly and more vigorouſly. They are the better and the more efficacious for having been once uſed, becauſe they are thereby thoroughly drenched with the fermented acid: and therefore the vinegar-makers lay them by for preparing other vinegar, after waſhing them nimbly in running water, in order to free them from a viſcid oily matter which ſettles on them during the fermentation. This matter muſt by all means be removed; becauſe it is diſpoſed to grow mouldy and rot; ſo that it cannot but be prejudicial to any liquor in which you put it.

As the acetous fermentation differs from the ſpirituous in its production, ſo it doth in many circumſtances attending it. 1. Motion and agitation are not prejudicial to the acetous fermentation, as they are to the ſpirituous; on the contrary, moderate ſtirring, provided it be not continual, is of ſervice to it. 2. This fermentation is accompanied with remarkable heat; whereas the warmth of the ſpirituous fermentation is ſcarce ſenſible. 3. We do not believe there ever was an inſtance of the vapour that riſes from a liquor in acetous fermentation proving noxious, and producing either diſorders or ſudden death, as the vapour of fermenting wine doth. 4. Vinegar depoſites a viſcid oily matter, as hath juſt been obſerved, very different from the lees and tartar of wine. Vinegar never depoſites any tartar; even though new wine, that hath not yet depoſited its tartar, ſhould be uſed in making it.

To concentrate Vinegar by Froſt.

Expose to the air, in froſty weather, the vinegar you deſire to concentrate. Icicles will form in it; but the whole liquor will not freeze. Take out thoſe icicles: and if you deſire a further concentration of your vinegar by this method, the liquor which did not freeze the firſt time muſt be expoſed to a ſtronger froſt. More icicles will form therein, which muſt likewiſe be ſeparated, and kept by themſelves. The liquor which doth not freeze this ſecond time will be a very ſtrong concentrated vinegar.

Vinegar analyſed by Diſtillation.

Into a glaſs or ſtone cucurbit put the vinegar to be diſtilled; fit to it a glaſs head; place your alembic in the ſand-bath of a diſtilling furnace, and lute on a receiver. Apply a very gentle heat at firſt. A clear, limpid, light liquor will riſe, and fall in diſtinct drops, like water, from the noſe of the alembic.

Continue diſtilling this firſt liquor, till the vinegar contained in the cucurbit be diminiſhed about a fourth part. Then ſhift your receiver, and increaſe the fire a little. A clear liquor will ſtill come over, but heavier and more acid than the former. Diſtil in this manner till you have drawn off into your ſecond receiver two thirds of the liquor that was left in the cucurbit.

A thick matter will now remain at the bottom of the ſtill: put it into a retort; lute on a receiver; ſet your retort in a reverberating furnace, and diſtil with degrees of fire. There will come over a limpid liquor, very acid and ſharp, yet ponderous, and requiring a great degree of fire to raiſe it; on which account it makes the receiver very hot. It hath a ſtrong empyreumatic ſmell When the diſtillation begins to ſlacken, increaſe your fire. There will riſe an oil of a fetid, quick ſmell. At laſt, when nothing more will riſe with the ſtrongeſt fire, break the retort, and in it you will find a black charred matter: burn it, and from the aſhes lixiviated with water you will obtain a fixed alkali.

The Acid of Vinegar combined with different Subſtances.

The Acid of Vinegar combined with Alkaline Subſtances. Foliated Salt of Tartar, or regenerated Tartar. Decompoſition of that Salt.

INTO a glaſs cucurbit put ſome very pure and well dried ſalt of tartar; and pour on it ſome good diſtilled vinegar, by little and little at a time. An effervеſcence will ariſe. Pour on more vinegar, till you attain the point of ſaturation. Then fit a head to the cucurbit; ſet it in a ſand bath; and, having luted on a receiver, diſtil with a gentle heat, and very ſlowly, till nothing remain but a dry matter. On this reſiduum drop a little of the ſame vinegar; and if any effervеſcence appears, add more vinegar till you attain the point of ſaturation, and diſtil again as before. If you obſerve no effervеſcence, the operation was rightly performed.

It is not eaſy to hit the exact point of ſaturation in preparing this neutral ſalt; becauſe the oily parts, with which the acid of vinegar is loaded, hinder it from acting ſo briſkly and readily as it would do, if it were as pure as the mineral acids: and for this reaſon it often happens, that, when we have nearly attained the point of ſaturation, the addition of an acid makes no ſenſible effervеſcence, though the alkali be not yet entirely ſaturated; which deceives the operator, and makes him conclude erroneouſly that he hath attained the true point of ſaturation.

But he eaſily perceives his miſtake, when, after having ſeparated from this ſaline compound all its ſuperfluous moiſture by diſtillation, he drops freſh vinegar upon it: for then the ſalts being more concentrated, and conſequently more active, produce an effervеſcence, which would not have been ſenſible if this laſt portion of acid, inſtead of coming into immediate contact with the dried alkali, could not have mixed therewith till diffuſed through, and in a manner ſuffocated by that phlegm from which the acid of the vinegar before neutraliſed was gradually ſeparated by its combining with the alkali; that phlegm keeping in ſolution both the neutral ſalt already formed, and the alkali not yet ſaturated. And for this reaſon it is neceſſary to try, after the firſt deſiccation of this ſalt, which is called *regenerated tartar*, whether or no the juſt point of ſaturation hath been attained.

From what hath been ſaid, concerning the deſiccation of this neutral ſalt, it is plain, that the uſe of it is only to free the ſalt from the great quantity of ſuperfluous moiſture wherein it is diſſolved: which proves, that the acid of vinegar, like all other acids diſſolved in much water, is ſeparated from moſt of this redundant phlegm by being combined with a fixed alkali. And hence we muſt conclude, that the acid of vinegar, contained in regenerated tartar deſiccated, is vaſtly ſtronger and more concentrated than it was before.

Though the acid of vinegar is freed, by combining with a fixed alkali, from a great quantity of ſuperfluous phlegm, yet the oily parts with which it is entangled ſtill cleave to it: theſe parts are not ſeparated from it by its converſion into a neutral ſalt, but, without quitting it, combine alſo with the fixed alkali; and this gives regenerated tartar a ſaponaceous quality, and ſeveral other peculiar properties.

Regenerated tartar, when dried, is of a brown colour. It is ſemi-volatile; melts with a very gentle heat, and then reſembles an unctuous liquor; which indicates its containing an oil: when caſt upon live coals, it flames; and, when diſtilled with a ſtrong heat, yields an actual oil; all which evidently proves the exiſtence of that oil.

This ſalt is ſoluble in ſpirit of wine; a quality which it probably owes alſo to its oil. It requires about ſix parts of ſpirit of wine to diſſolve it; and the diſſolution ſucceeds very well in a matras, with the help of a gentle warmth. If the ſpirit of wine be abſtracted from this ſolution, by diſtilling with a ſmall fire, it remains at the bottom of the cucurbit, in the form of a dry ſubſtance compoſed of leaves lying one upon another; which hath procured it the name of *terra foliata tartari*, or *foliated ſalt of tartar*.

It is not abſolutely neceſſary that regenerated tartar be diſſolved in ſpirit of wine to make the foliated ſalt: for it may be procured in this form only by evaporating the water in which it is diſſolved. But the operation ſucceeds better with ſpirit of wine; probably becauſe the ſucceſs thereof depends on uſing an exceeding gentle warmth: now ſpirit of wine evaporates with much leſs heat than water.

Regenerated tartar may alſo be cryſtalliſed. If you deſire to have it in this form, combine the acid with the alkali to the point of ſaturation; evaporate the liquor ſlowly to the conſiſtence of a ſyrup, and ſet it in a cool place; where it will ſhoot into cluſters of cryſtals lying one upon another like feathers.

Vinegar perfectly diſſolves abſorbent matters alſo, and particularly thoſe of the animal kingdom; ſuch as corals, crabs eyes, pearls, *&c.* In order to a diſſolution of ſuch matters, you muſt pulveriſe them, put them into a matras, and pour on them ſpirit of vinegar to the depth of four fingers breadth: an effervеſcence will ariſe: when that is over, ſet the mixture to digeſt two or three days in a ſand-bath; then decant the liquor, filter it, and evaporate it to dryneſs with a very gentle heat. The matter which remains is called *ſalt of coral*, *of pearls*, *of crabs-eyes*, &c. according to the ſubſtances diſſolved. If, inſtead of evaporating the liquor, a fixed alkali be mixed therewith, the abſorbent matter, that was diſſolved by the acid, will precipitate in the form of a white powder, which is called the *magiſtery of coral, of pearls*, &c.

The Acid of Vinegar combined with copper. Verdegris. Cryſtals of Copper. This Combination decompounded. Spirit of Verdegris.

INTO a large matras put verdegris in powder. Pour on it diſtilled vinegar to the depth of four fingers breadth. Set the matras in a moderate ſand-heat, and leave the whole in digeſtion, ſhaking it from time to time. The vinegar will acquire a very deep blue-green colour. When the liquor is ſufficiently coloured, pour it off by inclination. Put ſome freſh vinegar into the matras; digeſt as before; and decant the liquor again when it is ſufficiently coloured. Proceed in this manner till the vinegar will extract no more colour. There will remain in the matras a conſiderable quantity of undiſſolved matter. The vinegar thus impregnated with verdegris is called *tincture of copper*.

Mix theſe ſeveral tinctures, and evaporate them with a gentle heat to a pellicle. Then ſet the liquor in a cool place: in the ſpace of a few days a great many cryſtals of a moſt beautiful green colour will ſhoot therein, and ſtick to the ſides of the veſſel. Pour off the liquor from the cryſtals; evaporate it again to a pellicle, and ſet it by to cryſtalliſe. Continue theſe evaporations and cryſtalliſations, till no more cryſtals will ſhoot in the liquor. Theſe are called *cryſtals of copper*, and are uſed in painting. To this combination of the acid of vinegar with copper the painters and dealers have given them the title of *diſtilled verdegris*.

Verdegris is prepared at Montpellier. To make it they take very clean plates of copper, which they lay, one over another, with huſks of grapes between, and after a certain time take them out. Their ſurfaces are then covered all over with a very beautiful green cruſt, which is *verdegris*. This verdegris is nothing but copper corroded by the acid of tartar, analogous to the acid of vinegar, which abounds in the wines of Languedoc, and eſpecially in the rape, huſks, and ſtones of grapes that have a very auſtere taſte. Verdegris is a ſort of ruſt of copper, or copper corroded and opened by the acid of wine, but not yet converted entirely into a neutral ſalt: for it is not ſoluble in water, nor does it cryſtalliſe. This ariſes from its not being united with a ſufficient quantity of acid. The deſign of the operation here deſcribed is to furniſh the verdegris with the quantity of acid requiſite to make it a true metallic ſalt; for which purpoſe diſtilled vinegar is very fit.

Cryſtals of copper may be obtained, without employing verdegris, by making uſe of copper itſelf diſſolved by the acid of vinegar, according to the method practiſed with reſpect to lead as ſhall be ſhewn hereafter. But verdegris is generally uſed, becauſe it diſſolves ſooneſt; it being a copper already half diſſolved by an acid correſpondent to that of vinegar.

Cryſtals of copper are decompounded by the action of fire alone, without any additament; becauſe the acid of vinegar adheres but looſely to copper. In order to decompound this ſalt, and extract its acid, it muſt be put into a retort, and diſtilled in a reverberatory furnace with degrees of fire. An inſipid phlegm riſes firſt, which is the water retained by the ſalt in cryſtalliſing. This phlegm is ſucceeded by an acid liquor, which riſes in the form of white vapours that fill the receiver. Towards the end of the diſtillation the fire muſt be violently urged, in order to raiſe the ſtrongeſt and moſt fixed acid. At laſt there remains in the retort a black matter, which is nothing but copper, that may be reduced by melting it in a crucible with one part of ſaltpetre and two parts of tartar. A ſimilar acid, but more oily, and in a much ſmaller quantity, may be obtained from verdegris by diſtillation.

The acid, which in this diſtillation comes over after the firſt phlegm, is an exceeding ſtrong and concentrated vinegar. It is known by the title of *ſpirit of verdegris*.

The Acid of Vinegar combined with Lead. Ceruſe. Salt or Sugar of Lead. This Combination decompounded.

INTO the glaſs head of a cucurbit put thin plates of lead, and ſecure them ſo that they may not fall out when the head is put upon the cucurbit. Fit on this head to a wide-mouthed cucurbit containing ſome vinegar. Set it in a ſand-bath; lute on a receiver, and diſtil with a gentle heat for ten or twelve hours. Then take off the head: in it you will find the leaden plates covered, and, in a manner, cruſted over with a white matter. This being bruſhed off with a hare's foot is what we call *ceruſe*. The leaden plates thus cleanſed may be employed again for the ſame purpoſe, till they be wholly converted into ceruſe by repeated diſtillations. During the operation there will come over into the receiver a liquor ſomewhat turbid and whitiſh. This is a diſtilled vinegar in which ſome lead is diſſolved.

Reduce a quantity of ceruſe into powder; put it into a matras; pour on it twelve or fifteen times as much diſtilled vinegar; ſet the matras in a ſand-bath; leave the matter in digeſtion for a day, ſhaking it from time to time: then decant your liquor, and keep it apart. Pour freſh vinegar on what is left in the matras, and digeſt as before. Proceed thus till you have diſſolved one half, or two thirds, of the ceruſe.

Evaporate to a pellicle the liquors you poured off from the ceruſe, and ſet them in a cool place. Greyiſh cryſtals will ſhoot therein. Decant the liquor from the cryſtals; evaporate it again to a pellicle, and ſet it by to cryſtalliſe. Proceed thus evaporating and cryſtalliſing, as long as any cryſtals will ſhoot. Diſſolve your cryſtals in diſtilled vinegar, and evaporate the ſolution, which will then ſhoot into whiter and purer cryſtals. This is the *ſalt*, or *ſugar of lead*.

Lead is eaſily diſſolved by the acid of vinegar. If it be barely expoſed to the vapour of that acid, its ſurface is corroded, and converted into a kind of calx or white ruſt, much uſed in painting, and known by the name of *ceruſe*, or *white lead*. But this preparation of lead is not combined with a ſufficient quantity of acid to convert it into a ſalt: it is no more than lead divided and opened by the acid of vinegar; a matter which is to lead what verdegris is to copper. And therefore if you deſire to combine ceruſe with the quantity of acid neceſſary to convert it into a true neutral ſalt, you muſt treat it in the ſame manner as we did verdegris in order to procure cryſtals of copper; that is, you muſt diſſolve it in diſtilled vinegar, as the proceſs directs.

The ſalt of lead is not very white when it firſt ſhoots; and for this reaſon it is diſſolved again in diſtilled vinegar, and cryſtalliſed a ſecond time. If ſalt of lead be repeatedly diſſolved in diſtilled vinegar, and the liquor evaporated, it will grew thick; but ſtill cannot be deſiccated without great difficulty. If the ſame operation be oftener repeated, this quality will be thereby more and more increaſed; till at laſt it will remain on the fire like an oil or melted wax: it coagulates as it cools, and then looks, at firſt ſight, like a metallic maſs, ſomewhat reſembling ſilver. This matter runs with a very gentle heat, almoſt as eaſily as wax.

The ſalt of lead hath a ſaccharine taſte, which hath procured it the name alſo of ſugar of lead. For this reaſon, when wine begins to turn ſour, the ſure way to cure it of that diſagreeable taſte, is to ſubſtitute a ſweet one which is not diſagreeable to the taſte, by mixing therewith ceruſe, litharge, or ſome ſuch preparation of lead; for the acid of the wine diſſolves the lead, and therewith forms a ſugar of lead, which remains mixed with the wine, and hath a taſte which, joined with that of the wine, is not unpleaſant. But, as lead is one of the moſt dangerous poiſons we know, this method ought never to be practiſed; and whoever uſes ſuch a pernicious drug deſerves to be moſt ſeverely puniſhed. Yet ſome thing very like this happens every day, and muſt needs have very bad conſequences; while there is nobody to blame, and thoſe to whom the thing may prove fatal can have no miſtruſt of it.

Salt of lead may be decompounded by diſtillation without additament. In order to perform this, you muſt put the ſalt of lead into a glaſs or ſtone retort, leaving a full third thereof empty, and diſtil in a reverberating furnace with degrees of fire. A ſpirit riſes, which fills the receiver with clouds. When nothing more will come over with a fire that makes the retort red-hot, let the veſſels cool, and then unlute them. You will find in the receiver an auſtere liquor, which is inflammable; or, at leaſt, an inflammable ſpirit may be obtained from it, if about one half thereof be drawn off by diſtillation in a glaſs alembic. The retort in which the ſalt of lead was decompounded contains, at the end of the operation, a blackiſh matter: this is lead, which will reſume its metallic form on being melted in a crucible; becauſe the acid by which it was diſſolved, and from which it hath been ſeparated, being of a very oily nature, hath left in it a ſufficient quantity of phlogiſton.

What is moſt remarkable in this decompoſition of ſalt of lead, is the inflammable ſpirit which it yields, though the vinegar which entered into the compoſition of the ſalt ſeemed to contain none at all.

Of the Putrid Fermentation of Vegetable Subſtances.

The Putrefaction of Vegetables.

Fill a hogſhead with green plants, and tread them down a little; or, if the vegetables be dry and hard ſubſtances, divide them into minute parts, and ſteep them a little in water to moiſten them: then leave them, or the green plants, in the veſſel, uncovered and expoſed to the open air. By degrees a heat will ariſe in the center of the veſſel, which will continue increaſing daily, at laſt grow very ſtrong, and be communicated to the whole maſs. As long as the heat is moderate, the plants will retain their natural ſmell and taſte. As the heat increaſes, both theſe will gradually alter, and at laſt become very diſagreeable, much like thoſe of putrid animal ſubſtances. The plants will then be tender as if they had been boiled; or even be reduced to a kind of pap, more or leſs liquid according to the quantity of moiſture they contained before.

Almoſt all vegetable matters are ſuſceptible of putrefaction; but ſome of them rot ſooner, and others more ſlowly. As putrefaction is only a ſpecies of fermentation, the effect whereof is to change entirely the ſtate of the acid, by combining it with a portion of the earth and oil of the mixt, which are ſo attenuated that from this union there reſults a new ſaline ſubſtance in which no acid is diſcernible; which on the contrary hath the properties of an alkali, but rendered volatile; it is plain, that, the nearer the acid of a plant ſet to putrefy is to this ſtate, the ſooner will the putrefaction of that plant be completed. Accordingly all plants that contain a volatile alkali ready formed, or from which it can be obtained by diſtillation, are the moſt diſpoſed to putrefaction.

Thoſe plants, in which the acid is very manifeſt and ſenſible, are leſs apt to putrefy; becauſe all their acid muſt undergo the change above ſpecified. But vegetable matters, whoſe acid is entangled and clogged by ſeveral of their other principles, muſt be ſtill longer elaborated before they can be reduced to the condition into which complete putrefaction brings all vegetables. The earthy and oily parts, in which the acids of theſe ſubſtances are ſheathed, muſt be attenuated and divided by a previous fermentation, which, of thoſe parts ſubtiliſed and united with the acid, forms an ardent ſpirit, wherein the acid is more perceptible than in the almoſt inſipid or ſaccharine juices out of which it is produced. The acid contained in the ardent ſpirit muſt be ſtill further diſengaged, before it can enter into the combination of a volatile alkali: conſequently the ardent ſpirit muſt undergo a ſort of decompoſition; its acid muſt be rendered more ſenſible, and be brought to the ſame condition as the acid of plants in which it manifeſts all its properties.

Hence it appears that the ſpirituous and acetous fermentations are only preparatives which nature makes uſe of for bringing certain vegetable matters to putrefaction. Theſe fermentations therefore muſt be conſidered as advances towards that putrefaction in which they terminate, or rather as the firſt ſtages of putrefaction itſelf.

Putrefied Vegetable Subſtances analyſed.

Put the putrefied plants you mean to analyſe into a glaſs cucurbit, and ſet it in a ſand-bath. Fit to it a head; lute on a receiver; diſtil with a gentle fire, and a limpid fetid liquor will come over. Continue the diſtillation till the matter contained in the retort be almoſt dry.

Then unlute your veſſels, and keep the liquor you find in the receiver by itſelf. Put the matter remaining in the cucurbit into a retort, and diſtil with a graduated heat. There will riſe white vapours; a pretty conſiderable quantity of liquor nearly like that of the former diſtillation; a volatile ſalt in a concrete form; and a black oil, which towards the end will be very thick. In the retort there will remain a black charred matter, which being burnt in the open air will fall into aſhes, from which no fixed alkali can be extracted.

By means of a funnel ſeparate your oil from the aqueous liquor. Diſtil this liquor with a gentle heat. You will by this means obtain a volatile ſalt like that of animals; of which you may alſo get ſome, by the ſame means, from the liquor which came over in the firſt diſtillation.

This analyſis ſhews the changes which putrefaction produces in vegetable matters. Scarce any of their principles are now to be diſcerned. They now yield no aromatic liquor; no eſſential oil; no acid; and conſequently no eſſential ſalt, ardent ſpirit, or fixed alkali: in a word, whatever their natures were before putrefaction, they are all alike when they have once undergone this fermentative motion in its full extent. Nothing can then be obtained from them but phlegm, a volatile alkali, a fetid oil, and an inſipid earth.

Almoſt all theſe changes are owing to the tranſmutation of the acid, which is depraved by putrefaction, and combined with a portion of the oil and ſubtiliſed earth of the mixt; ſo that the reſult of their union is a volatile alkali. Now, as the fixed alkali, found in the aſhes of unputrefied plants, is only the moſt fixed part of their earth and of their acid, cloſely united together by the igneous motion, it is not ſurpriſing, that, when all the acid, with a part of the earth, is ſubtiliſed and volatiliſed by putrefaction, no fixed alkali can be found in the aſhes of putrefied vegetables. The alteration which the acid ſuffers by the putrefactive motion is, in our opinion, the greateſt it can undergo, without being entirely deſtroyed and decompoſed, ſo as to be no longer a ſalt.

Of Operations on ANIMAL SUBSTANCES.

Of MILK.

Milk ſeparated into Butter, Curd, and Whey: Inſtanced in Cow's-Milk.

Put new cow's-milk into a flat earthen pan, and ſet it in a temperate heat. In ten or twelve hours time there will gather on its ſurface a thick matter, of a ſomewhat yellowiſh white: this is called *cream*. Gently ſkim off this cream with a ſpoon, letting the milk you take up with it run off. Put all this cream into another veſſel, and keep it. The milk thus ſkimmed will not be quite ſo thick as before; nor will it be of ſuch a dead white, but have a little blueiſh caſt. If all the cream be not ſeparated from it, more will gather on its ſurface after ſome time, which muſt be taken off as the former. In two or three days the ſkimmed milk will coagulate into a ſoft maſs called *curd*, and then it taſtes and ſmells ſour.

Cut this curd acroſs in ſeveral places. It will immediately diſcharge a large quantity of *ſerum*. Put the whole into a clean linen cloth; hang it up, and underneath it ſet a veſſel to receive the ſerum as it drops. When the aqueous part hath done dripping, there will remain in the filter a white ſubſtance ſomewhat harder than the curdled milk. This ſubſtance is called *cheeſe*, and the *ſerum* ſeparated from it is known by the name of *whey*.

The milk of animals that feed only on vegetables is, of all animal matters, the leaſt removed from the vegetable nature. The truth of this will be demonſtrated by the experiments we ſhall produce by and by, for the further analyſis of milk.

Moſt chemiſts juſtly conſider milk as of the ſame nature with chyle. Indeed there is great reaſon to think, that, except ſome ſmall differences to be afterwards taken notice of, theſe two matters are nearly the ſame. They are both of a dead white colour, like that of an emulſion; which proves that, like emulſions, they conſiſt of an oily matter divided, diffuſed and ſuſpended, but not perfectly diſſolved, in an aqueous liquor.

It is not ſurpriſing that theſe liquors ſhould reſemble emulſions; for they are produced in the ſame manner, and may very juſtly be called *animal emulſions*. For how are vegetable ſubſtances converted into chyle and milk in an animal body? They are bruiſed, divided, and triturated by maſtication and digeſtion, as perfectly, at leaſt, as the matters pounded in a mortar to make an emulſion; and muſt thereby undergo the ſame changes as thoſe matters; that is, their oily parts, being attenuated by thoſe motions, muſt be mixed with and lodged between the aqueous parts, but not diſſolved therein; becauſe they do not, in the bodies of animals, meet with ſaline matters, ſufficiently diſentangled and active, to unite intimately with them, and by that means render them ſoluble in water.

Nevertheleſs, chyle and milk, though produced in the ſame manner as emulſions, and very much reſembling them, differ greatly from them in ſome reſpects; owing chiefly to the time they remain in the bodies of animals, their being heated while there, the elaborations they undergo therein, and the animal juices commixed with them.

New milk hath a mild agreeable taſte, without any ſaline pungency; nor hath any chemical trial diſcovered in it either an acid or an alkali. Yet it is certain, that the juices of plants, out of which milk is formed, contain many ſaline matters, and eſpecially acids: accordingly milk alſo contains the ſame; but the acids are ſo ſheathed and combined, that they are not perceptible. The caſe is the ſame with all the other liquors intended to conſtitute part of an animal body: there is no perceptible acid in any of them.

Hence it may be inferred, that one of the principal changes which vegetables undergo, in order to their being converted into an animal ſubſtance, conſiſts in this, that their acids are combined, entangled, and ſheathed in ſuch a manner, that they become imperceptible, and exert none of their properties.

Milk left to itſelf, without the help of diſtillation, or any additament whatever, undergoes a ſort of decompoſition. It runs into a kind of ſpontaneous analyſis; which doth not indeed reduce it to its firſt principles, yet ſeparates it into three diſtinct ſubſtances, as the proceſs ſhews; namely, into cream, or the buttery fat part, into curd or cheeſe, and into ſerum or whey: which ſhews that thoſe three ſubſtances of which milk conſiſts, are only mixed and blended together, but not intimately united.

The firſt parts, being the lighteſt, riſe gradually to the ſurface of the liquor as they ſeparate from the reſt: and this forms the cream.

Cream, as ſkimmed from the ſurface of milk, is not however the pure buttery or fat part; it is ſtill mixed with many particles of cheeſe and whey, which muſt be ſeparated in order to reduce it into butter. The moſt ſimple, and at the ſame time the beſt method of effecting this, is daily practiſed by the country people. It conſiſts in beating or churning the cream, in a veſſel contrived for that purpoſe, with the flat ſide of a circular piece of wood, in the centre of which a ſtaff is fixed. One would think that the motion, impreſſed one the cream by this inſtrument, ſhould rather ſerve to blend more intimately the particles of butter, cheeſe, and whey, of which it conſiſts, than to ſeparate them from each other; as this motion ſeems perfectly adapted to divide and attenuate thoſe particles. But, if we conſider what paſſes on this occaſion, we ſhall ſoon perceive that the motion by which butter is churned is nothing like triture: for churning is no other, properly ſpeaking, than a continually repeated compreſſion, the effect whereof is to ſqueeze out from amongſt the buttery particles thoſe of cheeſe and whey mixed therewith; by which means the particles of butter are brought into contact with each other, unite, and adhere together.

Milk, whether ſkimmed or no, grows ſour of itſelf, and curdles in a few days. When it is newly curdled, the cheeſe and whey ſeem to be united, and to make but one maſs: but theſe two matters ſeparate ſpontaneouſly from each other, with the greateſt eaſe, and in a very ſhort time.

The acidity, which milk naturally contracts in the ſpace of a few days, muſt be conſidered as the effect of a fermenting motion, which diſcovers in that liquor an acid that was not perceptible before. This, properly ſpeaking, is an acetous fermentation, which milk paſſes through in its way to putrefaction; and it ſoon follows, eſpecially if the milk be expoſed to a hot air.

If, inſtead of leaving milk to grow ſour and curdle of itſelf, an acid be mixed therewith, while it is yet ſweet and newly milked, it immediately coagulates; which gives reaſon to think, that its curdling naturally is the effect of the acid, which diſcovers itſelf therein as it grows ſtale.

The coagulation of milk may alſo be conſiderably accelerated, by ſetting it in a ſand-bath gently heated; or by mixing therewith a little of what, in the language of the dairy, is called *runnet*; which is nothing but ſome curdled and half-digeſted milk taken from the ſtomach of a calf: or both theſe methods may be employed at once, which will produce the effect ſtill more expeditiouſly.

It is not difficult to find out the cauſe of theſe effects. The runnet, which is milk already curdled and grown ſour, is an actual ferment to ſweet milk, diſpoſing it to turn ſour much more readily: for though milk, when thus haſtily curdled by the runnet, hath not a manifeſtly acid taſte, yet it is certain that this acid begins to exert itſelf. The proof thereof is, that, being expoſed to the ſame degree of heat with milk equally new, that is not mixed with this ferment, it turns ſour much ſooner. As to the effect of heat in coagulating milk, there is nothing extraordinary in it: we know how much it promotes and accelerates all fermentative motion. The whole of this perfectly agrees with what we ſaid before concerning fermentation.

Fixed alkalis alſo coagulate milk; but at the ſame time they ſeparate the whey from the cheeſe, which floats on the liquor in cloats. They give the milk a ruſſet colour inclining to red, which may ariſe from their attacking the fat part.

The ſeparation of milk into butter, cheeſe, and whey, is a kind of imperfect analyſis thereof, or rather the beginning of one. In order to render it complete, we muſt examine each of theſe ſubſtances ſeparately, and find the principles of which they conſiſt. This we ſhall endeavour to do in the following proceſs.

Butter analyſed by Diſtillation.

INTO a glaſs retort put the quantity of freſh butter you intend to diſtil. Set the retort in a reverberatory; apply a receiver; and let your fire be very gentle at firſt. The butter will melt, and there will come over ſome drops of clear water, which will have the peculiar ſmell of freſh butter, and ſhew ſome tokens of acidity. If the fire be increaſed a little, the butter will ſeem to boil: a froth will gather on its ſurface, and the phlegm, ſtill continuing to run, will gradually come to ſmell juſt like butter clarefied in order to be preſerved. Its acidity will be ſtronger and more manifeſt than that of the firſt drops that came over.

Soon after this, by encreaſing the fire a little more, there will riſe an oil, having nearly the ſame degree of fluidity as fat oils; but it will grow thicker as the diſtillation advances, and at laſt will fix in the receiver when it cools. It will be accompanied with ſome drops of liquor, the acidity whereof will always increaſe, while its quantity decreaſes, as the diſtillation advances.

While this thick oil is diſtilling, the butter contained in the retort, which at firſt ſeemed to boil, will be calm and ſmooth, without the leaſt appearance of ebullition; though the heat be then much greater than when it boiled. Continue the diſtillation, conſtantly increaſing the fire by degrees as you find it neceſſary for the elevation of the thick oil. This oil, or rather this kind of butter, will be at laſt of a ruſſet colour. There will riſe along with it ſome white vapours exceeding ſharp and pungent.

When you obſerve that nothing more comes over, though the retort be quite red-hot, let the veſſels cool, and unlute them. You will find in the receiver an aqueous acid liquor, a fluid oil, and a kind of fixed brown butter. Break the retort, and you will find therein a kind of charred matter; the ſurface of which, where it touched the glaſs, will be of a ſhining black, and have a fine poliſh.

The analyſis of butter proves, that this ſubſtance, which is an oily matter in a concrete form, owes its conſiſtence to the acid only, with which the oily part is combined: that is, it follows the general rule frequently mentioned above in treating of other oily compounds; the conſiſtence whereof we ſhewed to be ſo much the firmer, the more acid they contain. The firſt portions of oil that come over in the diſtillation of butter are fluid, becauſe a pretty conſiderable quantity of acid roſe before them, which, being mixed with the phlegm, gives it the acidity we took notice of.

This oil, being freed from its acid, and by that means rendered fluid, riſes firſt; becauſe it is by the ſame means rendered lighter. The kind of butter that comes over afterwards, though it be fixed, is nevertheleſs far from having the ſame conſiſtence as it had before diſtillation; becauſe it loſes much of its acid in the operation. This acid is what riſes in the form of white vapours. Theſe vapours are at leaſt as pungent and irritating as the ſulphureous acid or volatile alkalis: but their ſmell is different: it hath a reſemblance, or rather is the ſame, with that which riſes from butter when it is burnt and browned in an open veſſel. But, when concentrated and collected in cloſe veſſels, as in the diſtillation of butter, they are vaſtly ſtronger: they irritate the throat ſo as to inflame it; they are exceeding ſharp and pungent to the ſmell, and are ſo hurtful to the eyes that they quickly inflame them, as in an ophthalmy, and and make them ſhed abundance of tears. The great volatility of this acid is entirely owing to a portion of the phlogiſton of the butter with which it is ſtill combined.

We took notice in the proceſs, that butter ſeems to boil with a very moderate heat at the beginning of the diſtillation, and that in the courſe of the operation the ebullition ceaſes entirely, though the heat be then greatly increaſed; which is contrary to the general rule. The reaſon is, that butter, though a ſeemingly homogeneous maſs, contains nevertheleſs ſome particles of cheeſe and whey. The particles of whey, being much the lighteſt, endeavour, on the firſt application of heat, to extricate themſelves from amongſt the particles of butter, and to riſe in diſtillation. Thus they form the drops of acidulated phlegm which come over at firſt, and, in ſtruggling to get free, lift up the buttery parts, or actually boil, which occaſions the ebullition obſervable at the beginning of the proceſs. When they are once ſeparated, the melted butter remains calm and ſmooth without boiling. If you want to make it boil, you muſt apply a much greater degree of heat; which you cannot do in cloſe veſſels, without ſpoiling the whole operation: becauſe the degree of heat neceſſary for that purpoſe would force up the butter in ſubſtance, which would ruſh over into the receiver, without any decompoſition. Indeed if the veſſels were luted, they would be in danger of burſting.

As to the caſeous parts, which are mixed with freſh butter, they alſo ſeparate at the beginning of the diſtillation when the butter is melted, and gather on its ſurface in a ſcum. Theſe particles of cheeſe and whey, which are heterogeneous to butter, help to make it ſpoil the ſooner. And for this reaſon, thoſe who want to keep butter a long time, without the uſe of ſalt, melt it, and thereby evaporate the aqueous parts. The lighteſt portion of the particles of cheeſe riſes to the ſurface, and is ſkimmed off; the reſt remains at the bottom of the veſſel, from which the butter is eaſily ſeparated, by decanting it while it is yet fluid.

Butter may alſo be diſtilled, by incorporating it with ſome additament which will yield no principle itſelf, nor retain any of thoſe of the butter. It may be diſtilled in this manner with the additament of fine ſand: the operation ſucceeds very well, is ſooner finiſhed, and more eaſily conducted.

If you deſire to convert the butter wholly into oil, you muſt take the fixed matter you find in the receiver, and diſtil it once more, or oftener, according to the degree of fluidity you want to give it. The caſe is the ſame with this matter as with all other thick oils, which, the oftener they are diſtilled grow always the more fluid, becauſe in every diſtillation they are ſeparated from part of the acid, to which alone they owe their conſiſtence.

The Curd of Milk analyſed by Diſtillation.

INTO a glaſs retort put ſome new curd, having firſt drained it thoroughly of all its whey, and even ſqueezed it in a linen cloth to expreſs all its moiſture. Diſtil it as you did butter. There will come over at firſt an acidulated phlegm, ſmelling like cheeſe or whey. As the diſtillation advances, the acidity of this phlegm will increaſe.

When it begins to run but very ſlowly, raiſe your fire. There will come over a yellow oil, ſomewhat empyreumatic. Continue the diſtillation ſtill increaſing the fire by degrees as occaſion requires. The oil and acid phlegm will continue to riſe; the phlegm growing gradually more acid, and the oil deeper coloured and more empyreumatic. At laſt, when the retort is almoſt red-hot, there comes off a ſecond black oil, of the conſiſtence of turpentine, very empyreumatic, and ſo heavy as to ſink in water. In the retort will be left a conſiderable quantity of charred matter.

Cheeſe curd barely drained, till no more whey will drip from it, is not entirely freed thereof; and for this reaſon we directed it to be preſſed in a linen cloth, before it be put into the retort to be diſtilled. Without this precaution, the remaining whey would riſe in a conſiderable quantity on the firſt application of heat; and, inſtead of analyſing the curd only, we ſhould at the ſame time analyſe the whey alſo. This is to be underſtood of green curd and new-made cheeſe; for, if it be ſuffered to grow old, it will at length dry of itſelf; but then we ſhould not obtain from it the ſame principles by diſtillation; as it corrupts and begins to grow putrid after ſome time, eſpecially if it be not mixed with ſome ſeaſoning to preſerve it.

The firſt phlegm that riſes in this diſtillation, as in that of butter, is a portion of the whey that was left in the cheeſe, notwithſtanding its being well preſſed. This phlegm grows gradually more acid, being the vehicle of the acids of the cheeſe, which are forced up along with it by the fire.

The acid obtained from this matter is leſs in quantity, and weaker, than that of butter; and accordingly the oil diſtilled from cheeſe is not fixed like that of butter. Yet it is remarkable that the laſt empyreumatic oil, which is as thick as turpentine, is heavier than water: a property which it probably derives from the quantity of acid it retains.

The quantity of charred matter, which remains in the retort after the diſtillation of cheeſe, is much greater than that left by butter; which proves that the former contains a much greater quantity of earth.

Whey analyſed.

EVAPORATE two or three quarts of whey almoſt to dryneſs in a *balneum mariæ*; and diſtil the extract or reſiduum in a retort ſet in a reverberating furnace, with degrees of fire, according to the general rule. At firſt ſome phlegm will come over; then a lemon-coloured acid ſpirit; and afterwards a pretty thick oil. There will remain in the retort a charred matter, which being expoſed to the air grows moiſt. Lixiviate it with rain water, and evaporate the lixivium; it will yield you cryſtals of ſea-ſalt. Dry the charred matter, and burn it in the open air with a ſtrong fire, till it be reduced into aſhes. A lixivium of theſe aſhes will ſhew ſome tokens of a fixed alkali.

It will appear, on examining the three analyſes of the the ſubſtances whereof milk conſiſts, that none of them yields a volatile alkali; which is worthy of notice; as it is the only animal matter from which ſuch a ſalt cannot be obtained. It is true, the milk of animals that feed on vegetables may be conſidered as an intermediate liquor between vegetable and animal ſubſtances; as an imperfect animal juice, which ſtill retains much of the vegetable nature: and we actually find, that milk almoſt always hath, at leaſt in part, the properties of thoſe plants with which the animals that yield it are fed. Yet, as it cannot be formed in the body of the animal, without mixing with ſeveral of its juices that are entirely perfected, and become purely animal, it muſt appear ſtrange that the analyſis thereof ſhould not afford the leaſt veſtige of that principle, which all other animal-matters yield in the greateſt plenty.

The reaſon of this may be found in the uſe to which milk is deſtined. It is intended for the nouriſhment of animals of the ſame ſpecies with thoſe in whoſe bodies it is produced. Conſequently it ought as much as poſſible to reſemble the juices of the food which is proper for thoſe animals. Now, as animals that live only on vegetables could not be properly nouriſhed by animal matters, for which nature itſelf hath even given them an averſion, it is not ſurpriſing that the milk of ſuch animals ſhould be free from any mixture of ſuch things as are unſuitable to the young ones whom it is deſigned to nouriſh. There is reaſon therefore to think, that nature hath diſpoſed the organs in which the ſecretion of milk is performed, ſo as to ſeparate it entirely from all the animal juices firſt mixed with it: and this is the principal difference between milk and chyle; the latter being neceſſarily blended with the ſaliva, the gaſtric and pancreatic juices, the bile and lymph, of the animals in which it is formed. Hence it may be concluded, that, if a quantity of chyle could be collected ſufficient to enable us to analyſe it, the analyſis thereof would differ from that of milk, in this chiefly, that it would yield a great deal of volatile alkali, of which milk, as hath been ſaid, yields none at all.

The ſame thing probably takes place in carnivorous animals. It is certain, that thoſe animals chuſe to eat the fleſh of ſuch others only as feed upon vegetables; and that nothing but extreme hunger, and the abſolute want of more agreeable food, will force them to eat the fleſh of other carnivorous animals. Wolves, which greedily devour ſheep, goats, &c. ſeldom eat foxes, cats, polecats, &c. though theſe animals are not ſtrong enough to reſiſt them. Foxes, cats, and birds of prey, that make ſuch terrible havock among wild-fowl, and other ſorts of game, do not devour one another. This being laid down, there is reaſon to think, that the milk of carnivorous animals is ſomething of the nature of the fleſh of thoſe animals that feed on vegetables, and which they chuſe to eat, and not of the nature of their own fleſh; as the milk of animals that feed on vegetables is analogous to the juices of vegetables, and when analyſed yields no volatile alkali, though every other part of their body does.

But whatever be the nature of milk, and of whatever ingredients it be formed, it always contains the three ſeveral ſubſtances above mentioned; namely, the fat, or buttery part, properly ſo called, the cheeſy, and the ſerous part, the laſt of which we are now to examine. It is, properly ſpeaking, the phlegm of the milk, and conſiſts almoſt entirely of water. For this reaſon it is proper to leſſen the quantity thereof conſiderably by evaporation, ſo that its other principles, being concentrated and brought nearer together, may become much more ſenſible. There is no danger of loſing any eſſential part of the whey in the evaporation, if it be performed in the *balneum mariæ* with ſuch a gentle heat as may carry off the aqueous parts only: this greatly ſhortens the analyſis, which will be exceeding long and tedious if all the water be diſtilled off in cloſe veſſels.

As whey is chiefly the aqueous part of milk, as ſaid above, it muſt contain all the principles thereof that are ſoluble in water; that is, its ſaline and ſaponaceous parts. And accordingly the analyſis thereof ſhews that it contains an oil, rendered perfectly ſaponaceous by an acid; that is, made perfectly miſcible with water. This quality of the oil contained in whey appears from the perfect tranſparency of that liquor, which we know is the mark of a complete diſſolution. In the diſtillation of whey, the ſaponaceous matter contained therein is decompoſed; the ſaline part riſes firſt, as being the lighteſt; this is the acid taken notice of in the proceſs; after which the oil, now ſeparated from the principle which rendered it miſcible with water, comes over in its natural form, and doth not afterwards mix with the aqueous part.

Beſides the ſaponaceous matter, whey contains alſo another ſaline ſubſtance; namely, ſea ſalt: this is obtained by lixiviating the *caput mortuum* left in the retort, which, becauſe of its fixedneſs, cannot riſe with the other principles in diſtillation. To this ſalt it is owing that what remains in the retort after diſtillation grows moiſt in the air; for we know that ſea-ſalt thoroughly dried hath this property.

The fixed alkaline ſalt, obtained from the *caput mortuum* burnt to aſhes, proves that milk ſtill retains ſomething of the vegetable nature: for the following analyſis will ſhew us that matters purely animal yield none at all.

Of the Subſtances which compoſe an Animal Body.

Blood analyſed. Inſtanced in Bullock's Blood.

IN a *balneum mariæ* evaporate all the moiſture of the blood that the heat of boiling water will carry off. There will remain an almoſt dry matter. Put this dried blood into a glaſs retort, and diſtil with degrees of heat, till nothing more will come over, even when the retort is quite red-hot, and ready to melt. A browniſh phlegm will riſe at firſt: this will ſoon be impregnated with a little volatile alkali, and then will come over a yellow oil, a very pungent volatile ſpirit, a volatile ſalt in a concrete form, which will adhere to the ſides of the receiver; and, at laſt, a black oil, as thick as pitch. There will be left in the retort a charred matter, which being burnt yields no fixed alkali.

Blood, which is carried by the circulation into all the parts of the animal body, and furniſhes the matter of all the ſecretions, muſt be conſidered as a liquor conſiſting of almoſt all the fluids neceſſary to the animal machine: ſo that the analyſis thereof is a ſort of general though imperfect analyſis of an animal.

Blood drawn from the body of an animal, and ſet by in a veſſel, coagulates as it grows cold; and ſometimes afterwards the *coagulum* diſcharges a yellowiſh *ſerum* or lymph; and in the midſt thereof ſwims the red part, which continues curdled. Theſe two ſubſtances, when analyſed, yield nearly the ſame principles; and in that reſpect ſeem to differ little from each other. Though the ſerum of blood be naturally in a fluid form, yet it hath alſo a great tendency to coagulate; and a certain degree of heat applied to it, either by water or by a naked fire, will curdle it. Spirit of wine mixed with this liquor produces on it the ſame effect as heat.

Blood, while circulating in the body of a healthy animal, and when newly taken from it, hath a mild taſte, which diſcovers nothing like either an acid or an alkali; nor doth it ſhew any ſign of either the one or the other in chemical trials. When taſted with attention, it betrays ſomething like a ſavour of ſea-ſalt; becauſe it actually contains a little thereof, which is found in the charred matter left in the retort after the diſtillation, when carefully examined.

We ſhewed that milk alſo contains a little of this ſalt. It enters the bodies of animals with the food they eat, which contains more or leſs thereof according to its nature. It plainly ſuffers no alteration by undergoing the digeſtions, and paſſing through the ſtrainers, of the animal body. The caſe is the ſame with the other neutral ſalts which have a fixed alkali for their baſis: we find them unchanged in the juices of animals into whoſe bodies they have been introduced. They are incapable of combining, as acids do, with the oily parts; and ſo are diſſolved by the aqueous fluids, of which nature makes uſe to free herſelf from thoſe ſalts, and diſcharge them out of the body.

Blood, like all other animal-matters, is, properly ſpeaking, ſuſceptible of no fermentation but that of putrefaction. Yet it turns ſomewhat ſour before it putrefies. This ſmall degree of acetous fermentation is moſt ſenſible in fleſh; and eſpecially in the fleſh of young animals, ſuch as calves, lambs, chickens, &c.

The quantity of pure water, which blood, in its natural ſtate, contains, is very conſiderable, and makes almoſt ſeven eighths thereof. If it be diſtilled, without being firſt dried, the operation will be much longer; becauſe it will be neceſſary to draw off all this inſipid phlegm with a gentle fire. There is no reaſon to apprehend that, by drying blood in open veſſels as directed, any of its other principles will be carried off with its phlegm: for it contains no other ſubſtance that is volatile enough to riſe with the warmth of a *balneum mariæ*. This may be proved by putting ſome undried blood into a glaſs cucurbit, fitting thereto a head and receiver, and diſtilling, in a *balneum mariæ*, all that the heat of the bath, not exceeding the heat of boiling water, will raiſe: for, when nothing more will come over, you will find in the receiver an inſipid phlegm only, ſcarce differing from pure water, except in having a faint ſmell like that of blood; wherein it reſembles all the phlegms that riſe firſt in diſtillation, which always retain ſomething of the ſmell of the matters from which they were drawn. That part of the blood, which remains in the cucurbit after this firſt diſtillation, being put into a retort, and diſtilled with a ſtronger fire, yields exactly the ſame principles, and in the ſame proportion, as blood dried in open veſſels in the *balneum mariæ*: ſo that, if this phlegm of blood contains any principles, the quantity thereof is ſo ſmall as to be ſcarce perceptible.

The volatile alkali that riſes with the oil, when blood is diſtilled in a retort with a degree of heat greater than that of boiling water, is either the production of the fire, or ariſes from the decompoſition of an ammoniacal ſalt of which it made a part. For we ſhall ſee, when we come to treat of this ſaline ſubſtance, that it is ſo extremely volatile as to exceed, in that reſpect, almoſt all other bodies that we know: and therefore if this volatile alkali pre-exiſted formerly in the blood, uncombined with any other matter capable, in ſome meaſure, of fixing it, it would riſe at firſt almoſt ſpontaneouſly, or at leaſt on the firſt application of the gentleſt heat. We have an inſtance of this in blood, or any other animal-matter, that is perfectly putrefied; which containing a volatile alkali, either formed or extricated by putrefaction, lets go this principle when diſtilled, even before the firſt phlegm: and, for this reaſon, when putrefied blood is to be analyſed, it muſt by no means be dried, like freſh blood, before diſtillation; for all the volatile alkali would by that means be diſſipated and loſt at once.

Though blood and other animal matters afford no fixed alkali, but, on the contrary, yield much volatile alkali, it doth not therefore follow that all the acid, which thoſe ſubſtances contained before they were analyſed, is employed in the production of a volatile alkali.

Fleſh analyſed. Inſtanced in Beef.

INTO an alembic or retort, placed in a ſand-bath, put ſome lean beaf, from which you have carefully ſeparated all the fat. Diſtil till nothing more will riſe. In this firſt diſtillation a phlegm will come over, weighing at leaſt half the maſs of the diſtilled fleſh. In the retort you will find a matter almoſt dry, which you muſt afterwards diſtil with a naked fire in a reverberating furnace, taking the uſual precautions. There will come over at firſt a little phlegm replete with volatile alkali; then a volatile alkali in a dry form, which will ſtick to the ſides of the veſſel; and alſo a thick oil. After the diſtillation there will be left in the retort a black, ſhining, light coal. Burn it to aſhes in the open air, and lixiviate thoſe aſhes: the water of the lixivium will have no alkaline property, but will ſhew ſome tokens of its containing a little ſea-ſalt.

The fleſh of an animal, as appears from the proceſs, yields much the ſame principles with its blood: and it cannot be otherwiſe; becauſe it is formed altogether of materials furniſhed by the blood.

Bones analyſed. Inſtanced in Ox-Bones.

CUT into pieces the bones of a leg of beef, carefully ſeparating all the marrow. Put them into a retort, and diſtil them in a reverberating furnace as uſual. A phlegm will come over firſt; then a volatile ſpirit, which will become ſtronger and ſtronger; afterwards a volatile ſalt in a dry form, with ſome oil; and, laſtly, a black oil, with a little more volatile ſalt. There will be left in the retort a charred matter, from which a little ſea-ſalt may be extracted. Reduce this charred matter to aſhes, by burning it in the open air. Theſe aſhes will give ſome ſlight tokens of a fixed alkali.

The analyſis of bones proves, that they conſiſt of the ſame principles with fleſh and blood; and the ſame may be ſaid in general of all matters that are truly animal, that actually conſtitute any part of an animal.

Animal Fat Analyſed. Inſtanced in Mutton-Suet.

PUT as much mutton-ſuet as you pleaſe into a glaſs retort, only taking care that the veſſel be but half full; and diſtil with degrees of fire as uſual. A phlegm ſmelling of the ſuet will riſe firſt, and ſoon grow very acid. After this ſome drops of oil will come over, and be followed by a matter like oil, in appearance, when it comes over; but it will fix in the receiver, and acquire a conſiſtence ſomewhat ſofter than ſuet. This kind of butter of ſuet will continue to riſe to the end of the diſtillation; and there will be left in the retort a ſmall quantity of charred matter.

Eggs analyſed. Inſtanced in Pullet's Eggs.

PUT ſome hens eggs in water, and boil them till they be hard. Then ſeparate the yolks from the whites. Cut the whites into little bits; put them into a glaſs cucurbit; fit on a head and receiver; diſtil in a *balneum mariæ* with degrees of fire, raiſing it towards the end to the ſtrongeſt heat which that bath can give; that is, to the heat of boiling water. There will come over an aqueous liquor, or inſipid phlegm; the quantity whereof will be very conſiderable, ſeeing it will make about nine tenths of the whole maſs of the whites of the eggs. Continue your diſtillation, and keep the water in the bath conſtantly boiling, till not a drop more of liquor will aſcend from the alembic. Then unlute your veſſels. In the cucurbit you will find your whites of eggs conſiderably ſhrunk in their bulk. They will look like little bits of brown glaſs, and be hard and brittle.

Put this reſiduum into a glaſs retort, and diſtil, as uſual, in a reverberating furnace with degrees of heat. There will come over a volatile oily ſpirit, a yellow oil, a volatile ſalt in a dry form, and, at laſt, a black thick oil. There will be left in the retort a charred matter.

Reduce alſo into the ſmalleſt pieces you can the hard yolks of the eggs which you ſeparated from the whites. Set them in a pan over a gentle fire: ſtir them with a ſtick till they turn a little brown, and diſcharge a ſubſtance like melted marrow. Then put them into a new, ſtrong, canvaſs bag, and preſs them between two iron plates well heated; whereby you will obtain a conſiderable quantity of a yellow oil.

Let what remains in the bag be diſtilled in a retort ſet in a reverberating furnace: it will give you the ſame principles as you got from the whites.

Of the two perfectly diſtinct ſubſtances that conſtitute the egg, the yolk contains the embryo of the chick, and is deſtined to hatch it: the white is to ſerve for the nouriſhment of the chick when it is formed.

Theſe two matters, though they contain the very ſame principles, yet differ conſiderably from each other; and chiefly in this, that their principles are not in the ſame proportions.

The white of an egg contains ſo much phlegm, that it ſeems to conſiſt almoſt totally thereof. All the aqueous liquor, obtained by diſtilling it in the *balneum mariæ*, is, properly ſpeaking, nothing but pure water; for no chemical trial can diſcover in it either an acid or a volatile alkali; or any very perceptilbe oily part. And yet it muſt contain ſome oil, becauſe the liquor that riſes laſt is a little bitteriſh to the taſte, and ſmells ſomewhat of empyreuma. But the principles from which it derives theſe properties are in too ſmall quantities to be diſtinctly perceived.

If, inſtead of diſtilling the hard white of an egg, with a view to draw off the great quantity of water it contains, you leave it ſome time in an air that is not too dry, the greateſt part of its moiſture ſeparates ſpontaneouſly, and becomes very ſenſible. In all probability this is the effect of a beginning putrefaction, which attenuates this ſubſtance, and breaks its contexture. The liquor thus diſcharged by the white of an egg thoroughly diſſolves the gum-reſins, and particularly myrrh. If you deſire to diſſolve myrrh in this manner, cut a hard-boiled egg in halves; take out the yolk; put the powdered gum-reſin into the cavity left by the yolk; join the two halves of the white; faſten them together with a thread, and hang them up in a cellar. In a few days time the myrrh will be diſſolved by the moiſture that iſſues from the white of the egg, and will drop into the veſſel placed underneath to receive it. This liquor is improperly called *oil of myrrh per deliquium*.

All the properties of the whites of eggs, as well as the principles obtained by analyſing them, are the ſame with thoſe of the lymphatic part of the blood; ſo that there is a great reſemblance between theſe two ſubſtances.

As to the yolk, it is plain from its analyſis, that oil is the predominant principle thereof. If the yolk of an egg be mixed with water, the oil with which it is replete, and which is by nature very minutely divided, diffuſes eaſily through the whole liquor, and remains ſuſpended therein by means of its viſcoſity. The liquor at the ſame time becomes milk-white like an emulſion, and is in fact a true animal emulſion.

In order to obtain the oil of eggs by expreſſion with the more eaſe, care muſt be taken to chuſe eggs that are ſeven or eight days old; becauſe they are then a little leſs viſcous. Nevertheleſs their viſcoſity is ſtill ſo great, that they will not eaſily yield their oil by expreſſion: and therefore, in order to attenuate and deſtroy entirely this viſcoſity, they muſt be torrefied before they are put to be preſſed.

The oil of eggs, like all other oily animal matters, ſeems analogous to the fat oils of vegetables. It hath all the properties that characteriſe thoſe oils. Its colour is yellow, and it ſmells and taſtes a little of the empyreuma, occaſioned by torrefying the yolks. It is rendered ſomewhat leſs diſagreeable by being expoſed to the dew for thirty or forty nights, if care be taken to ſtir it often in the mean time.

To conclude: all the principles both in the yolk and the white of an egg are the ſame as thoſe found in blood, fleſh, and all other matters that are perfectly animal.

Of the Excrements of Animals.

Dung analyſed. Inſtanced in human Excrements. Mr Homberg's Phoſphorus.

TAKE any quantity you pleaſe of human excrement, and diſtil it in a glaſs alembic ſet in the *balneum mariæ*. You will obtain an aqueous, clear, inſipid liquor; which will nevertheleſs have a diſagreeable odour. Having urged the diſtillation as far as is poſſible with the heat of this bath, unlute your veſſels, and you will find at the bottom of the cucurbit a dry matter, making about an eighth part only of what you put into it. Put this reſiduum into a glaſs retort, and diſtil in a reverberating furnace, with degrees of heat. You will obtain a volatile ſpirit, and a volatile ſalt, with a fetid oil; and a charred matter will be left in the retort.

This ſubſtance, conſiſting of matters ſubject to putrefaction, hath conſtantly a fetid ſmell, like that of all putrid matters; having been for ſome time confined in a warm, moiſt place, which we know promotes putrefaction, and even quickly produces it. Yet the analyſis thereof proves that it is not putrefied, or at leaſt not entirely ſo: for all putrefied matters contain a volatile alkali perfectly formed and extricated; and, as this principle riſes with leſs heat than that of boiling water, it always comes over firſt in diſtillation. Now we have ſeen that, with the heat of boiling water, it parts with nothing but an inſipid phlegm, containing no volatile alkali: a ſure proof that the fecal matter is not completely putrefied.

One of the methods by which Mr Homberg endeavoured to obtain from excrement a clear oil, without any bad ſmell, was to ſeparate its earthy and groſs parts, by filtering it before he diſtilled it. "For this purpoſe he diluted excrement newly diſcharged with hot water, uſing a quart of water to an ounce of feces. Then he let the mixture ſtand to cool, and the groſs parts falling to the bottom, he poured off the water by inclination. This liquor he filtered through brown paper, and evaporated to a pellicle over a gentle fire. There ſhot in it long cryſtals of four, five, and ſix ſides, which Mr Homberg thinks may be called the eſſential ſalt of excrement. They reſemble ſalt-petre, in ſome meaſure, and deflagrate in the fire much like it; with this difference, that their flame is red, and they burn ſlowly; whereas the flame of ſalt-petre is white and very vivid: probably, ſays Mr Homberg, becauſe there is too much of an oily matter in the one, and leſs in the other.

"Mr Homberg diſtilled this ſalt in a glaſs retort with degrees of fire, and at laſt with a very violent one. At firſt there came over an aqueous liquor, ſharp and acid, which was followed by a brown fetid oil, ſmelling very ſtrong of empyreuma. This diſtillation he attempted four ſeveral times; and each time the matter in the retort took fire, juſt when the oil began to come off."

The ſalt which Mr Homberg obtained from excrement is very remarkable. Its nitrous character is by no means ambiguous: its deflagrating on live coals convinced Mr Homberg of its being a true nitre. But its conſtantly taking fire in the retort, as oft as diſtilled, is a ſure proof that it is a nitrous ſalt: for nitre only hath the property of thus taking fire in cloſe veſſels, and making other combuſtible matters burn along with it.

The proceſs, by which Mr Homberg at laſt obtained from excrement a clear oil without any bad ſmell, is curious, and worthy of a place here, on account of the views and occaſions of reflection which it may open.

"Mr Homberg having tried in vain, by diſtilling excrement a great many different ways, to obtain from it ſuch an oil as he wanted, reſolved to employ fermentation, the effect whereof is to change the diſpoſition of the principles of mixts. With this view he dried ſome excrement in the water-bath, and, having pulveriſed it, poured thereon ſix times its weight of phlegm that had been ſeparated from it by diſtillation, and put the whole into a large glaſs cucurbit, covered with an inverted veſſel that fitted exactly into it, and was cloſe luted. This veſſel he ſet in a *balneum mariæ* for ſix weeks, keeping up ſuch a gentle heat as would not burn one's hand; after which he uncovered the cucurbit, and having fitted thereto a head and a receiver, diſtilled off all the aqueous moiſture in the *balneum mariæ* with a very gentle heat. It had now loſt almoſt all its bad ſmell, which was changed into a faint one. It came over ſomewhat turbid, whereas it was very clear when put into the cucurbit. Mr Homberg found this water to have a coſmetic virtue: he gave ſome of it to perſons whoſe complexion, neck, and arms, were quite ſpoiled, being turned brown, dry, rough, and like a gooſe ſkin: they waſhed with it once a day, and, by continuing the uſe of this water, their ſkin became very ſoft and white.

“ The dry matter left in the cucurbit after the firſt diſtillation, had not the leaſt ſmell of feces: on the contrary, it had an agreeable aromatic odour; and the veſſel in which Mr Homberg had digeſted it, being left open in a corner of his laboratory, acquired in time a ſtrong ſmell of ambergris. It is ſurpriſing, as Mr Homberg juſtly obſerves, that digeſtion alone ſhould change the abominable ſmell of excrement into an odour as agreeable as that of ambergris.

“ This dry matter he powdered coarſely, and put two ounces thereof at once into a glaſs retort that would hold about a pound or a pound and a half of water. This he diſtilled in a ſand-bath with a very gentle heat. A ſmall quantity of an aqueous liquor came over firſt, and then an oil as colourleſs as ſpring-water. Mr Homberg continued the ſame gentle degree of heat till the drops began to come off a little rediſh; and then he changed the receiver, ſtopping that which contained the clear oil very cloſe with a cork. Having carried on the diſtillation with a fire gradually augmented, there came over a conſiderable quantity of red oil; and there remained in the retort a charred matter which burnt very readily.”

The clear oil, without any ill ſmell, which Mr Homberg obtained from the fecal matter by this proceſs, was the very thing he was in ſearch of, and which he had been aſſured would convert mercury into fine fixed ſilver; yet he ingenuouſly owns, that, whatever way he applied it, he could never produce any change in that metallic ſubſtance. We ſhall now proceed to the other diſcoveries made by Mr Homberg on this occaſion.

In his attempt to obtain a clear oil from excrement, he diſtilled it with different additaments, and amongſt the reſt with vitriol and alum. He found that the matters left in the retort, when he made uſe of theſe ſalts, being expoſed to the open air, took fire of themſelves; that they kindled combuſtible matters; in a word, that they were a true phoſphorus, of a ſpecies different from all then known. Purſuing theſe firſt hints, he ſought and found the means of preparing this phoſphorus by a way much more expeditious, certain, and eaſy. His proceſs is this.

“ Take four ounces of feces newly excreted: mix therewith an equal weight of roch alum coarſely powdered: put the whole into a little iron pan that will hold about a quart of water, and ſet it over a gentle fire under a chimney. The mixture will melt, and become as liquid as water. Let it boil with a gentle fire, conſtantly ſtirring it, breaking it into little crumbs, and ſcraping off with a ſpatula whatever ſticks to the bottom or ſides of the pan, till it be perfectly dry. The pan muſt from time to time be removed from the fire, that it may not grow red hot; and the matter muſt be ſtirred, even while it is off the fire, to prevent too much of it from ſticking to the pan. When the matter is perfectly dried, and in little clots, let it cool, and powder it in a metal mortar. Then put it again into the pan, ſet it over the fire, and ſtir it continually. It will again grow a little moiſt, and adhere together in clots, which muſt be continually roaſted and bruiſed till they be perfectly dry; after which they muſt be ſuffered to cool, and then be pulveriſed. This powder muſt be returned a third time to the pan, ſet on the fire, roaſted, and perfectly dried: after which it muſt be reduced to a fine powder, and kept in a paper in a dry place. This is the firſt or preparatory operation.

“ Take two or three drams of this powder. Put it into a little matras, the belly of which will hold an ounce, or an ounce and half of water, and having a neck about ſix or ſeven inches long. Order it ſo that your powder ſhall take up no more than about a third part of the matras. Stop the neck of the matras ſlightly with paper: then take a crucible four or five inches deep: in the bottom of the crucible put three or four ſpoonfulls of ſand: ſet the matras on this ſand, and in the middle of the crucible, ſo as not to touch its ſides. Then fill up the crucible with ſand, ſo that the belly of the matras may be quite buried therein. This done, place your crucible with the matras in the midſt of a little earthen furnace, commonly called a *ſtove*, about eight or ten inches wide above, and ſix inches deep from the mouth to the grate. Round the crucible put lighted coals about half way up, and when it hath ſtood thus half an hour, fill up with coals to the very top of the crucible. Keep up this fire a full half hour longer, or till you ſee the inſide of the matras begin to be red. Then increaſe your fire, by raiſing your coals above the crucible. Continue this ſtrong heat for a full hour, and then let the fire go out.

“ At the beginning of this operation denſe fumes will riſe out of the matras, through the ſtopple of paper. Theſe fumes iſſue ſometimes in ſuch abundance as to puſh out the ſtopple; which you muſt then replace, and ſlacken the fire. The fumes ceaſe when the inſide of the matras begins to grow red; and then you may increaſe the fire without any fear of ſpoiling your operation.

“ When the crucible is ſo cold that it may be ſafely taken out of the furnace with one's hand, you muſt gradually draw the matras out of the ſand, that it may cool ſlowly, and then ſtop it cloſe with a cork.

“ If the matter at the bottom of the matras appear to be in powder when ſhaken, it is a ſign the operation hath ſucceeded: but if it be in a cake, and doth not fall into powder on ſhaking the matras, it ſhews that your matter was not ſufficiently roaſted and dried in the iron pan during the preparatory operation."

Mr Lemeri hath ſhewn, that excrement is not the only matter capable of producing this phoſphorus with alum; but that, on the contrary, almoſt all animal and even vegetable matters are fit for this combination; that though Mr Homberg mixed alum in equal quantities only with the fecal matter, it may be uſed in a much greater proportion, and, in certain caſes, will ſucceed the better; that, according to the nature of the ſubſtances to be worked on, the quantity of that ſalt may be more or leſs increaſed; and that whatever is added, more than the doſe requiſite for each matter, ſerves only to leſſen the virtue of the phoſphorus, or even deſtroys it entirely; that the degree of fire applied muſt be different according to the nature of thoſe matters; and, laſtly, that ſalts containing exactly the ſame acid with that of alum, or the acid of thoſe ſalts ſeparated from its baſis and reduced into ſpirit, do not anſwer in the preſent operation: which ſhews, ſays Mr Lemeri, that many ſulphureous matters may be ſubſtituted for excrement in this operation; but that there are no ſalts, or very few, if any, that will ſucceed in the place of alum.

This phoſphorus, made either by Mr Homberg's or by Mr Lemeri's method, ſhines both by day and by night. Beſides emitting light, it takes fire ſoon after it is expoſed to the air, and kindles all combuſtible matters with which it comes in contact; and this without being rubbed or heated.

Meſſ. Homberg and Lemeri have given the moſt probable and the moſt natural explanation of the cauſe of the accenſion and other phenomena of this phoſphorus. What they ſay amounts in ſhort to what follows.

Alum is known to be a neutral ſalt, conſiſting of the vitriolic acid and a calcareous earth. When this ſalt is calcined with the fecal matter, or other ſubſtances abounding in oil, the volatile principles of theſe ſubſtances, ſuch as their phlegm, their ſalts, and their oils, exhale in the ſame manner as if they were diſtilled; and there is nothing left in the matras, when thoſe principles are diſſipated, but a charred matter, like that which is found in retorts wherein ſuch mixts have been decompoſed by diſtillation.

This remainder therefore is nothing but a mixture of alum and charcoal. Now, as the acid of this ſalt, which is the vitriolic, hath a greater affinity with the phlogiſton than with any other ſubſtance, it will quit its baſis to unite with the phlogiſton of the coal, and be converted by that union into a ſulphur. And this is the very caſe, of which we have certain proofs in the operation for preparing this phoſphorus; for when, after the volatile principles of the oily matter are drawn off, the fire is increaſed, in order to combine cloſely together the fixed parts that remain in the matras, that is, the alum and the charred matter, we perceive at the mouth of the matras a ſmall blue ſulphureous flame, and a pungent ſmell of burning ſulphur. Nay, when the operation is finiſhed, we find a real ſulphur ſticking in the neck of the matras; and, while the phoſphorus is burning, it hath plainly a ſtrong ſulphureous ſmell. It is therefore certain, that this phoſphorus contains an actual ſulphur; that is, a matter diſpoſed to take fire with the greateſt eaſe. But though ſulphur be very inflammable, it never takes fire of itſelf, without being either in contact with ſome matter that is actually ignited, or elſe being expoſed to a conſiderable degree of heat. Let us ſee then what may be the cauſe of its accenſion, when it is a conſtituent part of this phoſphorus.

We mentioned juſt now, that the acid of the alum quits its baſis, in order to form a ſulphur by combining with the phlogiſton of the coal. This baſis we know to be an earth capable of being converted into lime; and that it is actually converted into quick-lime by the calcination neceſſary to produce the phoſphorus. We know that new made lime hath the property of uniting with water ſo readily, that it thereby contracts a very great degree of heat. Now when this phoſphorus, which is partly conſtituted of the baſis of the alum converted into quick-lime, is expoſed to the air, the lime inſtantly attracts the moiſture of which the air is always full, and by this means, probably, grows ſo hot as to fire the ſulphur with which it is mixed. Perhaps alſo the acid of the alum is not totally changed into ſulphur: ſome part thereof may be only half-diſengaged from its baſis, and in that condition be capable of attracting ſtrongly the humidity of the air, of growing very hot likewiſe by imbibing the moiſture, and ſo of contributing to the accenſion of the phoſphorus.

There is alſo room to think that all the phlogiſton of the charred matter is not employed in the production of ſulphur in this phoſporus, but that ſome part of it remains in the ſtate of a true coal. The black colour of the unkindled phoſphorus, and the red ſparkles it emits while burning, ſufficiently prove this.

Human Urine analyſed.

PUT ſome human urine into a glaſs alembic; ſet it in a water-bath, and diſtil till there remain only about a fortieth part of what you put in; or elſe evaporate the urine in a pan ſet in the *balneum mariæ* till it be reduced to the ſame quantity. With this heat nothing will exhale but an inſipid phlegm, ſmelling however like urine. The reſiduum will, as the evaporation advances, become of a darker and darker ruſſet, and at laſt acquire an almoſt black colour. Mingle this reſiduum with thrice its weight of ſand, and diſtil it in a retort ſet in a reverberating furnace, with the uſual precautions. At firſt there will come over a little more inſipid phlegm like the former. When the matter is almoſt dry, a volatile ſpirit will riſe. After this ſpirit, white vapours will appear on increaſing the fire; a yellow oily liquor will come off, trickling down in veins; and together with this liquor a concrete volatile ſalt, which will ſtick to the ſides of the receiver. At laſt there will come over a deep-coloured fetid oil. In the retort there will remain a ſaline earthy reſiduum, which being lixiviated will yield ſome ſea-ſalt.

Of

Of the Volatile Alkali.

Volatile Alkalis rectified and depurated.

MIX together the ſpirit, the volatile ſalt, the phlegm, and the oil, obtained from any ſubſtance whatever. Put the whole into a large wide-mouthed glaſs body, and thereto fit a head with a large beak. Set this alembic in a water-bath, lute on a receiver, and diſtil with a very gentle heat. There will aſcend a ſpirit ſtrongly impregnated with volatile alkali, and a volatile ſalt in a concrete form, which muſt be kept by itſelf. Then increaſe your heat to the degree of boiling water; whereupon there will riſe a ſecond volatile ſpirit, ſomewhat more ponderous than the former, with a light oil that will ſwim on its ſurface, and a little concrete volatile ſalt. Proceed till nothing more will riſe with this degree of heat. Keep by itſelf what came over into the receiver. At the bottom of the cucurbit you will find a thick fetid oil.

Into ſuch another diſtilling veſſel put the ſpirit and ſalt that roſe firſt in this diſtillation, and diſtil them in the *balneum mariæ* with a heat ſtill gentler than before. A whiter, purer, volatile ſalt will ſublime. Continue the diſtillation till an aqueous moiſture riſe, which will begin to diſſolve the ſalt. At the bottom of the veſſel will be left a phlegm, with a little oil floating on it. Keep your ſalt in a bottle well ſtopped.

Volatile Alkalis combined with Acids. Sundry Ammoniacal Salts. Sal Ammoniac.

ON a volatile ſpirit or ſalt pour gradually any acid whatever. An efferveſcence will ariſe, and be more or leſs violent according to the nature of the acid. Go on adding more acid in the ſame manner, till no efferveſcence be thereby excited, or at leaſt till it be very ſmall. The liquor will now contain a ſemi-volatile neutral ſalt, called an *ammoniacal ſalt*; which may be obtained in a dry form by cryſtalliſing as uſual, or by ſubliming it in cloſe veſſels, after the ſuperfluous moiſture hath been drawn off.

Volatile alkalis have the ſame properties with fixed alkalis, fixity only excepted: ſo that a volatile alkali muſt produce an efferveſcence when mixed with acids, and form therewith neutral ſalts, differing from each other in nothing but the nature of the acid in their compoſition.

IT muſt be obſerved, that the point of ſaturation is very difficult to hit on this occaſion; owing probably to the volatility of the alkali, which, being much lighter than the acid, tends always to poſſeſs the uppermoſt part of the mixture, while the acid ſinks to the bottom: whence it comes to paſs, that the lower part of the liquor is ſometimes overcharged with acid, while the upper part is ſtill very alkaline. But it is moſt eligible that the alkali ſhould predominate in the mixture; becauſe the exceſs of this principle eaſily flies off while the moiſture is evaporating in order to the cryſtalliſation or ſublimation of the ammoniacal ſalt; which being only ſemi-volatile, reſiſts the heat longer, and remains perfectly neutral.

If the vitriolic acid be combined with a volatile alkali, and the mixture diſtilled in a retort to draw off the ſuperfluous moiſture, a liquor comes over into the receiver which ſmells ſtrong of a ſulphureous acid. Now, as the acid of vitriol never becomes ſulphureous, but when it is combined with an inflammable matter, this experiment is one of thoſe which demonſtrate that volatile alkalis contain a very ſenſible quantity of inflammable matter. This ſame liquor taſtes of an ammoniacal ſalt; which proves that it carries up with it ſome of the neutral ſalt contained in the mixture. The reſt of this ſalt, which is called *Glauber's ſecret ſal ammoniac*, or *vitriolic ſal ammoniac*, ſublimes into the neck of the retort. It is very pungent on the tongue; it crackles a little when thrown on a red-hot ſhovel, and then flies off in vapours.

The ammoniacal ſalt formed by the acid of nitre exhibits much the ſame phenomena; but it requires greater care in drying and ſubliming it, becauſe it hath the property of detonating all alone, without the addition of any other inflammable matter: and it will infallibly do ſo, if too ſtrong a fire be applied towards the end of the operation, when it begins to be very dry. This property of detonating by itſelf it derives from the inflammable matter contained in the volatile alkali which ſerves for its baſis; and this is another demonſtrative proof of the exiſtence of ſuch an inflammable matter in the volatile alkali. This ſalt is called *nitrous ammoniacal ſalt*.

With the vegetable acids, that of vinegar for inſtance, is formed an ammoniacal ſalt of a ſingular nature, and which can ſcarce be brought to a dry form.

A volatile alkali, combined to the point of ſaturation with the acid of ſea-ſalt, forms another neutral ſalt, which takes a concrete form either by ſublimation or cryſtalliſation. The cryſtals of this ſalt are ſo very ſoft and fine, that a parcel of it looks like cotton or wool. This is the ſalt properly called *ſal ammoniac*. It is of great uſe in chemiſtry and in manufactures; but that which is daily conſumed in great quantities is not made in the manner above mentioned. It would come extremely dear, if we had no other way of procuring it, but by forming it thus with the acid of ſea-ſalt and a volatile alkali. This ſalt, or at leaſt the materials of which it is formed, may be found in the fuliginoſities and ſoots of moſt animal, and of ſome vegetable ſubſtances. The greateſt part of what we uſe comes from Egypt, where vaſt quantities thereof are made.

The method of preparing ſal ammoniac in Egypt was not known among us till Meſſ. Lemaire and Granger. Their memoirs inform us, that chimney-ſoot alone, without any additament, is the matter from which they obtain their ſal ammoniac; that thoſe chimneys under which nothing is burnt but cow's-dung, furniſh the beſt ſoot. Six and twenty pounds of that ſoot yield uſually ſix pounds of ſal ammoniac.

“The operation takes up about fifty, or two and fifty hours. The veſſels in which they put the ſoot are ballons of very thin glaſs, terminating in a neck of fifteen or ſixteen lines long and an inch in diameter: but they are not all of the ſame ſize. The leaſt contain twelve pounds of ſoot, and the greateſt fifty; but they fill them only three quarters full, in order to leave room for the ſublimation of the ſalt.

“The furnace, in which they place theſe ballons, conſiſts of four walls built in a quadrangular form. The two front-walls are ten, and the ſides nine foot long: but they are all five foot high, and ten inches thick. Within the quadrangle formed by theſe walls, three arches run lengthwiſe from end to end thereof, at the diſtance of ten inches aſunder. The mouth of this furnace is in the middle of one of its fronts, and of an oval form; two foot four inches high, and fixteen inches wide.

"The ballons lie in the ſpaces between the arches of the furnace, which ſerve inſtead of a grate to ſupport them. Four of them are uſually placed in each interval; which makes ſixteen for one furnace. They are ſet at the diſtance of about half a foot from each other, and ſecured in their places with brick and earth. But they leave about four inches on the upper part of the ballon uncovered, with a view to promote the ſublimation, as they alſo do ſix inches of the inferior part, that the heat may the better act on the matters to be ſublimed. Things being thus prepared, they firſt make a fire with ſtraw, which they continue for an hour. Afterwards they throw in cow's-dung made up in ſquare cakes like bricks. (The want of wood in this country is the reaſon that they generally make uſe of this fuel.) Theſe cakes of dung add to the violence of the fire, which they continue in this manner for nineteen hours; after which they increaſe it conſiderably for fifteen hours more; and then they ſlacken it by little and little.

"When the matter contained in the veſſels begins to grow hot, that is, after ſix or ſeven hours baking, it emits a very thick and ill-ſcented ſmoke, which continues for fifteen hours. Four hours after that, the ſal ammoniac is obſerved to riſe in white flowers, which adhere to the inſide of the neck of the veſſel; and thoſe who have the direction of the operation take care from time to time to paſs an iron rod into the neck of the ballon, in order to preſerve a paſſage through the ſaline vault, for giving vent to ſome blueiſh vapours, which conſtantly iſſue out of the veſſel during the whole operation."

From this hiſtory of the preparation of ſal ammoniac it appears, that ſoot, and particularly the ſoot of animal matters, either contains abundance of this ſalt perfectly formed, and waiting only for ſublimation to ſeparate it therefrom, or at leaſt that it contains the proper materials for forming it; and that during the operation, which is a kind of diſtillation of ſoot, theſe materials combine together and ſublime.

We ſhewed, in our analyſis of ſoot, that this ſubſtance yields by diſtillation a great deal of volatile alkali; and this is an ingredient which makes at leaſt one half of ſal ammoniac. As to the other principle of this ſalt, the marine acid, this alſo muſt needs exiſt in ſoot: but it is not ſo eaſy to conceive how it ſhould come there.

It is very true that vegetable and animal ſubſtances, the only ones that produce ſoot in burning, contain ſome portion of ſea-ſalt: but then this ſalt is very fixed, and ſeems unfit to riſe with the acid, the oil, and the ſubtile earth, of which the volatile alkali is formed. Therefore we muſt ſuppoſe either that its elevation is procured by the force of the fire, aided by the volatility of the matters that exhale in burning; or that, being decompoſed by the violence of the combuſtion, its acid alone riſes with the other principles above mentioned. The latter ſeems probable enough: for though in the common operations of chemiſtry the bare force of fire doth not ſeem ſufficient to decompoſe ſea-ſalt; yet the example of ſea-plants, which, before burning, contain this ſalt in abundance, and whoſe aſhes contain ſcarce any at all, but are replete with its fixed part, that is, with its alkaline baſis, ſeems to prove, that, when this ſalt is intimately mixed with inflammable matters, it may be deſtroyed by burning; ſo that its acid ſhall deſert its baſis, and fly off with the ſoot.

Before the exact method of procuring ſal ammoniac was known, it was generally imagined that the manufacturers mixed ſea-ſalt, and even urine, with the ſoot; becauſe theſe two ſubſtances contain the principles of which this ſalt conſiſts. But, beſides that the contrary now certainly appears from the above mentioned memoirs, it hath been ſhewn by Mr Duhamel, who hath publiſhed ſeveral memoirs and experiments concerning the compoſition and decompoſition of ſal ammoniac, from which we have partly taken what we have already ſaid on this ſubject; it hath been ſhewn, in the firſt of theſe memoirs, that the addition of ſea-ſalt to the ſoot, from which ſal ammoniac is to be extracted, contributes nothing to its production, and cannot increaſe its quantity. That alone, therefore, which was originally contained in the matters that produced the ſoot, enters as a principle into the compoſition of ſal ammoniac.

Sal ammoniac is ſometimes found perfectly formed in the neighbourhood of vulcanos. This ſalt is probably produced from the fuliginoſities of vegetable or animal matters conſumed by the fire of the vulcano.

Sal ammoniac is often impure, becauſe it carries up with it, in ſublimation, ſome of the black charred matter which ought to be left at the bottom of the veſſel: but it is eaſily purified. For this purpoſe you need only diſſolve it in water, filter the ſolution, then evaporate and cryſtallize; by which means you will have a very white and very pure ſal ammoniac. You may if you pleaſe, ſublime it again in a cucurbit and blind head, with a fire not too briſk. Some of it will riſe in the form of a light white powder, called *flowers of ſal ammoniac.* Theſe flowers are no other than true ſal ammoniac, which hath ſuffered no decompoſition; becauſe the bare action of fire is not capable of ſeparating the acid and the volatile alkali, of which this neutral ſalt conſiſts. When you intend to decompoſe it, you muſt uſe the means to be mentioned hereafter.

Though ſal Ammoniac be only ſemi-volatile, and requires a conſiderable heat to ſublime it, yet it hath the property of carrying up with it matters that are very fixed and ponderous; ſuch as metallic ſubſtances, and ſome kinds of earths. For medicinal uſes we ſublime therewith iron, lapis hæmatites, the copper in blue vitriol, &c. and then it takes different names, as *martial flowers of ſal ammoniac, ens veneris,* and other ſuch denominations, which it borrows from the matters ſublimed with it.

Sal Ammoniac decompounded by acids.

INTO a large tubulated retort put a ſmall quantity of ſal ammoniac in powder: ſet your retort in a furnace, and lute on a large ballon, as in the diſtillation of the ſmoking acids of nitre and ſea-ſalt. Through the hole in your retort pour a quantity of oil of vitriol or ſpirit of nitre equal in weight to your ſal ammoniac. An efferveſcence will inſtantly follow. The mixture will ſwell, and diſcharge white vapours which will come over into the receiver. Stop the whole in the retort immediately, and let the firſt vapours paſs over, together with ſome drops of liquor, which will diſtil without fire. Then put a few coals into the furnace, and continue the diſtillation with a very gentle heat; which however muſt be increaſed little by little till nothing more will come over. When the operation is finiſhed, you will find in the receiver a ſpirit of ſalt if you made uſe of oil of vitriol; or an *aqua regis*, if the ſpirit of nitre was employed: and in the retort will be left a ſaline maſs, which will be either a glauber's ſecret ſal ammoniac, or a nitrous ſal ammoniac, according to the nature of the acid uſed to decompound the ſal ammoniac.

Sal ammoniac decompounded by fixed Alkalis. Volatile ſalt. The Febriſuge of Sylvius.

INTO a glaſs alembic or retort put ſal ammoniac and ſalt of tartar pulveriſed and mixed together in equal quantities. Set your veſſel in a proper furnace, and immediately lute on a large receiver. A little volatile ſpirit will aſcend; and a volatile alkali, in a concrete form, very white and beautiful, will ſublime into the head, and come over into the receiver, in quantity near two thirds or three fourths of the ſal ammoniac uſed. Continue the diſtillation, increaſing the fire by degrees till nothing more will ſublime. Then unlute the veſſels. Put up your volatile ſalt immediately into a wide mouthed bottle and ſtop it cloſe with a cryſtal ſtopple. At the bottom of the retort or cucurbit you will find a ſaline maſs, which, being diſſolved and cryſtalliſed, will form a ſalt nearly cubical, having the taſte and other properties of ſea-ſalt. This is the *ſal febriſugum ſilvii*.

Sal Ammoniac decompounded by abſorbent Earths and Lime. Fixed Sal Ammoniac.

LET one part of ſal ammoniac and three parts of lime ſlaked in the air be pulveriſed ſeparately, and expeditiouſly mixed together. Put this mixture immediately into a glaſs retort, ſo large that half of it may remain empty. Apply thereto a capacious receiver, with a ſmall hole in it to give vent to the vapours, if needful. Let your retort ſtand in the furnace about a quarter of an hour, without any fire under it. While it ſtands thus, a great quantity of inviſible vapours will riſe, condenſe into drops, and form liquor in the receiver. Then put two or three live coals in your furnace, and gradually increaſe the fire till no more liquor will riſe. Now unlute your veſſels, taking all poſſible care to avoid the vapours, and quickly pour the liquor out of the receiver into a bottle, which you muſt ſtop with a cryſtal ſtopple, rubbed with emery. There will remain, at the bottom of the retort, a white maſs, conſiſting of the lime employed in the diſtillation, together with the acid of the ſal ammoniac: this is called *fixed ſal ammoniac*.

Volatile Alkalis combined with oily matters. A Volatile Oily Aromatic ſalt.

PULVERISE and mix together equal parts of ſal ammoniac and ſalt of tartar: put the mixture into a glaſs or ſtone cucurbit: pour on it good ſpirit of wine till it riſe half an inch above the matter. Mix the whole with a wooden ſpatula; apply a head and a receiver, and diſtil in a ſand-bath, gently heated, for two or three hours. A volatile ſalt will riſe into the head; and then the ſpirit of wine will diſtil into the receiver, carrying with it a portion of the volatile ſalt.

When nothing more will come over, let your veſſels cool; then unlute them, ſeparate the volatile ſalt, and weigh it directly. Return it into a glaſs cucurbit, and for every ounce thereof add a dram and a half of eſſential oil, drawn from one or more ſorts of aromatic plants. Stir the whole with a wooden ſpatula, that the eſſence may incorporate thoroughly with the volatile ſalt. Cover the cucurbit with a head, fit on a receiver, and, having luted it exactly, diſtil in a ſand-bath, as before, with a very gentle heat. All the volatile ſalt will riſe, and ſtick to the head. Let the fire go out, and when the veſſels are cooled take your ſalt out of the head. It will have an odour compounded of its own proper ſmell, and the ſmell of the eſſence with which it is combined. This is an *aromatic oily ſalt*. Put it into a bottle ſtopped cloſe with a cryſtal ſtopple.

A TABLE. Shewing the manner in which natural bodies, conſidered in a chemical view, may be divided i

NATURAL BODIES, conſidered as the objects of CHEMISTRY, may be divided into the ſix following claſſes, *viz.*

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   - SIMPLE, are thoſe which can be no further analized by chemiſtry; and are of two ſorts, *viz.*
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       - *Acid of ants.* Obtained from the anima
       - *Acid of borax,* or *ſedative-ſalt.* Obtain
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     - *Lead.* Of a dull bluiſh colour, exceedingly ſoft, and eaſily malleab … alone. The principal ore of it is the cubic, called *galena,*
     - *Copper.* Of a reddiſh colour, hard and ſonorous; admits of being … of it are of great variety, and extremely beautiful; blue, re
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     - *Iron.* A grey-coloured metal, extremely ductile when hot; the li… nitely various.
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SEMI-METAL. ZINC. … fluid ſolution

Sal Ammoniac decompounded by acids.

Into a large tubulated retort put a ſmall quantity of ſal ammoniac in powder: ſet your retort in a furnace, and lute on a large ballon, as in the diſtillation of the ſmoking acids of nitre and ſea-ſalt. Through the hole in your retort pour a quantity of oil of vitriol or ſpirit of nitre equal in weight to your ſal ammoniac. An efferveſcence will inſtantly follow. The mixture will ſwell, and diſcharge white vapours which will come over into the receiver. Stop the whole in the retort immediately, and let the firſt vapours paſs over, together with ſome drops of liquor, which will diſtil without fire. Then put a few coals into the furnace, and continue the diſtillation with a very gentle heat; which however muſt be increaſed little by little till nothing more will come over. When the operation is finiſhed, you will find in the receiver a ſpirit of ſalt if you made uſe of oil of vitriol: or an *aqua regis*, if the ſpirit of nitre was employed: and in the retort will be left a ſaline maſs, which will be either a glauber's ſecret ſal ammoniac, or a nitrous ſal ammoniac, according to the nature of the acid uſed to decompound the ſal ammoniac.

Sal ammoniac decompounded by fixed Alkalis. Volatile ſalt. The Febrifuge of Sylvius.

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SEMI-METAL. ZINC. luid ſolution

- NITROUS ACID.
  - EMPYREUMATIC. This mixture has no name, nor is it applied to any remarkable uſe in arts.
  - FOSSILE. - - Ditto.
  - ALCOHOL.
    - *Nitrous æther.* By digeſting; the æther ariſing to the ſurface.
    - *Spiritus nitri dulcis.* By digeſting a little, and then diſtilling.
  - METALS.
    - GOLD *. *Slightly impregnated.* By a boiling heat in cloſe veſſels, after the ordinary method of ſeparating ſilver from gold by the nitrous acid. It ſpontaneouſly ſubſides in the air.
    - SILVER.
      - *A fluid ſolution.* By ſolution. This when diluted with water ſtains hair and bones black; as alſo marble, agate, jaſper, *&c.* of different colours.
      - *Sel metellorum.* By ſolution and cryſtallization.
      - *Catharticum lunare, lunar cauſtic,* or *lapis infernalis.* By inſpiſſitating the ſolution to drineſs.
    - COPPER. A green-coloured ſolution. By ſolution.
    - IRON. A greeniſh ſolution, if a diluted acid is employed; if otherwiſe, it is of a yellowiſh colour: evaporated to drineſs, it deliquates in the air.
    - LEAD.
      - A yellow ſolution. By diſſolving in a diluted acid. If much water is added, the metal is precipitated.
      - *Saturni fulminans.* By inſpiſſating the ſolution. This explodes when put upon the fire with greater force than nitre, and has been propoſed to be uſed as an ingredient in gun-powder to augment its force.
    - TIN. A ſolution or corroded calx. By a careful ſolution without heat it remains ſuſpended; if otherwiſe, it falls down in form of a calx. This is commonly ſuppoſed to be the compoſition uſed in dying ſcarlet; but by miſtake: for it is a ſolution of tin in aqua regia that communicates that fine colour to cochineal. The ſame ſolution is the baſis of the powder which tinges glaſs of a ruby colour. It is the precipitate of gold from aqua regia by means of tin.
  - SEMI-METALS.
    - BISMUTH.
      - A greeniſh ſolution. By uſing a concentrated acid. This might be applied in ſome caſes in the art of dying; but is not yet come into general uſe.
      - *Magiſtery of biſmuth.* By precipitating from the ſolution by means of water. This has been employed as a coſmetic, but is inefficacious and unſafe. If mixed with pometum, this ſtains hair of a dark colour without injuring it.
    - MERCURY.
      - A limpid ſolution, intenſely corroſive. By ſolution.
      - *Red precipitate.* By evaporating the ſolution to drineſs, and then calcining till it becomes red.
      - *Mercurius corroſivus fuſus.* By precipitating from the nitrous acid by fixt alkali.
      - *White precipitate.* - By ditto with the volatile alkali.
    - ZINC. A corroded ſolution. By the ordinary means.
    - ANTIMONY.
      - A colourleſs calx. By ſimple corroſion.
      - *Bezoardic mineral.* By diſtilling from butter of antimony, after having added the nitrous acid.
      - *Antimonium diaphoreticum.* By adding nitre to crude antimony, and deflagrating.
      - *Ceruſa antimonii.* By deflagrating regulus of antimony with nitre.
    - COBALT.
      - A red liquor. By ſolution either in its calcined or metallic ſtate.
      - *Roſe-coloured cryſtals.* By adding muriatic acid, and allowing it to cryſtallize.
      - *Green ſympathetic ink.* By diſſolving theſe cryſtals in water. The ſolution is red when cold, and green when warm: when wrote with, it diſappears when dry; but when held to the fire it becomes green, and again diſappears when cold.
    - NICKEL. A green-coloured liquor. By ſolution.
  - EARTHS.
    - CALCARIOUS.
      - *Deliqueſcent cryſtals.* - By ditto and cryſtallization.
      - *Baldwin's phoſphorus.* By ditto and evaporating to drineſs.
    - EARTH of ALUM, and all other abſorbent earths. By ſolution. The compounds have no names nor any remarkable properties hitherto diſcovered.
    - CRYSTALLINE EARTHS *. By ſolution after precipitation from the liquor ſilices.
  - WATER. *Acidulated water.* By ſolution.
- The MURIATIC ACID
  - ACIDS.
    - VITRIOLIC, and NITROUS. As in the former part of this table.
    - VEGETABLE, and all others yet known. By ſolution: but as none of theſe mixtures are applied to any particular purpoſe, we take no notice of them.
  - ALKALIS.
    - VEGETABLE. *Digeſtive ſalt.* By ſolution and cryſtallization.
    - FOSSILE.
      - *Common ſalt.* Commonly obtained by evaporating ſea-water to drineſs; or artificially made by mixing the acid and alkali, and cryſtallizing.
      - *Sal gem.* A native foſſile ſalt, found in mines in Poland, Spain, *&c.* of the ſame nature as common ſalt, but more pure.
    - VOLATILE. *Common ammoniac.* Obtained at large by a particular proceſs from ſoot. Artificially made by mixing the acid and alkali, and cryſtallizing.
  - OILS *. By ſolution. The union here is but imperfect, nor have they any particular name.
  - ALCOHOL. *Spiritus ſalis dulcis.* By digeſting, and afterwards diſtilling. The acid here is never totally dulcified.
  - METALS.
    - GOLD *. *A yellow liquor.* By boiling a calx of gold (in whatever way obtained) in this acid. It does not act upon it in its metallic ſtate.
    - SILVER *.
      - *A fluid ſolution.* By diſſolving the ore of ſilver in this acid. It does not act upon pure metallic ſilver.
      - *Luna cornea.* By elective attraction from the nitrous acid.
    - COPPER. *A green deliqueſcent inflammable ſalt.* By ſolution and inſpiſſating to drineſs.
    - IRON. *Tinctura martis aurea.* By ſolution. The iron is in ſome meaſure rendered volatile by this operation.
    - LEAD.
      - A limpid ſolution. By a boiling heat, and frequent cohobations with freſh acid.
      - *Cornea Saturni.* By precipitation from the nitrous acid.
    - TIN *.
      - A corroded powder. By ſimple corroſion.
      - *Butter of tin.* By diſtilling from corroſive ſublimate.
    - MERCURY *. A colourleſs cryſtalline maſs, extremely acrid. By corroſion, employing the fumes of a very concentrated acid.

The MURIATIC ACID			*Butter of tin.* By distilling from corrosive sublimate.
		MERCURY *.	A colourless crystalline mass, extremely acrid. By corrosion, employing the fumes of a very concentrated acid.
can be combined with these bodies, *viz.*	SEMI-METALS.	BISMUTH *.	A solution very slightly impregnated. By employing a very concentrated acid.
		ZINC.	A solution of a very slight yellow colour.
		ARSENIC *.	*Butter of arsenic.* By distilling corrosive sublimate with arsenic; the arsenic uniting with the acid, and leaving the mercury.
		MERCURY *.	*Mercur. corrosiv. albus.* By precipitation from the nitrous acid.
			Corrosive sublimate. By subliming from sal ammoniac, common salt, or many other bodies.
			Mercurius dulcis. By resubliming corrosive sublimate with more quicksilver.
			Mercurial panacea. By sublinning corr. sub. nine times, and digesting for some time in spirit of wine.
		COBALT.	A reddish solution. By the ordinary means. It becomes green by a gentle heat.
		PLATINA *.	A fluid solution. With difficulty effected, after having been precipitated from aqua regia by alkalis.
		NICKEL.	A green solution. By the ordinary means.
	EARTHY.	CALCARIOUS.	*Liquid shell.* By solution. A substance whose effects in medicine have been greatly extolled.
			Ol. calcis per deliquium. By evaporating liquid shell to driness. It naturally deliquesces.
			Fixt ammoniac. By solution and crystallization. This sometimes appears luminous in the dark when struck with a hammer.
		OSTEOCELLO, MAGNESIA, and other absorbents.	By solution; but the properties or uses of these are not known.
	WATER.		*Acidulated water.* Generating heat by mixture.
VINEGAR, or VEGETABLE ACID can be combined with these bodies, *viz.*	ACIDS.	VITRIOLIC, NITROUS, and MURIATIC,	as in the above table. It likewise unites with all other acids, generating heat; but the properties or uses of these are not known.
	ALKALIS.	VEGETABLE.	*Regenerated tartar.* By solution and crystallization.
		FOSSILE.	*Polychrest of Rochelle.* By ditto.
		VOLATILE.	*Spiritus menderari.* By solution.
	OILS *.		The union here is imperfect, nor have any of them obtained particular names.
	ALCOHOL.		A mixture much used for anointing sprains, *&c.*
	METALS.	SILVER *.	*Lunar caustic.* By dissolving in this acid a precipitate of silver from the vitriolic acid by means of fixt alkali, and evaporating the solution to driness.
		COPPER.	*Verdegris.* By solution and crystallization; or at large, by stratifying copper plates with the husks of the grape.
		IRON.	*Sal martis aperiens.* By solution and crystallization.
		LEAD.	*Ceruse.* By exposing, in certain circumstances, thin plates of lead to the fumes of vinegar.
			Saccharum Saturni. By solution and crystallization.
		TIN *.	This is not properly dissolved; but the acid is evidently impregnated. By the ordinary means of solution.
	SEMI-METALS.	ZINC.	A colourless solution of a sweetish taste. By digesting for some time.
		MERCURY *.	*A fluid solution.* By employing a precipitate of mercury from the nitrous acid by alkalis.
			A red calx. By long digestion with fluid mercury.
		ANTIMONY *.	*Vinum benedictum.* This is not a proper solution of the metal, but the acid is impregnated with an emetic quality.
		ARSENIC.	*Vinum arsenicum.* By ditto.
		BISMUTH.	An austere stiptic liquor. By strong coction.
	EARTHY.	CALCARIOUS EARTHS.	*Earthy salts.* Not known in medicine or arts.
		MAGNESIA.	*Dr Black's purging salt.* By solution. It unites with all the other absorbent earths; but the properties of these mixts are unknown.
	WATER.		*Acidulated water.*
ACID of URINE.	ACIDS of all kinds.		The nature of these not known.
	ALKALI.	VOLATILE.	A glass-like saline substance called *microcosmic salt.* The acid is always found in this state by evaporating urine.
	OILS.		*Baldwin's phosphorus.* By distilling with substances that contain oils or inflammable matters.
	METALS.	LEAD.	An inflammable malleable mass. By calcining the dry salt with lead.
		TIN.	A mass resembling zinc; and inflammable. By ditto.
		IRON.	A true *phosphorus.* By ditto.
			A bluish solution. By employing a watery solution of the acid.
		COPPER.	A corroded powder, or green solution. By a boiling heat in a watery solution of the acid.
	SEMI-METALS.	MERCURY.	A semi-opaque mass. By fusion with the acid in its solid form.
		ZINC.	A corroded powder, soluble in water. By solution in the acid in a watery situation.
			A true *phosphorus* By fusion with the dry acid.
		ANTIMONY.	A solution in the ordinary way.
			A brilliant striated mass. By fusion with the dry acid.
		BISMUTH.	A mixture but little changed in appearance from ordinary bismuth. By fusion.
		ARSENIC.	A whitish semi-transparent deliquescent mass. By fusion.
		COBALT.	A reddish tincture. By solution.
	VITRESCENT EARTHS.		Glass of different sorts. By fusion.
ACID of AMBER.	ALKALI.	FIXED.	A neutral saline mass which would not crystallize. By solution.
		VOLATILE.	A neutral ammoniacal oleaginous liquor, extremely volatile. By solution with a pure alkali.
			Liquor cornu cervi succinatus. By solution, using salt of hartshorn.
	OIL.	FOSSILE.	*Amber.* A native production; but may be again artificially formed by uniting these together by solution.
	METALS.	COPPER.	It dissolves very slowly in its metallic state; but corrodes it much more readily when calcined.
		IRON.	Dissolves a part into a colourless liquor, but corrodes a great deal more into a crocus.
	SEMI-METAL.	ZINC.	[illegible] fluid solution

The effects of this acid upon other bodies are not yet known.

ACID of ANTS.
ACIDS of all kinds. The properties not known.
ALKALIS. FIXED. A deliquescent neutral salt. By solution and crystallization.
VOLATILE. A neutral liquor that would not crystallize.
METALS. SILVER *. By solution. The calx of silver precipitated from aqua fortis by alkalis; but does not act upon it in its metallic state.
COPPER. Beautiful green crystals. By dissolving and crystallizing calcined copper. It acts slowly upon it in its metallic state.
IRON. A metallic salt. It dissolves this metal with great facility.
LEAD *. A salt resembling Saccharum Saturni. By dissolving the red calx of lead. But it does not act upon it in its metallic state.
SEMI-METAL. ZINC. Elegant crystals. By the ordinary means.
The effects of this acid upon other bodies, or the uses to which these combinations might be applied, are not yet sufficiently known.

ACID of BORAX.
FOSSILE. *Borax.* A native substance, which may be imitated by art. It is of great use in promoting the fusion of metals and earths.
ALKALI. A solution with a considerable heat, which burns with a green flame.
ALCOHOL. A solution in a considerable heat. The other mixtures with this acid not known.
WATER.

ACID of ANIMALS.
We know as yet but little of the nature of this acid; and its combinations with other bodies have not hitherto been examined.

The FIXED ALKALI, whether VEGETABLE or FOSSILE, can be united with the following bodies; but the vegetable is best known.
ACIDS: Vitriolic, Nitrous, Muriatic, Vegetable; and acid of Urine, of Amber, of Ants, of Borax; as in the former part of this table.
ALKALIS of all sorts. The uses of these mixtures are not known.
OILS.
EXPRESSED. *Soap.* The best hard soap is made of olive-oil and fossile alkali. The ordinary white soap of this country is made of tallow and potash;
black soap, with whale-oil and potash.
ESSENTIAL. *Saponaceous mass.* Best made by pouring spirit of wine upon caustic alkali and then oil, digesting and shaking.
EMPYREUMATIC. This mixture dissolves gold when precipitated from aqua regia; and is the basis of the fine colour called *Prussian blue*; and has various other properties, as yet but little known.
FOSSILE. This has no name, nor are the properties well known; but from some observations that have been made on native soapy waters, it is probable that it would keep linen much longer white than any other kind of soap.
SULPHUR.
Hepar sulphuris. By injecting alkalis upon melted sulphur.
Lac sulphuris. By dissolving sulphur in an alkaline lixivium, and precipitating by an acid.
METALS.
GOLD *. After having precipitated it from aq. regia it dissolves it, if the alkali has been calcined with animal-substances.
SILVER *. After having precipitated it from the nitrous acid, it dissolves it if the alkali has been calcined in contact with the flame.
TIN. A corroded powder. By the ordinary means of solution.
COPPER. By ditto.
LEAD. A fluid solution. By ditto. This stains hair black.
IRON *. A blood-coloured solution. By dropping a solution of iron in the nitrous acid, into an alkaline lixivium.
MERCURY *. A fluid solution. After precipitating it from acids; if the alkali is in too large proportions, it then dissolves it, especially if the alkali has
been calcined in contact with the flame.
SEMI-METALS.
ZINC *. By solution, after having precipitated it from the nitrous acid.
BISMUTH *. By solution, after having precipitated it from the nitrous acid.
ANTIMONY.
Kermes mineral. By dissolving antimony in an alkaline lixivium, filtering, and allowing it to stand in a cool place till it precipitates.
Golden sulphur of antimony. By dissolving a crude antimony in an alkaline lixivium, and precipitating by an acid.
Hepar antimonii. By deflagrating crude antimony with nitre.
Crocus metellorum. Is hepar antimonii pulverised and edulcorated with water.
Diaphoretic antimony. By deflagrating regulus of antimony with nitre.
Antimoniated nitre. By dissolving diaphoretic antimony in water, and allowing it to crystallize.
Magistery of antimony. By precipitating a solution of diaphoretic antimony by adding vinegar.
Regulus antimonii medicinalis. By fusing crude antimony with alkali. This is not properly a compound of alkali and antimony, but of
another kind. But as it is a term much used, it was proper to explain it.
ARSENIC *. A metallic arsenical salt. By a particular elective attraction from regulus of antimony and nitre.
EARTHS.
CHRYSTALLINE. *Liquor silicum.* By fusion with twice their weight of alkalis.
Glass. By fusion with a much smaller proportion of alkali. This is the composition of crystal glass, and all others commonly used.
ABSORBENTS. Argillaceous, and all kinds of earths. *Glass.* By fusion; differing in quality according to the nature of the ingredients. Glass is
likewise produced with it in fusion with metals.
WATER. *Alkaline lixivium*, when caustic, or even the ordinary solution of mild alkali, is a fluid of great power in washing, blacking, &c.
AIR. FIXT. *Mild alkali.* This is the general state in which alkalis are found; but if they are rendered caustic by means of quick-lime or otherwise, they again
absorb it from the air, or from many other bodies, by elective attraction. When perfectly mild, this alkali may be made to assume a crystalline form.

The VOLATILE ALKALI, or SPIRIT of SAL AMMONIAC, can be united with these bodies, *viz.*
ACIDS: Vitriolic, Nitrous, Muriatic, Vegetable; of Urine, of Amber, of Ants.
ALKALI, as above.
OILS.
EXPRESSED. Has no name. By solution.
ESSENTIAL. *Sal volatile oleosum.* By ditto with some difficulty, unless the alkali is in a caustic state.
EMPYREUMATIC. A pungent oily substance, of great power in medicine. The principal one of this kind in use is spirit of hartshorn.
FOSSILE. A particular kind of soapy substance.
SULPHUR. Smoking spirit of sulphur. By distilling sal ammoniac, quick-lime, and sulphur.
ALCOHOL *. By distilling alcohol from volatile alkalis, it acquires a caustic fiery taste; but the union is not complete.
METALS.
GOLD *. *Aurum fulminans.* A powder obtained by precipitating it from aqua regia by volatile alkalis.
A liquid solution. By adding a large proportion of alkali after it has been precipitated from aqua regia. This deposites the gold when long
exposed to the air. The curious vegetation called *arbor Dianæ* is formed by adding mercury to this solution.
SILVER *. A solution. After it has been precipitated from the nitrous acid.
COPPER.
A blue-coloured solution. By the ordinary means. This when evaporated to driness, and mixed with tallow, tinges the flame green.
Sapphire-coloured crystals. By crystallizing the solution.
Venus fulminans. By evaporating the solution to driness.
Aqua cerulea sappharina. By mixing sal ammoniac, quick-lime, and thin plates of copper, with water, and allowing them to remain a night
IRON. By ordinary solution.
LEAD. By ditto.
TIN. The mixts that are produced by these metals are little known.
SEMI-METALS.
BISMUTH *. By solution, after having precipitated it from the nitrous acid.
ANTIMONY.
PLATINA *. By solution, after having precipitated it from aqua regia.
COBALT. A reddish liquor. By solution.
NICKEL. A blue liquor. By ditto.
This solution might be of use in washing or bleaching; but, unless in particular cases, would be too expensive. It coagulates with alcohol.
WATER. FIXT. Mild vola[illegible] alkali. The usual state in which it is found; nor has any method yet been discovered of rendering it solid but in this state.

EXPRESSED OILS.	ACIDS:		Vitriolic, Nitrous, Muriatic, Vegetable, of Urine, of Amber, as in the foregoing part of this table.
	ALKALIS:		Fixt, and Volatile, as above.
	OILS:		Eſſential, Empyreumatic, and Foſſile. By mixture; but their uſes are not much known.
	SULPHUR.		*Balſam of Sulphur.* By ſolution in a boiling heat.
	ALCOHOL.		After expreſſed oils are freed from ſoap or plaiſters, they are ſoluble in alcohol; but not in their ordinary ſtate.
	METALS.	TIN *.	A kind of plaiſter. By ſolution when the tin is in the ſtate of a calx.
		LEAD *.	Ditto. By boiling the calx of lead in oils. This is uſed for cements in water-works. The common white paint is a mixture of this leſs perfect.
	SEMI-METALS.	ZINC *.	Ditto. By ditto.
	CALCARIOUS EARTHS.		Ditto. By mixture when in a cauſtic ſtate.
ESSENTIAL OILS.	ACIDS:		Vitriolic, Nitrous, &c. as above.
	ALKALIS:		Fixt, and Volatile, as above.
	OILS of all kinds.		By ſolution or mixture.
	SULPHUR.		A balſam of ſulphur. By ſolution, imperfectly: better by adding eſſential oils to the ſolution made by expreſſed oils or hepar ſulphuris.
	ALCOHOL.	Imperfect mixture.	By ſolution.
		Aromatic waters.	By diſtillation.
	METALS.	COPPER.	By ſolution.
		LEAD.	By ditto.
	WATER.		Diſtilled water of the ſhops. By diſtilling recent vegetable ſubſtances with water.
EMPYREUMATIC OILS.	ACIDS:		Vitriolic, and Nitrous, as above.
	ALKALIS:		Fixt, and Volatile, as above.
	OILS of all kinds.		By mixture.
	ALCOHOL.		By ſolution. By repeated diſtillations the oils are rendered much more ſubtile.
FOSSILE OILS.	ACIDS:		Vitriolic, and Nitrous, as above.
	ALKALIS:		Fixt, and Volatile, as above.
	OILS of all kinds.		By mixture.
	SULPHUR.		With ſome difficulty, by ſolution.
	ALCOHOL.		- - - By ditto.
SULPHUR.	ACID *:		Vitriolic; with the phenomena above deſcribed.
	ALKALIS:		Fixt, and Volatile, as above.
	OILS:		Expreſſed, Eſſential, and Foſſile, as above.
	METALS.	SILVER.	A maſs of a red like colour. By adding ſulphur to red-hot ſilver, and fuſing; found alſo with it in the ſtate of an ore.
		LEAD.	A ſparkling friable maſs, hardly fuſible. By deflagrating ſulphur with lead. This in a native ſtate forms the ore of lead called *galena.*
		COPPER.	A black brittle maſs; eaſily fuſed. By adding ſulphur to red-hot copper, or ſtratifying with ſulphur and fuſing. Naturally in ſome yellow pyrites.
		IRON.	A ſpungy-like droſs, eaſily fuſible. By putting ſulphur to red-hot iron. This is alſo found naturally in the common yellow or brown pyrites. A fulminating compound. By mixing filings of iron with ſulphur, moiſtening them with water, and preſſing them hard, they in a few hours burſt out into flame. This compoſition has been employed for imitating earthquakes. *Crocus martis.* By deflagrating with iron. *Crocus martis aperiens.* By calcining the crocus martis in the fire till it aſſumes a red appearance. *Crocus martis aſtringens.* By puſhing the heat ſtill further.
		TIN.	A dark-coloured maſs, reſembling antimony. By fuſion.
	SEMI-METALS.	MERCURY.	*Ethiops mineral.* By heating flowers of ſulphur, and pouring the mercury upon it, and ſtirring it well. Its natural ore is called *cinnabar.* *Factitious cinnabar.* By applying the mercury and ſulphur to each other in their pure ſtate, and ſubliming. *Cinnabar of antimony.* By ſubliming corroſive ſublimate and crude antimony; or the reſiduum, after diſtilling butter of antimony.
		BISMUTH.	A faint greyiſh maſs, reſembling antimony. By fuſion. If in its metalline ſtate, the ſulphur ſeparates in the cold; but not ſo if the calx has been employed.
		ANTIMONY.	*Crude antimony.* By fuſion.
		ZINC *.	A very brittle, dark-coloured, ſhining ſubſtance. With ſome difficulty, by keeping it long in a moderate fire, and covering it ſeveral times with ſulphur, and keeping it conſtantly ſtirred.
		ARSENIC.	*Yellow arſenic.* By fuſing it with 1-10th its weight of ſulphur. *Red arſenic.* By ditto with 1-5th its weight of ſulphur. *Ruby of ſulphur,* or arſenic, or golden ſulphur. By ſubliming when the proportions are equal. *Orpiment.* A natural production; not perfectly imitable by art; compoſed of ſulphur and arſenic. Much uſed as a yellow paint.
		NICKEL.	A compound; compact and hard as lead; of a bright metallic appearance; internally yellow. By fuſion.
	WATER.		*Gas ſylveſtræ.* By receiving the fumes of burning ſulphur in water. This ought rather to be called a union of the volatile vitriolic acid with water.
ALCOHOL.	ACIDS:		Vitriolic, Nitrous, Muriatic, Vegetable, and of Borax, as above.
	ALKALI *:		Volatile, as above.
	OILS:		Expreſſed, Eſſential, Empyreumatic, and Foſſile, as above.
	METALLIC calces,		in ſome particular caſes.
	WATER.		By ſolution.
GOLD.	ACIDS:		Vitriolic *, Nitrous *, and Muriatic *. In the circumſtances and with the phenomena above deſcribed.
	ALKALIS:		Fixt *, and Volatile *, as above.
	METALS.	SILVER.	By fuſion. And the ſame is to be underſtood of all the combinations of metals, unleſs particularly ſpecified.
		LEAD.	A very brittle maſs. Gold is rendered pale by the leaſt admixture with this.
		TIN.	Remarkably brittle. The ſmalleſt particle of tin falling upon a furnace renders all the gold or ſilver melted in it extremely brittle.
		COPPER.	Paler and harder than pure gold. This mixture is uſed in all our coins, the copper being called the alloy.
		IRON.	Silver-coloured, hard and brittle; very eaſily fuſed.
	SEMI-METALS.	MERCURY.	Soft like a paſte called an *amalgamum.* By ſolution; it being in this caſe called *amalgamation;* and the ſame is to be underſtood of the ſolution of any other metal in quick-ſilver.
		ZINC.	A bright and whitiſh compound, admitting of a fine poliſh, and not ſubject to tarniſh; for which qualities it has been propoſed as proper for analyſing ſpeculi for teleſcopes.
		ARSENIC.	Brittle; and the gold is thus rendered a little volatile.
		ANTIMONY.	A fine powder for ſtaining glaſs of a red colour. By calcination.
		BISMUTH *.	A brittle whitiſh regulus; volatile in the fire.
		PLATINA.	Ductile, and of a duſky colour. This has been employed to debaſe gold, as it is of the ſame ſpecific gravity, and is not diſcoverable by the uſual teſts for diſcovering the purity of gold.
		COBALT.	
		NICKEL.	White and brittle.
	ACIDS:		Vitriolic *, Nitrous, Muriatic *, Vegetable *, and Acid of Ants *, as above.

With their ſeveral ſubdiviſions; their properties defined; and the manner in which they are obtained, pointed out.

s all fluids next to mercury, and the moſt fixed in the fire, and moſt powerful as a ſolvent of all the acids. Obtained chiefly from ſulphur by inflammation.
n ſulphur by inflammation, air being admitted during the operation. This acts leſs powerfully as a ſolvent than when in its fixt ſtate.
l of a reddiſh colour, emitting noxious fumes when in its concentrated ſtate. The next acid in ſtrength to the vitriolic. Obtained chiefly from nitre.
e fluid of a beautiful yellow colour. Inferior in power to the former. Obtained from ſea-ſalt.
y expreſſion or diſtillation from vegetables; as lemon-juice, citron, ſorrel, *&c.*
y hard ſubſtance, depoſited on the ſides of veſſels in which wine is fermented.
allowing any fermentable liquor to proceed in the fermentation till it is paſt the vinous ſtate. All theſe vegetable acids are much leſs corroſive, and leſs powerful
than any of the former.
g urine. This is in a dry form; and much leſs known in arts than the former.
n a ſolid form. This is likewiſe little known in arts.
l from which it has its name, by diſtillation, in a fluid form. It is alſo little known.
ed from borax, in a ſolid ſtate and ſcaly-like form.
n arſenic.
nal-ſubſtances in diſtillation.

ined from the aſhes of burnt vegetables. A deliqueſcent ſalt.
metimes found native, as the natrum of Egypt; and ſometimes by burning ſea-weed, as kelp.
oniac, from the ſoot of burning bodies, and from the putrefactive fermentation. It is naturally in a ſolid ſtate.

li; and are of many different kinds, as may be ſeen in the following table.
The principal of theſe are vitriols; the others may be ſeen in the following table.
s in allum and gypſum. See the following table.
joined with the juices of the plant in a particular manner not to be imitated by art. Of this kind is ſugar, manna, honey, and others of that ſort.
d taſte, inodorous, and not ſoluble in alcohol. They are obtained by expreſſion; as, oil of olives, rapſeed, almonds, *&c.* Animal-fats are of the ſame

ion, and are poſſeſſed of the taſte and odor of the ſubſtance from which they are drawn, and are ſoluble in alcohol. Of this kind are oil of cloves, ſpike,
in the animal-kingdom.
able degree of heat; and are of an acrid taſte and burnt-like flavour, as oil of hartſhorn. Theſe are ſoluble in ſpirit of wine.
e called, when pure, *naptha;* which is of an acrid taſte, and extremely volatile; not miſcible with alcohol. A great many inflammable foſſils contain

in many mineral ſubſtances, metallic ores, *&c.*; but it is for the moſt part obtained from pyrites.
er. Obtained from fermented vegetable juices by diſtillation; as, from the juice of the grape, malt-liquors, rice, *&c.*
fire, of all bodies; of a yellow colour. It is more commonly found in its metallic ſtate than any other metal. There is no proper ore of it: But it is found

alleability, and fixity. Sometimes found in its native ſtate; more frequently in that of an ore, with ſulphur, ſometimes arſenic; aſſuming different appearances.
le, and next to the foregoing metals in weight. Almoſt never found in its metallic ſtate; uſually in an ore with ſulphur or arſenic, but ſeldom with ſulphur
and the glaſſy called *ſparr.*
extended greatly under the hammer, either hot or cold. It is difficult of fuſion. This is generally found in the ſtate of an ore with ſulphur. The ores
, green, yellow, *&c.*
le. The ores of this metal are generally arſenical, and aſſume a cryſtalline appearance. The colour moſt uſually a dark brown, and ſometimes very beautiful.
ghteſt metal except tin. It is the only metal that admits of being welded, and tempered by cooling. It is found in almoſt every body, and its ores are inſi

intenſe degree of cold; of great gravity, and eaſily volatilized in heat. It is ſometimes found in its fluid form; but uſually in a beautiful red ore with

hard and ſonorous, and has a ſmall degree of ductility; eaſily fuſed and volatilized. Lapis calaminaris is its principal ore.
hard and brittle, and conſiderably heavy; not difficult of fuſion, and eaſily converted into glaſs. Its only ore is with ſulphur, which is the crude antimony

orous body, of a plated texture; eaſily fuſed and vitrified. It is only reduced to an ore by arſenic. Its appearance much the ſame as the regulus.
ted texture, very brittle, and extremely volatile. It is generally found in the ores of other metals.
of the ſame ſpecific gravity and fixity with gold, and reſiſting the teſts which have uſually been applied for diſcovering the purity of gold, ſuppoſed from
ies. Of its ores we know nothing.
converted into a fine blue-coloured glaſs called *ſmalt.* This is always obtained from an arſenical ore, which is likewiſe called *cobalt.*
ght; eaſily fuſed, but difficult to vitrify. Of its ores we know nothing.
riety of colours and texture. Marble is the hardeſt and fineſt. Thoſe kinds of lime-ſtone which feel unctuous to the touch are generally impregnated with
e lime is hard and weighty, contain ſand: This is beſt for building, the other for manure.
his is much freer of any heterogeneous mixture than any lime-ſtone, and is eaſily calcined into quick-lime. This is probably nothing elſe than lime-ſtone
llized.
d yield a very fine quick-lime. Theſe are uſed in medicine.
d combined with the vitriolic acid, and forming bitter purging ſalt. It is likewiſe obtained from the mother-lye of nitre, the aſhes of burnt vegetables, *&c.*
ent earth, found in many places mixed with ſulphureous pyrites, as in Yorkſhire, *&c.* Clay of any kind may, by a particular proceſs, be converted into

the calcination of animal-ſubſtances. It can hardly be converted into glaſs; and is therefore uſed as a baſis to white enamels, *&c.*

tifully every where. With alkaline ſubſtances they are eaſily converted into glaſs, and hence are termed *vitreſcent.*
able to this claſs; but they are of a much greater degree of hardneſs and tranſparency than the others.

but chiefly red or yellow or white. The pureſt clay is that which burns white in the fire.
er kind of clay; ſometimes mixed with a little iron or other matters.
clays, found in various parts. Theſe are at firſt ſoft, and readily cut; but turn extremely hard in the air. Many other varieties of theſe earths might be
their chemical properties ſo much as in their external appearance, and being all mixed with one another, they more properly belong to the natural

of mucilaginous matter, which it is impoſſible ever to get perfectly ſeparated.
is exceeding great; but they all agree in having an acid joined with them. The moſt common ſorts are impregnated with ſulphur and iron.

moſphere; and in this ſtate may be conſidered as a menſtruum for water and other volatile bodies; but as it only ſuſpends them, without altering

orming with them a true chemical mixt, differing in its properties from what it was without it. The bodies whoſe qualities we certainly know to be
is probably owing to it that they retain their metallic form; but experim are yet wanting here.

A TABLE. Shewing the ſeveral combinations that the SIMPLE CHEMICAL ELEMENTARY BODIES admit of with one another; the compound reſulting from that mixture; and the manner in which the union is effected: With ſome account of the principal uſes to which theſe are applied in arts or manufactures.

N. B. This mark *, put above any word, denotes that there is ſome difficulty in the proceſs, or that the union is not very complete.

The VITRIOLIC ACID may be combined with theſe bodies, *viz.*

- **ACIDS.**
  - NITROUS ACID. A mixture which readily inflames oils. By ſolution, generating heat.
  - MURIATIC, VEGETABLE, and all other ACIDS yet known. By ſolution, generating heat. But theſe mixtures are applied to no particular uſe in medicine or arts.
- **ALKALIS.**
  - VEGETABLE.
    - *Vitriolated tartar.* By ſolution and cryſtallization, or double elective attraction from a great variety of bodies.
    - *Nitrum vitriolatum.* A vitriolated tartar obtained by diſtilling from nitre with the vitriolic acid.
    - *Sal polychreſtum.* By deflagrating nitre with ſulphur. There are many other kinds of vitriolated tartar, known formerly by different names, and ſuppoſed to be poſſeſſed of particular properties, but they are now neglected.
  - FOSSILE. *Glauber's ſalt.* By ſolution and cryſtallization. Much uſed in medicine as a gentle purgative.
  - VOLATILE. *Secret ammoniac.* By ſolution. Formerly ſuppoſed a moſt powerful menſtruum for metals, *&c.* but without any juſt foundation.
- **OILS.**
  - EXPRESSED. A blackiſh gummy-like maſs. By ſolution, generating a conſiderable heat. Native gums are ſuppoſed to owe their origin to a mixture of this kind.
  - ESSENTIAL. A dark-coloured reſinous maſs. A great heat and violent effervescence being produced by this mixture. Native reſins ſuppoſed the ſame.
  - EMPYREUMATIC. Little known. By ſolution.
  - FOSSILE. A ſubſtance reſembling amber. By ſolution.
- **SULPHUR *.** Here there is no proper union of ſubſtances; but if ſulphur is boiled in this acid, it becomes leſs inflammable and more fixed than any ordinary ſulphur.
- **ALCOHOL.**
  - *Vitriolic æther.* By careful ſolution and diſtillation, the æther being ſeparated by the addition of water.
  - *Spiritus vitrioli dulcis.* By ſolution and diſtillation.
  - *Oleum diſtillatio dulcis.* By continuing the heat after the æther has ariſen.
  - *Oleum anodynum mineralis.* By rediſtilling the reſiduum of the laſt with alcohol. A medicine much celebrated by Hoffman.
  - *Sulphur.* By puſhing the heat after the oil comes over. It is to be obſerved that this is produced in every combination of this acid with inflammables or metals.
- **METALS.**
  - GOLD *. Imperfectly. By a particular proceſs after being ſeparated from aqua regia.
  - SILVER *. By ſolution, after it has been precipitated from the nitrous acid by alkalis. The fumes which ariſe in this ſolution are inflammable.
  - COPPER. *Blue vitriol.* This is ſometimes a native production, but in this way it is never pure. It is artificially prepared by ſolution in a very concentrated acid, and cryſtallizing it.
  - IRON.
    - *Green vitriol*, or *copperas.* Obtained at large by a particular proceſs from pyrites; or by ſolution, *&c.* in a diluted acid. This is the baſis of all black dyes, ink, *&c.* as it ſtrikes a black colour with vegetable aſtringents.
    - *Salt of ſteel.* By calcining the cryſtals of green vitriol till it they are converted into a white powder.
    - *Colcother of vitriol.* By continuing the calcination till it aſſumes a brown colour.
  - LEAD.
    - *Saturnus vitriolicus.* A ſolution in a boiling heat, but is again precipitated when cold.
    - An indiſſoluble concrete. By precipitation from the nitrous acid.
  - TIN. *Jupiter corroſivus.* By a boiling heat in a concentrated acid.
- **SEMI-METALS.**
  - ANTIMONY *. *A metallic ſalt.* By elective attraction from butter of antimony.
  - ZINC. *White vitriol.* Often found in its native ſtate. Artificially made by ſolution and cryſtallization in a diluted acid. Uſed by painters for drying.
  - BISMUTH. A corroded calx. By ſolution in a concentrated acid.
  - ARSENIC. - - - By ditto.
  - MERCURY.
    - *Ignis Gehenne*, or infernalis of Paracelſus. By a boiling heat, and repeated coctions with freſh acid when it is evaporated.
    - *Turpeth mineral*, or mercurius precipitatus flavus. By evaporating to drineſs, and then waſhing with water.
  - COBALT. A roſe-coloured mixture. By ſolution. If this is precipitated by a fixt alkali, and again diſſolved, the liquor appears of a beautiful red.
- **EARTHS.**
  - CALCARIOUS EARTHS.
    - A corroded calx. By ſimple corroſion. This when perfectly edulcorated with water is found to be a true gypſum.
    - *Sclenites.* By precipitation from a very dilute ſolution of chalk in the nitrous acid, by means of the vitriolic acid.
    - *Gypſum*, or *Paris-plaſter.* Often found in a native ſtate. May be artificially formed by precipitating from a ſolution of chalk in a very concentrated nitrous acid. Uſed as a cement; for taking impreſſions from medals, *&c.*
    - *Talc*, *aſbeſtos*, *&c.* A native production which cannot be perfectly imitated by art. Uſed for holding objects in microſcopes, making incombuſtible cloth, *&c.*
  - MAGNESIA. *Epſom*, or *magneſia Glauber's ſalt.* By ſolution and cryſtallization. Much uſed in medicine for the ſame purpoſes as real Glauber's ſalt.
  - EARTH of ALUM. *Alum.* By ſolution, cryſtallization, *&c.* Uſed by dyers as a preparatory for taking on the colours, papermakers, goldſmiths, *&c.*
  - EARTH of ANIMALS, OSTEOCELLO, *&c.* By ſolution. The mixtures of theſe are not applied to any particular uſe.
  - CLAY *. *Alum.* By digeſting pure clay for ſome time in this acid, and expoſing it for ſome time to the air, an alum is produced; and, if the clay is precipitated from this aluminous concrete, it is found to be a pure earth of alum, ſoluble in all acids.
  - FLINT *. A thickiſh coagulum. By digeſting the liquor ſilices in the vitriolic acid.
- **WATER.** An acidulated water. Sometimes, though ſeldom, found iſſuing along with native ſprings. Applied to no particular uſe.

- **ACIDS.**
  - VITRIOLIC, as above.
  - MURIATIC. *Aqua regia.* By ſolution. This is the only proper menſtruum for gold; and it is a ſolution of tin in this menſtruum which is the baſis of the ſcarlet dye.
  - VEGETABLE, and all others. By ditto. Theſe compounds have no particular names, nor are applied to any particular uſes in medicine or arts.
- **ALKALIS.**
  - VEGETABLE. *Common nitre.* A native production. Made artificially by ſolution and cryſtallization. This deflagrates with oily or metallic bodies, and is the foundation of gun-powder.
  - FOSSILE. *Cubic nitre.* By ſolution.
  - VOLATILE. *Nitrous ammoniac.* By ſolution. This differs from all the other ammoniacal ſalts by being ſoluble in alcohol.
- **OILS.**
  - EXPRESSED. A thick bituminous-like ſubſtance. Upon the mixture a conſiderable degree of heat is generated, and ſometimes, though very ſeldo actual flame is produced.
  - ESSENTIAL. Ditto. A more violent heat is generated upon the mixture with theſe oils than any other, and with many of them an actual flame is produ

BISMUTH.	METALS:		Gold, Silver, Lead, Tin, Copper, and Iron, as above.
	SEMI-METALS.	MERCURY and ANTIMONY,	as above.
		ARSENIC.	Nature not known.
		PLATINA.	This mixture changes its colour much on being expoſed to the air.
		COBALT *.	By mixing firſt with nickel or regulus of antimony, and then adding cobalt; but it cannot be united by itſelf.
		NICKEL.	This mixt is not known.
	VITREOUS MATTERS.		A yellow glaſs. The ore of biſmuth affords with theſe a blue glaſs; but this is probably owing to ſome mixture of cobalt with it.
RSENIC.	ACIDS:		Vitriolic, Muriatic *, Vegetable *, and Urinous; with the phenomena, &c. above mentioned.
	ALKALIS:		Fixt, and Volatile; with the phenomena, and by the means mentioned above.
	SULPHUR,		as above.
	METALS:		Gold, Silver, Lead, Tin, Copper, and iron, as above.
	SEMI-METALS.	ZINC, Antimony, and Biſmuth,	as above.
		PLATINA.	
		COBALT.	
		NICKEL.	The phenomena attending theſe mixtures have not been as yet particularly obſerved.
	VITREOUS MATTERS.		A glaſs which greatly promotes the fuſion of other matters. The arſenic muſt firſt be prepared by diſſolving and precipitating from alkalis.
LATINA.	ACIDS:		Muriatic *; with the phenomena, &c. mentioned above.
	ALKALI:		Volatile, as above.
	METALS:		Gold, Silver, Tin, Copper, and Iron, as above.
	SEMI-METALS.	MERCURY, Zinc, Biſmuth, and Arſenic,	as above.
		COBALT.	
		NICKEL.	The phenomena attending theſe mixtures not yet obſerved.
COBALT.	ACIDS:		Vitriolic, Nitrous, Muriatic, and Urinous; with the phenomena, &c. as above deſcribed.
	ALKALI:		Volatile, as above.
	METALS:		Gold, Silver, Lead, Tin, Copper, and Iron, as above.
	SEMI-METALS.	MERCURY *, Zinc, Antimony, Biſmuth *, Arſenic, and Platina,	as above.
		NICKEL.	The properties of this compound not known.
	EARTHY.	CALX of FLINT. *Zaffre.*	By mixing calcined cobalt with calx of flint, and moiſtening them with water, and preſſing them cloſe in wooden tubs.
		Smalt.	By vitrifying theſe with the addition of a little potaſh.
NICKEL.	ACIDS:		Nitrous, and Muriatic; with the phenomena, &c. as mentioned above.
	ALKALI:		Volatile, as above.
	SULPHUR,		as above.
	METALS:		Gold, Lead, Tin, Copper, and Iron, as above.
	SEMI-METALS:		Antimony, Biſmuth, Arſenic, Platina, and Cobalt, as above.
ABSORBENT EARTHS.	ACIDS:		Vitriolic, Nitrous, Muriatic, and Vegetable; with the phenomena, and by the aſſiſtances above mentioned.
	ALKALIS:		Fixed, as above.
	EARTHY.	CRYSTALLINE.	By this mixture they are both much eaſier melted into glaſs than by themſelves, but not without the addition of ſome alkali.
		ARGILLACEOUS.	This mixture eaſily runs into a glaſs without any addition.
	WATER.	*Lime-water.*	By ſolution. It is ſometimes found flowing out of the earth in ſprings; and as it always quits the water when expoſed to the air, it is there depoſited on the banks of the ſtreams, forming the ſtony incruſtations called *petrifications:* And filtring through the pores of the earth, and dropping through the roofs of ſubterraneous caves, it forms the curious incruſtations found hanging from the roof of ſuch places; ſometimes aſſuming forms ſtupenduouſly magnificent.
	AIR.	FIXT. *Lime-ſtone.*	It is from the quality that quick-lime has of abſorbing its air, and again with it reſuming its ſtony conſiſtence, that it is fitted for a cement in building; and the great hardneſs of the cements in old buildings is owing to the air being more perfectly united with theſe than in newer works.
CRYSTALLINE or VITRESCENT EARTHS.	ACIDS:		Vitriolic *, and Nitrous *; with the phenomena, &c. as above mentioned.
	ALKALI:		Fixed, as above.
	METALS:		Lead, Tin, Copper, and Iron, as above.
	SEMI-METALS:		Antimony, Biſmuth, Arſenic, and Cobalt, as above.
	ABSORBENT EARTHS:		as above.
	ARGILLACEOUS EARTHS.		A maſs running into glaſs in a moderate heat.
	WATER.		Although this is not ſoluble in water by any operation that we are acquainted with, yet, from its cryſtalline form, it is probable that it has been once ſuſpended and certainly it is ſo at this day in thoſe petrifying ſprings whoſe incruſtations are of the cryſtalline ſort.
ARGILLACEOUS EARTHS,			with Abſorbent and Cryſtalline Earths, as above. With water it only unites into a paſte of a mechanical nature.

EXPLANATION OF THE TABLES.

It was imagined, that a ſyſtematic view of the ſeveral chemical bodies, arranged under diſtinct claſſes, would be of uſe to convey a clear idea of this ſubject to the mind, and ſerve to impreſs it better upon the memory of the reader; and with this view the firſt table was compoſed, the ſeveral parts of which are ſo plain as to admit of no explanation.

The ſame cauſes induced us to think, that a ſyſtematic view of the ſeveral compounds reſulting from the mixture of theſe ſimple bodies would be agreeable to the public; and on that account the ſecond table was compiled; in which we have followed the ſame general arrangement as in the firſt: Shewing, in the firſt place, the ſeveral bodies with which the vitriolic acid can be combined; then proceeding to the nitrous acid, the muriatic, &c. through all the other claſſes, in the ſame order as in the foregoing table.--- In the firſt column, then, on the left hand, is placed a ſimple body, which can be united with ſome one or more individuals of each of thoſe ſpecies which are put in the ſecond column, and the particular ſubſtance of each ſpecies with which it can be united is put in the third column; after which is placed the name and properties of the compound, the operation by which they are united, &c. And in the enumeration of theſe bodies with which any one can be combined, they are placed in the ſame order as is generally obſerved; beginning with acids, and proceeding to alkalis, oils, ſulphur, &c. through all the claſſes. An example of the manner of reading the table will make all this plain.

At the top of the firſt column, on the left hand, is placed the *Vitriolic Acid*, which can be combined with ſome particular kind of each of thoſe ſpecies of bodies enumerated in the ſecond column, included within the crotchet oppoſite to it. By this it appears that it can be combined with acids, alkalis, oils, ſulphur, alcohol, metals, ſemi-metals, earths, and water. The particular kinds of each claſs with which it can be united are placed in the third column; by which it appears, that of the claſs of acids it can be united with the nitrous acid, and with it form a mixture, the only property of which, that has been obſerved, is, that it readily inflames oils. It likewiſe unites with the muriatic and all other acids, as there mentioned. Under the claſs of alkalis, it appears that it can be united with the vegetable, foſſile, and volatile alkalis. With the firſt of which it forms the ſubſtance called *vitriolated tartar*, and the two other ſubſtances there enumerated, by the operations there mentioned. With the foſſile alkali it forms *Glauber's ſalt;* and with the volatile alkali, *ſecret ſal ammoniac;* by the means there mentioned. All the other articles throughout the table are to be read in the ſame manner.

In the ſame way we proceed through the whole of the table, taking each ſimple chemical body in its order, and, placing it in the firſt column, ſhew what others it can be united with. But it is to be obſerved, that as we advance in the table we put down only the names of thoſe ſubſtances which have been already examined; becauſe under each of theſe the particular mixts formed by this union have been already deſcribed. Thus, looking along the firſt column till you come to *Fixt Alkali*, you find in the ſecond column, at the top of the crotchet belonging to this article, *Acids*, and, following it, Vitriolic, Nitrous, Muriatic, &c. with a reference to the foregoing parts of the table; and if you look back to the article *Vitriolic Acid*, under the article *Alkalis* in the ſecond column, you find both the vegetable and foſſile, with the compounds reſulting from this mixture, ſo that it was unneceſſary to repeat it over again under the article *Alkali*. By the ſame means the union of this with the nitrous and other acids are found under each particular acid. And the ſame method is to be obſerved with regard to every reference to the end of the table.

We once propoſed to have omitted mentioning any of theſe articles which had been already deſcribed, from which the references are made; but were induced to place them as in the table, becauſe by means of theſe it is eaſy to ſee, at one view, all the bodies that any one particular body can be united with; whereas, without this, if any one had wanted to know this particular, he behoved to have turned to every article that preceded it. For example, if the article *Biſmuth* was to be examined with this view; turn to it, in the firſt column near the end; at once you ſee with what particular acids, alkalis, ſulphur, and metals, it can be joined with; whereas if theſe had been here omitted, it would have been neceſſary to have conſulted every article preceding it before you could have known which it could, and which it could not be united with.

It is unneceſſary to ſay much about the uſes that may be made of this table, as they are pretty obvious. The principal one is to ſhow, at one view, what bodies any one can be united with, as in the example juſt now given. Again, if it was wanted to know if any one particular ſubſtance could unite with any other particularly ſpecified, it is here at once ſeen. Let it be (*e. g.*) required to know if copper and zinc can be united; turn to the article *Copper* in the firſt column, and ſearch among the ſemi-metals; you there find *Zinc*, and ſee that this compound forms braſs, prince's-metal, and ſpelter. And in the ſame way any other ſubſtance may be examined. If, on the other hand, by glancing along the compounds (which are here printed in italics) you meet with any particular ſubſtance whoſe compoſition you want to know, it is at once diſcovered. Thus, for example, common nitre has catched your eye, of whoſe compoſition you would wiſh to be informed. By looking to the left hand, you find *Vegetable Alkali* (which in the firſt table is ſhown to be the ſame with *Potaſh*); and by looking to the firſt column oppoſite to it, you find the *Nitrous Acid* (or *Aq. Fortis*); from which you at once are informed that it is compoſed of aq. fortis and potaſh.

SILVER.	ALKALIS: Fixt *, and Volatile *, as above.		
	SULPHUR, as above.		
	METALS.	GOLD, as above.	
		LEAD.	Very brittle.
		TIN.	Extremely brittle, as much ſo as glaſs.
		COPPER.	Harder than ſilver alone. Uſed in ſmall proportions as alloy in coins.
		IRON.	A hard whitiſh compound.
	SEMI-METALS.	MERCURY *.	By amalgamation with ſilver-leaf, or calx of ſilver precipitated by copper, but not by ſalts. This is uſed for ſilverizing on other metals, in the ſame way as the amalgamum of gold.
		ZINC.	Hard, ſomewhat malleable, and of a white colour.
		ANTIMONY.	A brittle maſs.
		BISMUTH.	A whitiſh ſemi-malleable body.
		ARSENIC.	Brittle; the ſilver being rendered in part volatile.
		PLATINA.	Pretty pure and malleable. Difficult of fuſion; and in part ſeparates when cold.
		COBALT.	
	CHRYSTALLINE EARTHS, and other vitreous matters. A fine yellow opaque glaſs. The fineſt yellow paint for porcelain is procured from a glaſs mixed with ſilver.		
LEAD.	ACIDS: Vitriolic, Nitrous, Muriatic, Vegetable, of Urine, of Ants *, as above.		
	ALKALIS: Fixt, and Volatile, as above.		
	OILS: Expreſſed *, and Eſſential, as above.		
	SULPHUR, as above.		
	METALS.	GOLD and Silver, as above.	
		TIN.	A little harder than either of the metals, and eaſily fuſed: hence it is uſed as a ſolder for lead; and it forms the principal ingredients of pewter. If the fire is long continued, the tin floats on the ſurface.
		COPPER *.	Brittle and granulated, like tempered iron or ſteel when broke. By throwing pieces of copper into melted lead. The union here is very ſlight.
		IRON *.	An opaque browniſh glaſs. By a great degree of heat if the iron has been previouſly reduced to the ſtate of a calx; but never in its metallic ſtate.
	SEMI-METALS.	MERCURY *.	By amalgamation. Effected only in a melting heat, unleſs ſome biſmuth has been previouſly united with the mercury.
		ZINC.	Hard and brittle. By pouring zinc on melted lead. If the zinc is firſt melted, and the lead injected upon it, it then deflagrates.
		ANTIMONY *.	
		BISMUTH.	A grey-coloured ſemi-malleable body, eaſily fuſed; and thence uſed as a ſolder for lead or tin.
		ARSENIC.	A grey-coloured brittle maſs; eaſily fuſed, and extremely volatile. A hyacinth-coloured glaſs. By fuſion in a conſiderable heat. This glaſs is eaſily fuſed; and is a much more powerful flux than pure glaſs of lead.
		PLATINA.	Of a leafy or fibrous texture, and purpliſh or blue colour, when expoſed to the air. If a large proportion of platina is uſed, it ſeparates in the cold.
		COBALT.	The nature of this compound is not known.
		NICKEL.	A brittle metallic body.
	CRYSTALLINE EARTHS. A thin glaſs. By fuſion in a moderate heat.		
TIN.	ACIDS: Vitriolic *, Nitrous *, Muriatic, Vegetable *, of Urine, as above.		
	ALKALIS: Fixt, and Volatile, as above.		
	OIL: Expreſſed *, as above.		
	SULPHUR, as above.		
	METALS.	GOLD, Silver, and Lead, as above.	
		COPPER.	A brittle maſs. When the copper is in ſmall proportions, it is firmer and harder than pure tin. This in right proportions with a little zinc, forms bell-metal.
		IRON.	A white brittle compound. By heating filings of iron red-hot, and pouring melted tin upon them. A metal reſembling the fineſt ſilver is made of iron, tin, and a certain proportion of arſenic.
	SEMI-METALS.	MERCURY.	This amalgamum forms foils for mirrors; and forms the yellow pigment called *aurum moſaicum*. By being ſublimed with ſulphur and ſal ammoniac.
		ZINC.	Hard and brittle. When the zinc is in ſmall proportions, it forms a very fine kind of pewter.
		ANTIMONY *.	*Regulus veneris.* By elective attraction from copper and crude antimony.
		BISMUTH.	Bright, hard, and ſonorous, when a ſmall proportion of biſmuth is uſed. This is very eaſily fuſed; and employed as a ſolder.
		ARSENIC.	A ſubſtance in external appearance reſembling zinc.
		PLATINA.	A coarſe hard metal which tarniſhes in the air.
		COBALT.	By fuſion.
		NICKEL.	A brittle metallic maſs.
	CRYSTALLINE EARTHS, or other vitreous matters. An opaque white vitreous maſs, which forms the baſis of white enamels.		
COPPER.	ACIDS: Vitriolic, Nitrous, Muriatic, Vegetable, of Urine, of Amber, of Ants, as above.		
	ALKALIS: Fixt, and Volatile, as above.		
	OIL: Eſſential, as above.		
	SULPHUR, as above.		
	METALS:	GOLD, Silver, Lead *, and Tin, as above.	

METAL. IRON. Harder and paler than copper. Eaſily fuſed.

- METAL.
  - IRON. Harder and paler than copper. Eaſily fuſed.
  - MERCURY *. A curious amalgum. Soft at firſt, but afterward brittle. By triturating mercury with verdigris, common ſalt, vinegar, and water.
  - ZINC.
    - *Braſs.* Commonly made by cementation with calamine. The larger the proportion of zinc, the paler, harder, and more brittle is the braſs.
    - *Prince's metal, pinſhbeck,* and other metals reſembling gold. By employing zinc in ſubſtance in ſmall proportions. The beſt pinſhbeck about 1-4th of zinc.
    - *Spelter.* A native ſubſtance, found in Cornwall, conſiſting of zinc and copper, and uſed as a ſolder.
- SEMI-METALS.
  - ANTIMONY. By fuſion.
  - BISMUTH. A paliſh brittle maſs. Somewhat reſembling ſilver.
  - ARSENIC. *White copper.* By pouring arſenic, fuſed with nitre, upon copper in fuſion. If too large a proportion of arſenic is uſed, it makes the compound black and apt to tarniſh.
  - PLATINA. A white and hard compound, which does not tarniſh ſo ſoon as pure copper, and admits of a fine poliſh.
  - COBALT. White and brittle.
  - NICKEL. White and brittle, and apt to tarniſh.

IRON.

- ACIDS: Vitriolic, Nitrous, Muriatic, Vegetable, of Urine, of Amber, of Ants, as above.
- ALKALIS: Fixt *, and Volatile, as above.
- SULPHUR, as above.
- METALS: Gold, Silver *, Lead *, Tin, and Copper, as above.
- SEMI-METALS.
  - ZINC. A white ſubſtance reſembling ſilver.
  - ANTIMONY. The magnetic quality of the iron is totally deſtroyed in this compound.
  - BISMUTH. In a ſtrong heat, this emitteth flames.
  - ARSENIC. A whitiſh, hard, and brittle compound. By fuſing with ſoap or tartar. A metal reſembling fine ſteel is made by fuſing caſt iron with a little arſenic and glaſs.
  - PLATINA. With caſt iron it forms a compound remarkably hard, ſomewhat ductile, and ſuſceptible of a fine poliſh.
  - COBALT. A compound remarkably ductile. By fuſion in a moderate heat.
  - NICKEL. A brittle maſs.
- VITRESCENT EARTHS. A tranſparent glaſs. In general blackiſh; but ſometimes yellow, green, or blue. The colour is influenced by the degree of heat as well as nature of the ingredients.

MERCURY.

- ACIDS: Vitriolic, Nitrous, Muriatic, Vegetable *, of Urine, as above.
- ALKALI: Fixt *, as above.
- SULPHUR, as above.
- METALS: Gold, Silver *, Lead *, Tin, and Copper, as above.
- SEMI-METALS.
  - ZINC. An amalgum. Soft or hard, according to the proportions employed.
  - ANTIMONY *. By melting the regulus, and pouring it upon boiling mercury. By frequently diſtilling from this amalgum, the mercury is rendered much more pure, and is then called *animated mercury.*
  - BISMUTH. A ſilverizing for iron. By putting this amalgum upon iron, and evaporating the mercury. It has much the appearance of ſilver.
  - PLATINA. The compound reſulting from this mixture is not known.
  - COBALT. By mixing firſt with nickel, and then adding mercury.

ZINC.

- ACIDS: Vitriolic, Nitrous, Muriatic, Vegetable, of Urine, of Amber, of Ants, as above.
- OIL: Expreſſed *, as above.
- SULPHUR *, as above.
- METALS: Gold, Silver, Lead, Tin, Copper, and Iron, as above.
- SEMI-METALS.
  - MERCURY, as above.
  - ANTIMONY. This mixture is applied to no particular uſe.
  - ARSENIC. A black and friable maſs.
  - PLATINA. A hard ſubſtance.
  - COBALT. The particular nature and properties of this mixt is not known.

ANTIMONY.

- ACIDS: Vitriolic *, Nitrous, Vegetable *, and Urinous. With the phenomena, and by the means above deſcribed.
- ALKALIS: Fixed and Volatile, as above.
- SULPHUR, as above.
- METALS: Gold, Silver, Lead, Tin *, Copper, and Iron, as above.
- SEMI-METALS.
  - MERCURY, and Zinc, as above.
  - BISMUTH, A maſs reſembling regulus of antimony.
  - ARSENIC. The nature and qualities of this mixt are not known.
  - PLATINA. A hard maſs.
  - COBALT. Nature unknown.
  - NICKEL. Ditto.
- VITREOUS EARTHS. A thin penetrating glaſs; which is a powerful flux of metals.

- ACIDS: Vitriolic, Nitrous, Muriatic, Vegetable, and urinous; with the phenomena, *&c.* above deſcribed.
- ALKALIS: Fixed *, and Volatile *, as above.
- SULPHUR, as above.

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CHEMOSIS, a diſeaſe of the eyes, proceeding from an inflammation, when the white of the eye ſwells above the black, and overtops it to ſuch a degree, that there appears a ſort of gap between them.

Others define it to be an elevation of the membrane which ſurrounds the eye, and is called the white; being an affection of the eye, like white fleſh.

CHENOPODIUM, in botany, a genus of the pentandria digynia claſs. The calix conſiſts of five leaves; it has no corolla; and there is but one lenticular ſeed. There are 18 ſpecies, 13 of which are natives of Britain, *viz.* the bonus henricus, common Engliſh mercury, or all-good; the urbicum, or upright blite; the rubrum, or ſharp-leaved gooſe-foot; the murale, common gooſe-foot, or ſow-bane; the hybridum, or maple-leaved blite; the album, or common orache; the viride, or green blite; the ſerotinum, or late-flowered blite; the glaucum, or oak-leaved blite; the vulvaria, or ſtinking orache; the polyſpermum, round-leaved blite, or all-ſeed; the maritimum, ſea blite, or white glaſs-wort; and the fruticoſum, ſhrub ſtone-crop, or glaſs-wort. The leaves of the vulvaria, or ſtinking orache, are ſaid to be an excellent anti-hyſteric.

CHEPELIO, an iſland in the bay of Panama, and province of Darien, in South America, ſituated about three leagues from the city of Panama, which it ſupplies with proviſions: W. long. 81°, N. lat. 9°.

CHEPSTOW, a market-town in Monmouthſhire, ſituated on the river Wye, near its mouth, about ten miles ſouth of Monmouth: W. long. 2° 40′, N. lat. 51° 40′.

CHEQ, or Cherif, the prince of Mecca, who is, as it were, high-prieſt of the law, and ſovereign pontiff of all the Mahometans, of whatever ſect or country they be. See Caliph.

The grand ſignior, ſophies, moguls, khans of Tartary, *&c.* ſend him yearly preſents, eſpecially tapeſtry to cover Mahomet's tomb withal, together with a ſumptuous tent for himſelf, and vaſt ſums of money to provide for all the pilgrims during the ſeventeen days of their devotion.

CHERBURG, a port-town of France, in the province of Normandy, ſituated on a bay of the Engliſh channel, oppoſite to Hampſhire, in England: W. long. 1° 40′, N. lat. 49° 45′.

CHEREM, in Jewiſh antiquity, the ſecond and greater ſort of excommunication among the Jews.

The cherem deprived the excommunicated perſon of almoſt all the advantages of civil ſociety: he could have no commerce with any one, could neither buy nor ſell, except ſuch things as were abſolutely neceſſary for life; nor reſort to the ſchools, nor enter the ſynagogues; and no one was permitted to eat or drink with him.

The ſentence of cherem was to be pronounced by ten perſons, or at leaſt in the preſence of ten: but the excommunicated perſons might be abſolved by three judges, or even by one, provided he were a doctor of the law. The form of this excommunication was loaded with a multitude of curſes and imprecations, taken from different parts of the ſcripture.

CHERESOUL, the capital of Curdiſtan, in Aſiatic Turky, and the ſeat of the beglerbeg, or viceroy, of the province: E. long. 45°, N. lat. 36°.

CHERLERIA, in botany, a genus of the decandria trigynia claſs. The calix conſiſts of five leaves; it has five petals leſs than the leaves of the calix, and five bifid nectaria; the antheræ are alternately barren: and the capſule has three cells and as many valves. There is but one ſpecies, *viz.* the ſedoides, a native of Switzerland.

CHERLESQUIOR, in Turkiſh affairs, denotes a lieutenant-general of the Grand Signior's armies.

CHERMES, in zoology, a genus of inſects belonging to the order of inſecta hemiptera. The roſtrum is ſituate on the breaſt; the feelers are longer than the breaſt; the four wings are deflected; the breaſt is gibbous; and the feet are of the jumping kind. There are 17 ſpecies, and the trivial names are taken from the plants which they frequent, as the chermes graminis, or graſs-bug; the chermes ulmi, or elm-bug, *&c.*

CHERRY TREE, in botany. See Prunus.

Cherry-isle, in geography, an iſland ſituated in the north or frozen ocean, between Norway and Greenland: E. long. 20°, N. lat. 75°.

CHERSO, the capital of an iſland of the ſame name, in the gulf of Venice, and ſubject to the Venetians: E. long. 15°, N. lat 45° 25′.

CHERSONESUS, among geographers, the ſame with a peninſula. See Peninsula.

CHERTSEY, a market-town of Surry, about ſeven miles weſt of Kingſton: W. long. 30′, N. lat. 51° 25′.

CHERUB, or Cherubin, a celeſtial ſpirit, which in the hierarchy is placed next to the ſeraphim. See Hierarchy.

The ſeveral deſcriptions which the ſcripture gives us of cherubins, differ from one another; but all agree in repreſenting a figure compoſed of various creatures, as a man, an ox, an eagle, and a lion.

CHERVIL, in botany. See Chærophyllum.

CHERWEL, a river, which, ariſing in Northamptonſhire, runs ſouthwards by Banbury, and unites its waters with thoſe of the Iſis, near Oxford.

CHESHAM, a market-town of Buckinghamſhire, about nine miles ſouth-eaſt of Aileſbury: W. long. 35′, N. lat. 51° 36′.

CHESHIRE, a maritime county of England, bounded by Staffordſhire on the eaſt, and by the Iriſh ſea on the weſt: its chief commodities are ſalt and cheeſe, the laſt of which is much eſteemed all over Britain.

CHESNUT-TREE, in botany. See Fagus.

CHESS, an ingenious game, performed with different pieces of wood, on a board divided into ſixty-four ſquares or houſes; in which chance has ſo ſmall a ſhare, that it may be doubted whether a perſon ever loſt but by his own fault.

Each gameſter has eight dignified pieces, *viz.* a king, a queen, two biſhops, two knights, and two rooks; alſo eight pawns: all which, for diſtinction ſake, are painted of two different colours, as white and black.

As to their diſpoſition on the board, the white king is to be placed on the fourth black houſe from the corner of the board, in the firſt and lower rank; and the black king is to be placed on the fourth white houſe on the oppoſite or adverſary's end of the board. The queens are to be placed next to the kings, on houſes of their own colour. Next to the king and queen, on each hand, place the two biſhops; next to them, the the two knights; and laſt of all, on the corners of the board, the two rooks. As to the pawns, they are placed without diſtinction, on the ſecond rank of the houſe, one before each of the dignified pieces.

Having thus diſpoſed the men, the onſet is commonly begun by the pawns, which march ſtraight forward in their own file, one houſe at a time, except the firſt move, when it can advance two houſes, but never moves backwards: the manner of their taking the adverſary's men, is ſide-ways, in the next houſe forwards; where having captivated the enemy, they move forward as before. The rook goes forward or croſs-ways through the whole file, and back again. The knight ſkips backward and forward to the next houſe, ſave one, of a different colour, with a ſidling march, or a ſlope, and thus kills his enemies that fall in his way, or guards his friends that may be expoſed on that ſide. The biſhop walks always in the ſame colour of the field that he is placed in at firſt, forward and backward, aſlope, or diagonally, as far as he liſts. The queen's walk is more univerſal, as ſhe takes all the ſteps of the before-mentioned pieces, excepting that of the knight; and as to the king's motion, it is one houſe at a time, and that either forward, backward, ſloping, or ſide-ways.

As to the value of the different pieces, next to the king is the queen, after her the rooks, then the biſhops, and laſt of the dignified pieces comes the knight. The difference of the worth of pawns, is not ſo great as that of noblemen; only, it muſt be obſerved, that the king's biſhop's pawn is the beſt in the field, and therefore the ſkilful gameſter will be careful of him. It ought alſo to be obſerved, that whereas any man may be taken, when he falls within the reach of any of the adverſary's pieces, it is otherwiſe with the king, who, in ſuch a caſe, is only to be ſaluted with the word *check*, warning him of his danger, out of which it is abſolutely neceſſary that he move; and, if it ſo happen that he cannot move without expoſing himſelf to the like inconveniency, it is check-mate, and the game is loſt.

CHEST, in commerce, a kind of meaſure, containing an uncertain quantity of ſeveral commodities.

A cheſt of ſugar, *v. g.* contains from ten to fifteen hundred weight; a cheſt of glaſs, from two hundred to three hundred feet; of Caſtile ſoap, from two and an half to three hundred weight; of indigo, from one and an half to two hundred weight, five ſcore to the hundred.

Chest, or Thorax, in anatomy. See p. 277.

CHESTER, the capital city of Cheſhire, ſituated ſixteen miles ſouth of Liverpool: W. long. 3°, N. lat. 53° 15'. It is a biſhop's ſee, and gives the title of earl to the prince of Wales.

New-Chester, the capital of a county of the ſame name in Penſilvania, in North America, ſituated on the river Delawar, ſouth of Philadelphia: W. long. 74°, N. lat. 40° 15'. Its harbour is fine and capacious, admitting veſſels of any burden.

CHESTERFIELD, a market-town of Derbyſhire, fifteen miles north of Derby, W. long. 1° 25', N. lat. 53° 20'. It gives the title of earl to a branch of the noble family of Stanhope.

CHEVALER, in the menage, is ſaid of a horſe when in paſſaging upon a walk or trot, his off fore-leg croſſes or overlaps the near fore-leg every-ſecond motion.

CHEVALIER, in a general ſenſe, ſignifies a knight, or horſeman.

CHEVAUX DE FRISE, in fortification, a large joiſt, or piece of timber, about a foot in diameter, and ten or twelve in length, into the ſides whereof are driven a great number of wooden pins, about ſix foot long, armed with iron points, and croſſing one another. See Fortification.

CHEVERON, in heraldry. See Chevron.

CHEVIL. See Kevil.

CHEVIOT, or Tiviot-hills, run from north to ſouth through Cumberland, and were formerly the borders or boundaries between England and Scotland, where many a bloody battle has been fought between the two nations, one of which is recorded in the ballad of Chevy-chaſe.

CHEVISANCE, in law, denotes an agreement or compoſition, as an end or order ſet down between a creditor and his debitor, *&c.*

In our ſtatutes, this word is moſt commonly uſed for an unlawful bargain, or contract.

CHEVRON, or Cheveron, in heraldry, one of the honourable ordinaries of a ſhield, repreſenting two rafters of an houſe, joined together as they ought to ſtand; it was anciently the form of the prieſteſſes head attire: ſome ſay, it is a ſymbol of protection; others, of conſtancy; others, that it repreſents knights ſpears, *&c.* It contains the fifth part of the field, and is figured as in Plate LV. fig. 3.

A chevron is ſaid to be abaſed, when its point does not approach the head of the chief, nor reach farther than the middle of the coat; mutilated, when it does not touch the extremes of the coat; cloven, when the upper pieces are taken off, ſo that the pieces only touch at one of the angles; broken, when one branch is ſeparated into two pieces; couched, when the point is turned towards one ſide of the eſcutcheon; divided, when the branches are of ſeveral metals, or when metal is oppoſed to colour; inverted, when the point is turned towards the point of the coat, and its branches towards the chief.

Per Chevron, in heraldry, is when the field is divided only by two ſingle lines, riſing from the two baſe points, and meeting in the point above, as the chevron does.

CHEVRONED, is when the coat is filled with an equal number of chevrons, of colour and metal.

CHEVRONEL, a diminutive of chevron, and as ſuch only containing half a chevron.

CHEVRONNE, or Chevronny, ſignifies the dividing of the ſhield ſeveral times chevron-wiſe.

CHEWING-BALLS, a kind of balls made of aſafœtida, liver of antimony, bay-wood, juniper-wood, and pellitory of Spain; which being dried in the ſun, and wrapped in a linen-cloth, are tied to the bit of the bridle for the horſe to chew: they create an appetite; and it is ſaid, that balls of Venice treacle may be uſed in the ſame manner with good ſucceſs.

CHIAMPA, the ſouth diviſion of Cochin-china, a country of the Eaſt-Indies.

CHIAN *earth*, in pharmacy, one of the medicinal earths of the ancients, the name of which is preſerved in the catalogues of the materia medica, but of which nothing more than the name has been known for many ages in the ſhops.

It is a very denſe and compact earth, and is ſent hither in ſmall flat pieces from the iſland of Chios, in which it is found in great plenty at this time. It ſtands recommended to us as an aſtringent. They tell us, it is the greateſt of all coſmetics, and that it gives a whiteneſs and ſmoothneſs to the ſkin, and prevents wrinkles, beyond any of the other ſubſtances that have been celebrated for the ſame purpoſes.

CHIAPA, the capital of a province of the ſame name in Mexico, ſituated about 300 miles eaſt of Acapulco: W. long. 98°, N. lat. 16° 30′.

CHIARASCO, a fortified town of Peidmont in Italy, ſituated on the river Tanaro, twenty miles ſouth-eaſt of Turin, and ſubject to the king of Sardinia: E. long. 7° 45′, N. lat. 44° 40′.

CHIARENZA, a port-town of the north-weſt coaſt of the Morea, oppoſite to the iſland Zant, in the Mediterranean, and ſubject to the Turks: E. long. 21° 15′, N. lat 37° 35′.

CHIARO-SCURO, among painters. See Claro-obscuro.

CHICHESTER, the capital city of Suſſex, ſituated fifty-two miles ſouth-weſt of London, and twelve miles eaſt of Portſmouth; W. long. 50′, and N. lat. 50° 50′. It is a biſhop's ſee, and ſends two members to parliament.

New Chichester, a port-town of Penſilvania, ſituated on the river Delawar, below Cheſter. See Chester.

CHICK, or Chicken, in zoology, denotes the young of the gallinaceous order of birds, eſpecially the common hen. See Phasianus.

Chicken-*pox*. See *Small*-Pox, and Medicine.

Chick-*weed*, in botany. See Alsine.

CHICKLING *pea*, in botany, a name given to the lathyrus. See Lathyrus.

CHICUITO, or Cuyo, a province of South America, bounded by the province of La Plata on the north-eaſt, and by Chili on the weſt.

CHIDLEY, or Chimley, a market-town of Devonſhire, about eighteen miles north-weſt of Exeter: W. long. 4°, N. lat. 51°.

CHIEF, a term ſignifying the head or principal part of a thing or perſon. Thus we ſay, the chief of a party, the chief a family, *&c.*

Chief, in heraldry, is that which takes up all the upper part of the eſcutcheon from ſide to ſide, and repreſents a man's head. See Plate LXV. fig. 4.

It is to take up juſt the third part of the eſcutcheon, as all other honourable ordinaries do, eſpecially if they are alone on the ſhield; but if there be ſeveral of them, they muſt be leſſened in proportion to their number, and the ſame holds when they are cantoned, attended and bordered upon by ſome other figures; then the painter or engraver may be allowed to bring them into a ſmaller compaſs, to the end that all that is repreſented about the ordinaries may appear with ſome proportion and ſymmetry. Chiefs are very much varied, for they may be couvert, ſupported, crenellé, ſurmounted, abaiſé, rempli, dentillé, engreſlé, canellé, danché, nebulé, fleurdelezée, fleuronné, vair, echequeté, lozangé, burellé, patté, fretté, gironné, chaperonné, chappé, mantelé, emmanché, chauſſé, veſtu or reveſtu. See Couvert, Supported, *&c.*

In Chief, imports ſomething borne in the chief part or top of the eſcutcheon.

Chief *lord*, the feudal lord, or lord of an honour on whom others depend.

Chief-*juſtice of the king's bench and common pleas.* See Justice.

CHIEFTAIN, denotes the captain, or chief, of any claſs, family, or body of men: thus, the chieftains, or chiefs, of the highland clans, were the principal noblemen or gentlemen of their reſpective clans.

CHIERI, a fortified town of Peidmont in Italy, ſituated eight miles eaſt of Turin: E. long. 7° 45′, N. lat. 44° 50′.

CHILBLAINS, in medicine. See Pernio.

CHILD-*bed.* } See Midwifery.
Child-*birth.* }

CHILDERMAS-*day*, or Innocent's-*day*, an anniverſary held by the church, on the 28th of December, in commemoration of the children at Bethlehem, maſſacred by order of Herod.

CHILI, a province of ſouth America, bounded by Peru on the north, by the province of La Plata on the eaſt, by Patagonia on the ſouth, and by the Pacific ocean on the weſt; lying between 25° and 45° S. lat. and between 75° and 85° W. long. But ſome comprehend Patagonia in Chili, extending it to cape Horn, in 57° 30′ S. lat.

CHILIAD, denotes a thouſand of any things, ranged in ſeveral diviſions, each whereof contains that number.

CHILIARCHA, or Chiliarchus, in antiquity, a military officer, who had the command of a thouſand men.

CHILIASTS, in church-hiſtory. See Millenarians.

CHILMINAR, Chelminar, or Tchelminar, the moſt beautiful piece of architecture remaining of all antiquity, being the ruins of the famous palace of Perſepolis, to which Alexander the Great, in a drunken fit, ſet fire, at the inſtigation of Thais the courtezan:

the word comes from the Perſian *tchehel minar*, that is to ſay, forty towers.

Don Garcias de Silva Figueroa, Pietro della Valle, Sir John Chardin, and Le Brun, have been very particular in deſcribing theſe ruins.

There appear, ſay they, the remains of near fourſcore columns, the fragments of which are at leaſt ſix feet high; but there are only nineteen can be called entire, with another detached from the reſt, about an hundred and fifty paces: a rock of hard black marble ſerves as a foundation to the edifice: the firſt plan of the houſe is aſcended to by ninety five ſteps, all cut in the rock; the gate of the palace is about twenty feet wide, with the figure of an elephant on one ſide, and that of a rhinoceros on the other, thirty feet high, and both of poliſhed marble: near theſe animals there are two columns, and not far from thence the figure of a pegaſus. After paſſing this gate, are found fragments of magnificent columns in white marble, the ſmalleſt of which are fifteen cubits high, the largeſt eighteen, having forty flutings three full inches wide each; from whence we may judge of their thickneſs and other proportions. Near the gate is ſeen an inſcription on a ſquare piece of black marble, containing about twelve lines; the characters are of an extraordinary figure, reſembling triangles, or pyramids: beſides this, there are other inſcriptions, the characters of which reſemble the Hebrew, Chaldaic, or Syriac; others the Arabic or Perſian; and others, in fine, the Greek characters. Dr Hyde, who hath explained the Greek inſcription, by ſupplying ſome words that are effaced, obſerves, that the inſcriptions are engraved very negligently, and perhaps by ſome ſoldiers; or if they are the work of an engraver, he thinks that he was from Palmyra, and conſequently that they are in the Phœnician tongue: he adds, that as they are in praiſe of Alexander, they were probably done in the time of that conqueror.

CHILTERN, a chain of chalky hills, running from eaſt to weſt through Buckinghamſhire.

CHIMÆRA, in geography, a port-town of Turky in Europe, ſituated at the entrance of the gulph of Venice, in the province of Epirus, about thirty two miles north of the city Corfu, near which are the mountains of Chimæra, which divide Epirus from Theſſaly: E. long. 20° 40′, and N. lat. 40° 20′.

CHIMAY, the name of a great lake, lying in the province of Acham, between the Eaſt-Indies and China.

CHIMERA, a fabulous monſter, which the poets feign to have the head of a lion, the body of a goat, and the tail of a dragon; and add, that this odd beaſt was killed by Bellerophon. The foundation of the fable was, that in Lycia there was a burning mountain, or vulcano, of this name; that the top of this mountain was ſeldom without lions, nor the middle, which had very good graſs, without goats; that ſerpents bred at the bottom, which was marſhy; and that Bellerophon rendered the mountain habitable.

By a chimera, among the philoſophers, is underſtood a mere creature of the imagination, compoſed of ſuch contradictions and abſurdities as cannot poſſibly any where exiſt but in thought.

CHIMES *of a clock*, a kind of a periodical muſic, produced at equal intervals of time, by means of a particular apparatus added to a clock.

CHIMNEY, in architecture, a particular part of a houſe, where the fire is made, having a tube or funnel to carry away the ſmoke. See ARCHITECTURE.

CHINA, including Chineſe Tartary, a large empire, ſituated between 95° and 135° E. long. and between 21° and 55° N. lat. being accounted two thouſand miles in length, and one thouſand five hundred in breadth; it is bounded by Ruſſian Tartary on the north, by the Pacific ocean on the eaſt and ſouth, and by Tonquin, Tibet, and the territories of Ruſſia on the weſt. It is uſually divided into ſixteen provinces, which will be deſcribed in their alphabetical order. In theſe provinces there are computed to be one hundred and fifty-five capital cities, one thouſand three hundred and twelve of the ſecond rank, two thouſand three hundred and fifty ſeven fortified towns, and upwards of ten millions of families, which may amount to about fifty millions of people.

The principal commodities of this country are ſilk, tea, China ware, Japan-ware, and gold duſt; of all which the maritime ſtates of Europe import great quantities, ſending them ſilver in return.

CHINA-*root*, in pharmacy, a medicinal root, brought both from the Eaſt and Weſt Indies, thence diſtinguiſhed into oriental and occidental; it is the root of a ſpecies of ſmilax. See SMILAX.

CHINA-*ware*. See PORCELAIN.

CHINCA, a port-town of Peru, in South America, ſituated in an extenſive valley, on a river of the ſame name, about ſixty miles ſouth of Lima: W. long. 76°, and S. lat. 13°.

CHIN-COUGH, a convulſive kind of cough, which children are chiefly ſubject to. See MEDICINE.

CHINESE, in general, denotes any thing belonging to China. See CHINA.

It is obſerved by ſome, that the Chineſe language has no analogy with any other language in the world: it only conſiſts of three hundred and thirty words, which are all monoſyllables, at leaſt they are pronounced ſo ſhort that there is no diſtinguiſhing above one ſyllable or ſound in them; but the ſame word, as pronounced with ſtronger or weaker tone, has different ſignifications; accordingly, when the language is accurately ſpoke, it makes a ſort of muſic, which has a real melody, that conſtitutes the eſſence and diſtinguiſhing character of the Chineſe tongue.

As to the Chineſe characters they are as ſingular as the language; the Chineſe have not, like us, any alphabet, containing the elements, or, as it were, the principles of their words: inſtead of an alphabet they uſe a kind of hieroglyphics, whereof they have above eighty thouſand.

As the Chineſe pretend to an antiquity both with regard to their nation and arts, far beyond that of any other nation, it will not perhaps be unacceptable to give a ſhort view of theſe pretenſions, principally extracted from their own writers. But, when any thing is quoted from the Chineſe hiſtory, it is abſolutely neceſſary to attend, 1. To the times purely fabulous and mythological; 2. To the doubtful and uncertain times; and, 3. To the hiſtorical times, when the Chineſe hiſtory, ſupported by indiſputable monuments, begins to proceed on ſure grounds.

1. Some aſcribe to Tiene-hoang, a book in eight chapters, which contains the origin of letters. They add, that the characters uſed by the Sane hoang were natural, without any determinate form, that they were nothing but gold and precious ſtones.

Lieou-jou, author of Ouai-ki, ſays, that Tiene-hoang gave names to the ten *KANE*, and to the twelve *TCHI*, to determine the place of the year: this is meant of the cyclic characters.

Tiene-hoang ſignifies emperor of heaven. They call him alſo *Tiene-ling*, the intelligent heaven; *Tſee-jun*, the ſon who nouriſhes and adorns all things; and finally *Tchong-tiene-hoang-kune*, the ſupreme king of the middle heaven, *&c.* This Tiene-hoang ſucceeded Pouane-cou.

The Ouai-ki ſays, that Ti-hoang (emperor of the earth), the ſucceſſor of Tiene-hoang, divided the day and the night, and appointed thirty days to make one moon. The book Tong li, quoted in Lopi, adds further, that this emperor fixed the winter-ſolſtice to the eleventh moon. A proof that the Chineſe year was originally very incorrect, and that the courſe of it was regulated only by that of the ſeaſons, is, that for a long time, to expreſs a year, they ſaid a change of the leaves.

This Ti-hoang, ſay they, was father of Tiene-hoang, and of Gine-hoang who follows.

They give Gine-hoang (ſovereign of men) nine brothers, and pretend, that they divided the government among them. They were nine brothers (ſays Yuene-leoa-ſane) who divided the earth among them, and built cities, which they ſurrounded with walls. It was under this prince (ſays Lopi), that there firſt began to be a diſtinction between the ſovereign and the ſubject; they drank, they eat, and the two ſexes united.

After theſe three emperors which we have juſt now named, they place the period named *Ou-long* (the five Long or dragons) compoſed of five different families. But they do not tell us their names, nor the duration of their reigns. In theſe times (ſays an author) men dwelt in the bottom of caves, or perched upon trees as it were in neſts. This fact contradicts the invention of building cities, and ſurrounding them with walls, which they place under the reign of Gine-hoang; but we will meet with many ſuch contradictions in the ſequel.

They ſay nothing of the third Ki. Of the fourth, named *Ho lo*, and compoſed of three families, they ſay, that the Ho-lo taught men to retire into the hollows of rocks. This is all they ſay of it. Neither do they ſay any thing of the fifth Ki, named *Liene tong*, and compoſed of ſix families; of the ſixth Ki, named *Su ming*, and compoſed of four families.

It is a folly to dwell upon the epocha of theſe ſix Ki; nothing is more abſurd. Lopi cites an author who generouſly gives them 1,100,750 years duration; Lopi ſays himſelf, that the five firſt Ki after Gine-hoang make in all 90,000 years.

The ſeventh Ki is named *Sune-fei*, and comprehends twenty-two families. But they ſay nothing under all theſe reigns that has any relation to the arts or ſciences. Only under the twenty-ſecond and laſt, named *Tſee-che-chi*, they ſay, that it was not till then men ceaſed to dwell in caves. Is it not a palpable abſurdity, that after ſo many ages, and under kings of whom they relate ſo many wonders, they had not yet found out the art of building huts to ſhelter them from the winds and rains!

The eighth Ki, named *Tne-ti*, contains thirteen families or dynaſties. Tchine-fang-chi, the firſt of this period, reigned after Tſee-che-chi, and founded the firſt family. They ſay, that at the beginning men covered their bodies with leaves and herbs; ſerpents and beaſts were very numerous; the waters which had overflowed, were not yet returned into their channels; and the miſery of mankind was extreme. Tchine-fang taught men to prepare ſkins, to take off the hair with rollers of wood, and uſe them againſt the winds and froſt which incommoded them very much. He taught them alſo to make a kind of web of their hair, to ſerve them as a covering to their heads againſt the rain. They obeyed him with joy; he called his ſubjects *people clothed with ſkins*; he reigned 350 years. To Tchine-fang-chi ſucceeded Chou-chane-chi, then Hai-kouei-chi, of whom they ſay nothing which has any relation to our ſubject.

The fourth prince, who alſo ſucceeded Hai-kouei-chi, was named *Hoene-tune*; he founded the fourth dynaſty, (for each of theſe princes which we have juſt now mentioned, was the founder of a family or dynaſty.) In the hiſtory of this king, Lopi quotes Lao-chene-tſee, who ſpeaks thus:

"The ancient kings wore their hair diſhevelled, without any ornament upon their heads. They had neither ſceptre nor crown, and they governed their people in peace. Being of a beneficent diſpoſition, they cheriſhed all things, and put no perſon to death. Always giving, and never receiving any thing, their ſubjects, without dreading their power as maſters, revered their virtue in their hearts. Then heaven and earth obſerved a moſt beautiful order, and every thing flouriſhed in a ſurpriſing manner. The birds built their neſts ſo low, that they might be reached with the hand; all the animal creation tamely ſubmitted to the will of man. Then the juſt medium was obſerved, and harmony reigned over all. They did not reckon the year by the days. There was no diſtinction between within and without, between mine and thine. In this manner reigned Hoene-tune. But when mankind had degenerated from this happy ſtate, birds and beaſts, inſects and ſerpents, all together, and as it were in concert, made war againſt them."

To this dynaſty of Hoene-tune, ſucceeded that of Tong-hou-chi, containg ſeven kings which are not named. To this fifth dynaſty ſucceeded the ſixth, whoſe founder was Hoang-tane-chi.

The 7th, the dynaſty of Ki-tong-chi *.

The 8th, the dynaſty of Ki-y-chi *.

The 9th, the dynaſty of Ki-kiu-chi *.
The 10th, the dynaſty of Hi-ouei-chi *.
The 11th, the dynaſty of Yeou-tſao-chi.
The 12th, the dynaſty of Soui-gine.
The 13th and laſt, the dynaſty of Yong-tching-chi.

Of theſe ſeven kings, or founders of dynaſties, which remain to be conſidered to complete the number of dynaſties included in this eighth period, nothing is ſaid of thoſe marked * that has any relation to our ſubject.

As to Yeou-tſao-chi, founder of the eleventh dynaſty, whoſe reign, ſay they, laſted more than 300 years, and whoſe family, they add, continued more than 100 generations during the ſpace of 12 or 18,000 years: here is what we find recorded.

Hane-tſee ſays, that, in the firſt ages of the world, animals multiplied very faſt; and that men being but few, they could not ſubdue the beaſts and ſerpents.

Yene-tſee ſays alſo, that the ancients, either perched on trees, or ſtretched in hollow caves, poſſeſſed the univerſe, (Tiene-hia, that is to ſay, China). Theſe good kings (continues he) breathed nothing but charity without any ſhadow of hatred. They gave much, and took nothing. The people did not go to pay their court to them, but all the world ſubmitted to their virtues.

Lopi and Ouai-ki ſay almoſt in the ſame words, that, in the moſt remote antiquity, men ſheltered themſelves in the hollows of rocks, that they dwelt in deſerts, and lived in ſociety with all the other creatures. They had no thought of doing any injury to the beaſts, and the beaſts did not think of hurting them. But in the ſucceeding ages they became too wiſe, which made the animals rebel; armed with claws, teeth, horns, and venom, they aſſaulted man, and man was not able to reſiſt them. Yeou tſao reigned then. He was the firſt who built houſes of wood, in the form of birds neſts; he perſuaded men to retire into them to avoid the wild beaſts. They did not know as yet how to cultivate the earth, they lived on herbs and fruits. They drank the blood of animals, they devoured their fleſh quite raw, they ſwallowed the hair and the feathers. This is what they ſay of Yeou tſao chi: after him comes Soui gine, founder of the 12th dynaſty.

Soui-gine chi is eſteemed the inventor of fire.

On the ſummit of the mountain Pou-tcheou, ſays an author, are to be ſeen the walls of Juſtice. The ſun and the moon cannot approach them; there is no difference of ſeaſons there, nor viciſſitudes of days and nights. This is the kingdom of light on the confines of Si-ouang mou. A ſaint (a great man) went to make a tour beyond the bounds of the ſun and moon: he beheld a tree, and upon that tree a bird, who made fire come out of it by picking it. He was ſurpriſed at this; he took a branch of this tree, and from thence ſtruck fire; from whence they called this great perſonage *Soui-gine*.

Other authors ſay alſo, that Soui-gine made fire with a certain kind of wood, and taught men to dreſs their victuals. By this means all diſeaſes, and all diſorders of the ſtomach and bowels were prevented. In this he followed the direction of heaven, and from thence was named *Soui gine*.

They ſay further, that, in the days of Soui-gine, there was much water upon the earth, and that this prince taught men the art of fiſhing. He muſt, of conſequence, have invented nets or lines, which invention is after this aſcribed to Fou-hi.

One Long-ma, or Dragon-horſe, brought him a kind of table, and the tortoiſe letters. Soui-gine is the firſt to whom they apply this event, but the ſame thing will be ſaid in the ſequel of ſeveral others.

Soui-gine was the firſt who gave names to plants and animals; and theſe names (ſay they) were ſo expreſſive, that the nature of every thing was known by its name. He invented weights and meaſures for the regulation of commerce, which had been unknown before him.

Anciently (ſays an author) men married at fifty, and women at thirty years of age: Soui-gine ſhortened this period, and appointed that young men ſhould marry at thirty, and girls at twenty.

Laſtly, the Liki ſays, that it was Soui-gine who firſt taught men urbanity and politeneſs.

It now remains to ſpeak of Yong tching-chi, the founder of the thirteenth and laſt dynaſty of this period.

In his time, they uſed ſlender cords on which they tied various knots, and this ſerved them inſtead of writing. But, after the invention of letters, how could they return again to the uſe of theſe cords, which is ſo limited and imperfect? This evidently implies a contradiction?

We come now to the ninth Ki or period, named *Chene-tong*. This ninth period will bring us down to the times of Fou hi. It comprehends twenty-one kings, whoſe names are as follow:

1. Sſe hoang, or Tſan hie,
2. Pe-hoang-chi,
3. Tchong hoang-chi,
4. Tai-ting-chi,
5. Kouene-liene,
6. Yene-chi,
7. Tai chi,
8. Tching-hoei-chi,
9. Li lou, or Hoei-chi,
10. Sohoang chi,
11. Nuei-touane-chi,
12. Hiene-yuene,
13. He ſou,
14. Kai-tiene,
15. Tſune liu chi,
16. Tcho jong,
17. Hao-yng,
18. Yeou-tſao-chi,
19. Tchu-ſiang-chi,
20. Yne khang-chi,
21. Vou-hoai-chi.

Liu-pou-ouei ſays plainly, that Sſe-hoang made letters. This Sſe-hoang, is called alſo *Tſang hie*. Some hiſtorians place him under Hoang-ti, whoſe miniſter they make him; while others make him a ſovereign prince, and much anterior to Hoang-ti.

The firſt inventor of letters was Tſang-hie, then the king Vou-hoai made them be engraved on the coin, and Fou-hi uſed them in the public acts for the government of the empire. But obſerve, that theſe three emperors were even before Chini-nong; how can it be ſaid then, that letters were not invented till under Hoang-ti? Such is the reaſoning of Lopi, who was quite confounded with theſe fabulous times.

To this criticiſm it may be anſwered, You have told us, that letters had been invented in the reign of Soui-gine, the 12th king of the eighth period; how then can you pretend to give the honour of this invention to Tſang-

Tſang-hie, who, according to your own teſtimony, did not flouriſh till the ninth period? However this may be, Sſee-hoan (ſay ſome romancers) knew to form letters the moment he was born. He was endowed with great wiſdom, *&c.* After he had received the Ho-tou, he viſited the ſouth, went upon mount Yang-yu, and ſtopped on the bank of the river Lo. A divine tortoiſe carrying blue letters upon his ſhell, delivered them to him: then Sſee-hoang penetrated all the changes of heaven and earth; above he obſerved the various configurations of the ſtars; below he examined all the marks he had ſeen upon the tortoiſe; he viewed the plumage of birds, he took notice of the mountains, and of the rivers which flow from them, and of all this he compoſed letters. Some very learned Chineſe think, that this was the ancient kind of writing named *Ko-teou-chu*, which continued (ſay they) to the reign of the emperor Suene-ouang, that is, to the year 827 before J. C.

But Cong-yng-ta very well obſerves, that though the external figures of the letters have changed ſeveral times in ſome things, the ſix rules on which Tſang-hie formed them, have never ſuffered any change.

Then (continues Lopi) there was a difference between the ſovereign and the ſubject, relation between the father and the ſon, diſtinction between the precious and the vile; laws appeared, rites and muſic reigned. Puniſhments were inflicted with vigour. Thus Sſee-hoang laid the foundations of good government, he appointed officers for each affair, the ſmalleſt did not eſcape him; and thus heaven and earth arrived at their full perfection.

They ſay nothing of the ſucceſſor of Sſee-hoang which has any relation to our ſubject; but they ſay, that, under the reign of Tchong-hoang-chi, the third king of this period, they ſtill uſed ſlender cords for writing.

From this prince we come at once to Hiene-yuene, the 12th in order of this period, becauſe nothing is ſaid of his predeceſſors.

We find a great many things under the reign of this prince, becauſe he is the ſame with Hoang-ti, or at leaſt they have confounded theſe two princes together.

They aſcribe to Hiene-yuene the invention of cars. He joined two pieces of wood together, the one placed upright, and the other acroſs, to the honour of the Moſt High. It is from this he is called *Hiene-yuene*. The piece of wood placed acroſs is called *hiene*, and that which is placed upright is called *yuene*. Hiene-yuene ſtruck copper money, and made uſe of the balance to determine the weight of things. By this means he ruled the world in peace. *Ho* ſignifies merchandiſe in general. Formerly they wrote ſimply *hoa*, which ſignifies exchange. Theſe merchandiſes (ſay they) conſiſted in metal, *kine*, in precious ſtones, *yu*, in ivory, *tchi*, in ſkins, *pi*, in coined money, *tſuene*, and in ſtuffs, *pou*, &c.

They then denominated money (as is done ſtill) by the name of the reigning family. That of Hiene-yuene was one inch ſeven lines, and weighed twelve *tchu*, [the *tchu* is the 20th part of a *yo*, and a *yo* weighs 1200 little grains of millet]. They then ingraved letters on their money (as is ſtill done at preſent.) It is for this reaſon that *ven-tſee*, letters, ſignifies alſo a piece of money, which is called likewiſe *kini*, and *tſuene*, and *tao*.

Tcho-jong (16th emperor of the 9th period) hearing, at Cane-tcheou, the ſinging of birds, compoſed a muſic of union, whoſe harmony penetrated every where, touched the intelligent ſpirit, and calmed the heart of man, in ſuch a manner, that the external ſenſes were ſound, the humours in equilibrio, and the life very long. He called this muſic *Tſie-ouene*, that is to ſay, temperance, grace, and beauty.

But the deſign, and in ſome ſort the only aim of the ancient muſic of the Chineſe, according to their authors, was the harmony of the virtues, the moderation of the paſſions, elegance of manners, and, in a word, every thing that can contribute to the perfection of a good and wiſe government, *&c.* For they were perſuaded that muſic was capable of working all theſe miracles. It is difficult for us to believe them in this, eſpecially when we conſider the muſic which is at preſent uſed among them. But we appeal to the Greeks, who related as aſtoniſhing effects from this agreeable invention, whilſt the modern Greeks, like moſt part of the Orientals, have no muſic but a wretched and contemptible monotony.

The 17th king of the 9th period is named *Hao-yng*. In his time they cut down the branches of trees to kill beaſts with. Men were few. Nothing but vaſt foreſts were every where to be ſeen, and theſe frightful woods were filled with wild beaſts. How contradictory is this, and how incompatible with the times in which this prince is ſaid to have reigned!

The 18th king of the 9th period is called *Yeou-tſao-chi*. We have ſeen in the preceeding period, a prince of the ſame name. The Ouai-ki places this king at the beginning of the laſt ki, and gives him for ſucceſſor Soui-gine. At this rate, nine entire periods, or ki, muſt have elapſed before men knew how to build huts, or had the uſe of fire. Lopi follows another method: he has ranged Yeou-tſao-chi and Soui-gine in the preceeding period; and although the king we are now ſpeaking of bears the ſame name, he ſpeaks of him quite differently.

The 19th king of the 9th period is named *Tchu-ſiang-chi*.

They ſay, that he commanded Sſee-kouei to make a kind of guitar with five ſtrings named *ſe*, to remedy the diſorders of the univerſe, and preſerve every thing that had life.

The 20th king of the 9th period is named *Yne-khang-chi*.

In his time, the waters did not flow, the rivers did not purſue their uſual courſe, which occaſioned a great number of diſeaſes.

Yne-khang inſtituted the dances called *Ta-vou* (grand dances), with a view to preſerve health: for, as Lopi ſays, when the body is not in motion, the humours have not a free courſe; matter is amaſſed in ſome part, from whence come diſeaſes, which all proceed from ſome obſtruction.

The Chineſe alſo imagine, that a man's virtues may be known by his manner of touching the lute and drawing the bow, *&c.*

Thus the Chineſe make dances as well as muſic have a reference to good government; and the Liki ſay, that we may judge of a reign by the dances which are uſed in it.

The 21ſt and laſt king of the 9th period is named *Vou-hoai-chi*; but they relate nothing of this prince which is worthy of notice.

2. This is all that the fabulous times contain. If theſe times cannot enable us to fix the real epocha of various inventions, (as the Chineſe are ſo full of contradictions about the time of theſe different diſcoveries), we ſee at leaſt from them, that the origin of arts has been much the ſame among them as among other nations. We are now come down to Fou-hi, who is conſidered by the Chineſe hiſtorians as the founder of their monarchy. What they ſay of this prince and his ſucceſſors, has ſome more ſolidity in it than what we have hitherto ſeen.

FOU-HI.

The Ouai-ki, quoted in the Chineſe annals, thus deſcribes the manners of mankind in theſe days. "In the beginning, men differed nothing from other animals in their way of life. As they wandered up and down in the woods, and women were in common, it happened that children never knew their fathers, but only their mothers. They abandoned themſelves to luſt without ſhame, and had not the leaſt idea of the laws of decency. They thought of nothing but ſleeping and ſnoring, and then getting up and yawning. When hunger preſſed them, they ſought for ſomething to eat; and when they were glutted, they threw the reſt away. They eat the very feathers and hair of animals, and drank their blood. They clothed themſelves with ſkins quite hairy. The emperor Fou-hi began by teaching them to make lines for catching fiſh, and ſnares for taking birds. It was for this, that this prince was named *Fou hi-chi*. He taught them further to feed domeſtic animals, and to fatten them for ſlaughter; for which they gave him the ſirname of *Poa-hi-chi*."

It ſeems evident, that the ancient Chineſe had at firſt no other habitation than caves, the hollows of rocks, and natural dens. They were then infeſted with a kind of inſect or reptile called *iang*; and when they met, they aſked one another, Are you troubled with *iangs?* To this day they make uſe of this expreſſion, in aſking after any perſon's health; *Couei-iang?* What diſeaſe have you? How do you do? *Vou-iang*, I am without *iang*; that is to ſay, I am hearty, in perfect health, without any ailment.

It would be ſuperfluous to relate here, what the Chineſe ſay, in their annals, of the invention of characters, and of *coua*, after what hath been ſaid by F. Couplet and ſo many others on that ſubject. We ſhall only add, that the treatiſe *Hit-ſee* bears, that, at the beginning nations were governed by means of certain knots which they made on ſlender cords: that afterwards the ſaint introduced writing in their place, to aſſiſt the mandarins in performing all their offices, and the people in examining their conduct; and that it was by the ſymbol ䷪ *Kouai*, that he conducted himſelf in the execution of his work.

Lopi, whom we have ſo often quoted already, ſays, that Fou-hi extracted from the ſymbol of ſix lines every thing that concerned good government. For example, ䷝ *Li* gave him the hint of making lines for hunting and fiſhing, and theſe lines were a new occaſion of inventing ſtuffs for garments. Lopi adds, that it is a miſtake to imagine, that, in the times of Fou-hi, they ſtill uſed cords tied and knotted, and that books were not introduced till under Hoang-ti.

Fou-hi taught men to rear the ſix domeſtic animals, not only for food, but alſo for victims, in the ſacrifices which they offered to *Chine*, and to *Ki*. They pretend that Fou-hi regulated the rites *Kiao-chene*.

Fou-hi alſo inſtituted marriage; before this the intercourſe of the ſexes was indiſcriminate; he ſettled the ceremonies with which marriages were to be contracted, in order to render this great foundation of ſociety reſpectable. He commanded the women to wear a different dreſs from that of the men, and prohibited a man's marrying a woman of the ſame name, whether a relation or not, a law which is actually ſtill in force.

Fou-hi appointed ſeveral miniſters and officers to aſſiſt him in the government of the empire.

One of theſe officers made the letters, another drew up the calendar, a third built the houſes, a fourth practiſed medicine, a fifth cultivated the ground, a ſixth was the maſter of the woods and waters.

They pretend that Fou-hi applied himſelf very much to aſtronomy. The Tcheou-pi-ſouane ſays, that he divided the heavens into degrees. Lopi takes notice, that properly the heavens have no degrees, but that this term is uſed with relation to the path of the ſun in the courſe of a year.

The period of ſixty years is reckoned due to Fou-hi. The Tiene-piene ſays plainly, that this prince made a calendar to fix the year, and that he is the author of Kia-tſe. The Sane-fene ſays the ſame thing; and the Hane-li-tchi ſays, that Fou-hi made the firſt calendar by the Kia-tſe; but the Chi-pene aſcribes this to Hoang-ti. This is one of theſe contradictions ſo common in the Chineſe hiſtorians.

The ſame Fou-hi, they ſay, made arms, and ordained puniſhments. Theſe arms were of wood, thoſe of Chin-nong were of ſtone, and Tchi-yeou made ſome of metal.

Fou-hi drained off the waters, and ſurrounded the cities with walls. In the mean time, as Chin-nong is eſteemed the firſt who made walls of ſtone, we muſt ſuppoſe that thoſe raiſed by Fou-hi were only of earth or brick.

Fou-hi gave rules to muſic. Thoſe who aſcribe this fine art to Hoang-ti are deceived (or *vice verſa.*) After Fou-hi had invented fiſhing, he made a ſong for the fiſhers. It was from his example that Chin nong made one for the labourers.

Fou-hi took of the wood of Tong; he made it hollow; and of it made a *kine* (a lyre, or what you pleaſe to tranſlate it) ſeven feet two inches long; the ſtrings were of ſilk, to the number of 27; he commanded this inſtrument to be named *Li*. Others ſay it had but 25 ſtrings.

ſtrings, others 10, and others only 5; (which of them ſhall we believe?) Beſides, others make this inſtrument only three feet ſix inches ſix lines in length.

Fou-hi made this inſtrument, ſay ſome, to ward off inchantments, and baniſh impurity of heart.

He took of the wood of *ſang*, and made alſo a guitar of 36, or rather of 50 ſtrings. This inſtrument ſerved to adorn the perſon with virtues, and to regulate the heart, &c. Laſtly, he made a third inſtrument of baked earth; after which, ſay they, ceremonies and muſic were in high eſteem.

The money which Fou-hi introduced, was of copper, round within to imitate heaven, and ſquare without to reſemble the earth.

He himſelf made trial of many medicinal plants. (This is moſt commonly ſaid of Chin-nong: but it is pretended, that Chin-nong finiſhed what Fou-hi had begun.)

This is all we read of Fou-hi. Several contradictions will be remarked in moſt of theſe traditions, eſpecially when we come to ſee in the ſequel, that almoſt all theſe inventions are aſcribed to the ſucceſſors of Fou-hi. From hence may be judged what regard is due to the beginnings of the Chineſe hiſtory.

We have ſtill ſome reigns to examine, before we have done with the fabulous and uncertain times.

They ſay of Koung-koung, that he employed iron in making hangers and hatchets.

They aſcribe to Niu-oua (who is the Eve of the Chineſe) ſeveral inſtruments of muſic. The inſtruments *ſeng* and *hoang* ſerved her, ſay they, to communicate with the eight winds. By means of *kouene*, or double flutes, ſhe united all ſounds into one, and made concord between the ſun, moon, and ſtars. This is called *perfect harmony*. Niu-oua had a guitar (*ſe*) of five ſtrings; ſhe made another of 50 ſtrings, whoſe ſound was ſo affecting, that it could not be borne; wherefore ſhe reduced theſe 50 ſtrings to 25, to diminiſh its force.

The emperor Chin-nong is very famous among the Chineſe, by the great diſcoveries which, they ſay, he made in medicine, agriculture, and even in the military art, ſince they believe, that, in the times of *Han*, they had a book of this prince on the military art.

A fondneſs for the marvellous has made ſome ſay, that, at three years of age, he knew every thing that concerned agriculture. The very name *Chin-nong*, in the Chineſe language, ſignifies, *the ſpirit of huſbandry*. Chin-nong took very hard wood, of which he made the coulter of the plough, and ſofter wood of which he made the handle. He taught men to cultivate the earth. They aſcribe to him the invention of wine. He ſowed the five kinds of grains on the ſouth of Mount Ki, and taught the people to make them their food.

Chin-nong commanded that they ſhould be diligent in gathering the fruits which the earth produced. He taught every thing relative to hemp, to the mulberry-tree, and the art of making cloth and ſtuffs of ſilk. They owe alſo to Chin-nong the potters and the founders art; others, however, aſcribe pottery to Hoang-ti, and the art of melting metals to Tchi-yeou.

Chin-nong invented fairs in the middle of the day. This was the origin of commerce and mutual exchange. He made uſe of money to facilitate trade. He inſtituted feſtivals.

Chin-nong diſtinguiſhed plants, determined their various properties, and applied them ſkilfully in the cure of diſeaſes. They ſay, that, in one day, he made trial of 70 kinds of poiſons, ſpoke of 400 diſeaſes, and taught 365 remedies. This makes the ſubject of a book, intitled, *Pouenetſao*, which they aſcribe to him, and which contains four chapters. Others alledge, and with reaſon, that this book is not ancient. They ſay, with as little truth, that Chin-nong made books ingraved on ſquare plates.

Chin-nong commanded Tſiou-ho-ki to commit to writing every thing relative to the colour of ſick perſons, and what concerned the pulſe, to teach how to examine its motions if they were regular and harmonious, and, for this end, how to feel it from time to time, and acquaint the patient.

Chin-nong compoſed ballads or ſongs on the fertility of the country. He made a very beautiful lyre, and a guitar adorned with precious ſtones, to form the grand harmony, to bridle concupiſcence, to elevate virtue to the intelligent ſpirit, and bring men back to the celeſtial verity.

Chin-nong aſcended a car drawn by five dragons. He was the firſt that meaſured the figure of the earth, and determined the four ſeas. He found 900,000 lys is weſt, and 850,000 is north and ſouth. He divided all this vaſt ſpace into kingdoms.

Among the ſucceſſors of Chin-nong they place Hoang-ti, and the rebel Tchi-yeou, whom they make the inventor of arms of iron, and ſeveral kinds of puniſhments. Tchi-yeou had the power of raiſing miſts and darkneſs extremely thick. Hoang-ti knew not how to attack and overcome him. He accompliſhed it, however, by forming a car, on which he placed a figure whoſe arm of itſelf always turned to the ſouth, in order to point out the four regions. Hoang-ti uſed the lance and buckler.

Tchi-yeou ordered ſabres, lances, and croſs-bows to be made. They aſcribe to Hoang-ti the *kia-tſe*, or cycle of 60 years; or at leaſt Ta-nao made it by his direction.

The Mandarin Tſang-kiai was charged to compoſe hiſtory. Yong-tcheng made a ſphere which repreſented the celeſtial orbs, and diſcovered the polar ſtar.

Li-cheou regulated numbers, and invented an inſtrument for computation, like to, or the ſame with that which is ſtill in uſe in China and India; and of which Martini, in his Decades, and la Loubere, in his voyage to Siam, have given us the deſign and deſcription.

Ling-lune, a native of Yuene-yu, in the weſt of Tahia, (that is, Khoraſſan), took reeds in the valley of Hiai-ki; he cut two of an equal length, and blew into them: this gave occaſion to the invention of bells. He adjuſted twelve of theſe reeds to imitate the ſong of ſong-hoang, the royal bird, (one of the fabulous birds of the Chineſe). He divided theſe reeds into twelve *lu*; ſix ſerved to imitate the ſong of the male, and ſix that of the female. Finally, this man brought muſic to perfection, and explained the order and arrangement of different ſounds. By means of theſe lu-lu, he governed the Khi of the Yne and of Yang, he determined the change of the four ſeaſons, and gave calculations for aſtronomy, geometry, and arithmetic.

Yong-yuene, by order of Hoang-ti, made twelve bells of copper, which correſponded to the moons, and ſerved to adjuſt the five tones, and fix the ſeaſons, &c. fables.

Hoang-ti invented a kind of diadem or tiara, called *Miene*. He ordered a blue and yellow robe to be made for himſelf, in imitation of the colours of heaven and earth. Having viewed the bird *hoei*, and conſidered the variety of its colours, as well as thoſe of the flowers, he made garments be dyed of different colours, to make a diſtinction between the great and ſmall, the rich and poor.

Nin-fong and Tche-tſiang invented mortars for pounding rice; kettles or caldrons: they invented the art of building bridges, and of making ſhoes; they made coffins for the dead; and men reaped great advantages from all theſe inventions. Hoei invented the bow, Y-meou arrows; Khy-pe invented the drum, which made a noiſe like thunder, trumpets and horns, which imitated the voice of the dragon.

Kong-kou and Hoa-hu, by order of the Emperor Hoang-ti, hollowed a tree of which they made a ſhip; of the branches of the ſame tree they made oars; and by this means they were able to penetrate into places which ſeemed inacceſſible, and where men had never been.

For the tranſportation of merchandiſe by land, they alſo invented chariots under this reign, and trained oxen and horſes to draw them.

Hoang-ti alſo turned his thoughts to buildings, and gave models of them. He built a temple, called *Ho-kong*, in which he ſacrificed to *Chang-ti*, or to the Supreme Being.

With a view to facilitate commerce, Hoang-ti ſtruck money, called *kine-tao*, *knife of metal*, becauſe it had the ſhape of the blade of a knife.

Hoang-ti having obſerved that men died before the time fixed by nature, of diſeaſes which carried them off, he commanded Yu-fou, Ki-pe, and Lei-kong, three famous phyſicians of theſe times, to aſſiſt him to determine what remedies were proper for each diſeaſe.

Si-ling-chi, the chief conſort of that emperor, contributed on her part to the good of the ſtate, and taught the people the art of rearing ſilk-worms, of ſpinning their cods, and making ſtuffs of them.

The Ouai-ki takes notice, that Hoang-ti commanded China to be meaſured, and divided into provinces or tcheou. Each *tcheou* was compoſed of ten *che*, each *che* was compoſed of ten *tou*, and each *tou* contained ten *ye*, or ten cities. Theſe ten *ye*, or cities, had each five *ly*, or ſtreets, &c.

The empire of Hoang-ti, which, according to this hiſtorian, ſeems to have been conſiderable, extended on the eaſt to the ſea, on the weſt to Khong tong. It was bounded on the ſouth by Kiang, and on the north by the country of Hoene-jo.

They ſay nothing that has any relation to the arts under the three princes who follow Hoang-ti; that is to ſay, under the reigns of Chao-hao, who reigned 84 years; of Tchouene-hio, who reigned 78 years; and of Cao ſine, who reigned 70 years. They obſerve only, that Chao-hao made them beat the watches with a drum: this ſuppoſes that they had then ſome inſtrument for marking the hours. The Se-ki adds, that this emperor levelled the highways, in order to render the mountains acceſſible, and that he cleared the channels of rivers. He made alſo a new kind of muſic, called *Ta-yuene*, to unite men and genii, and reconcile high and low.

3. After having overcome the fatigue of ſo many fabulous traditions, we now come to the hiſtorical times. But before we enter upon them, it will not be improper to make ſome reflections which are abſolutely neceſſary to ſhew how little regard is due to this ſort of traditions. Theſe reflections are thought to be ſo much the more important, as they will help to undeceive a great many people of the miſtake they are in about the Chineſe antiquities.

The Chineſe monarchy begun by three princes, diſtinguiſhed by the title of *Sane-hoang*, that is to ſay the *three Auguſti*. Theſe three Auguſti, according to the moſt generally received opinion, are *Fou-hi*, *Chine-nong*, and *Hoang-ti*. The five emperors, ſucceſſors of the Sane-hoang, are diſtinguiſhed by the title of *Ou-ti*, that is to ſay, *the five emperors*. The five emperors are, *Chao-hao*, *Tchouene-hio*, *Tico*, *Yao*, and *Chune*. This diviſion has been followed by Cong-ngane-coue, the great grandſon of Confucius, in the eighth generation, and one of the moſt celebrated writers of the dynaſty of Hane. It has been adopted alſo by Hoang-fou-mi, and by moſt part of the beſt writers. The proofs of this opinion are taken partly from the book Tcheou-li, an ancient record, or ſtate of the empire, which many aſcribe to the famous Tcheou-cong, miniſter and brother of Vou-vang, who was the founder of the imperial dynaſty of Tcheou, eleven hundred and ſome odd years before the Chriſtian æra; partly from the commentaries of Tſo-kieou-mine on the Tchune-tſieou of Confucius's maſter. In theſe works, mention is made of the books, Sane-fene, and Ou-tiene, which, they ſay, are the hiſtories of the three Hoang, and of the five Ti: now, the two firſt chapters of Chou-king, which contain an extract of the hiſtories of Yao and of Chune, bore the title of *Tiene-yao* and *Tiene-Chune*; from whence it was concluded, that Yao and Chune were two of the five Ti; conſequently Fou-hi, Ching-nong, and Hoang-ti, were what are called the three Hoang; and Chao-hao, Tchouene-hio, Tico, Yao, and Chune, were the five Ti.

Theſe may perhaps be thought but feeble proofs to ſupport an hiſtorical fact of this kind; but thoſe who are of a contrary opinion, bring nothing to induce us to believe them, rather than Cong-ngane-coue and Hoang-fou-mi.

Hou-chouang-hou, in a preface before the Tſiene-piene of Kine-gine-chane confeſſes, that we find in the Tcheou-li, the exiſtence of the book of three Hoang, and that of five Ti: but he adds, that we do not find there the names of theſe eight monarchs; that, under the Tſin, they ſpoke of Tiene-hoang, of Ti-hoang, and of Gine-hoang; that Cong-ngane-coue, in his preface to

Chou-king, gives Fou hi, Chine nong, Hoang-ti, for the three Hoang, and that he takes Chao hao, Tchouene-hio, Tio, Yao, and Chune for the five Ti; but that we know not on what foundation he does this, ſince Confucius, in the Kia-yu, diſtinguiſhes by the title of *Ti*, all the kings after Fou hi. The ſame thing is proved by ſome paſſages of Tſo-chi and of Liu-pou-ouei; from whence they conclude, that Fou-hi, Chine-nong, and Hoang ti are not the three Hoang, and that there are no other Hoang but heaven, earth, and man.

Tchine-huene retrenches Hoang-ti from the number of the Sane-hoang, and puts in his place Niu-oua, whom he ranges between Fou-hi and Chine nong. Others ſtrike out Niu-oua, and put Tcho-yong in the place of Hoang-ti. Niu-oua was the ſiſter of Fou hi, and Fou-hi, they ſay, reigned 115 years. At what age muſt this princeſs have mounted the throne, for they make her ſucceed her brother?

The famous Se ma-tſiene, to whom the Chineſe, from their high eſteem of him, have given the name of *Tai ſſe-cong*, or *father of hiſtory*, will have Hoang-ti, Tchouene-hio, Cao-ſine, Yao, and Chune to be the five Ti; and he gave theſe princes for their predeceſſors Soui-gine chi, Fou-hi, and Chine-nong, who, according to him, were the three Hoang. This opinion, ſince his time, has been embraced by ſeveral other writers, who depended upon his authority more than upon proofs which he could not produce.

Confucius ſays in his Kia yu, that the princes who had governed the empire began at Fou hi to take the name of *Ti* or Emperor. The ſame philoſopher ſays further, in the treatiſe Hi-tſee, or commentary upon the Y-king, that anciently Fou hi governed China, that Chine nong ſucceeded him, that after them Hoang-ti, Yao, and Chune were ſeated on the throne. From ſo deciſive a teſtimony, Hou-ou-ſang, and ſeveral others with him, have not doubted, that theſe five princes named by Confucius were the Ou-ti, or five emperors. As to the Sane-hoang, they admitted Tiene hoang chi, Ti-hoang chi, Gine-hoang chi, as three chiefs of the people who had governed the empire before Fou-hi.

As it is from Tao-ſſe, that the ſeveral authors we have now quoted, have borrowed their idea of this chimerical diviſion of the eight firſt Chineſe emperors, into three Hoang and five Ti, it is neceſſary to relate what theſe religious think themſelves. They have opinions peculiar to themſelves about theſe firſt ages of the monarchy. They believe, that at the firſt there were three Auguſti, Sane-hoang; then five emperors, Ou ti; next three kings, Sane-vang; and laſtly, five Pa, Ou-pa; that is to ſay, five chiefs of Regulos.

This order ſo regularly obſerved of three and then five, which is repeated twice, ſhews plainly, that all this has no foundation in truth, but that it is a ſyſtem invented at pleaſure. Wherefore Tou-chong-chu, who lived under the Hane, explained this in an allegorical manner. The three Hoang were, according to him, the three powers, (heaven, earth, and man); The five Ti were the five duties (the duties of king and ſubject, of father and children, of huſband and wife, of elder and younger brothers, of friends); the three Vang were the three lights, (ſun, moon, and ſtars); finally, the five Pa were the five mountains, four of which are ſituated at the four cardinal points of the empire, and the fifth at the centre. Thus Tong-tchong-chu allegorized this this pretended ſucceſſion of kings. But Lopi, who relates this explanation, adds, it was not his own. This is a point of criticiſm of little importance to us; let them, if they pleaſe, aſcribe it to ſome other than Tong-tchong-chu; we have ſtill ground to ſay, that it came from ſome writer who lived in an age not far from that of Tong-tchong-chu. This is enough for our preſent purpoſe, ſince we ſee from hence the little regard they then paid to this diviſion, which they conſidered as chimerical. It would be in vain to attempt to reconcile all theſe contradictions. All theſe imaginary reigns are in the manner of the Tao-ſſe, who have darkened the origin of the Chineſe monarchy by their fables and mythology. The ten Ki or periods are of their inventing; they gave them between two and three millions of years duration. But before theſe ten periods, they place three dynaſties, viz. the dynaſty of Thiene-hoang-chi, that of Ti-hoang-chi, and finally, that of Gine-hoang-chi. If we attend to the ſignification of theſe names, they muſt be interpreted thus: the *Sovereign of heaven*, the *Sovereign of earth*, the *Sovereign of men*. We ſee from hence, that the allegorical explanation of Tong-tchong-chu, which made the three Hoang ſignify the three powers, that is, heaven, earth, and man, is not without probability.

Theſe three Hoang ſucceeded to Pouane-cou, otherwiſe Hoene-tune, the chaos, the origin of the world, which ſeveral of the Tao ſſe take for the firſt man, or the firſt king who governed China.

The dynaſty of Thiene-hoang-chi had thirteen kings, who reigned, ſay they, 18,000 years; then came the dynaſty of Ti-hoang-chi, whoſe kings, to the number of eleven, make up a like duration of 18,000 years. Finally, to Ti-hoang-chi ſucceeded the Gine-hoang-chi, whoſe dynaſty, compoſed of nine kings, furniſhes a ſpace of 45,600 years. Theſe three ſums added, give us preciſely 81,600 years. But if we add to theſe three dynaſties, thoſe which are comprehended in each of the ten Ki, and which amount, according to ſome calculations, to more than 230; we ſhall find that the pretenſions of the Chineſe very much exceed thoſe of the Chaldeans and Egyptians. For if we believe the calculations of various authors, from Pouane-cou to the death of Confucius, which happened in the year 479 before J. C. there is elapſed 276,000 years, or 2,276,000, or 2,759,860, or even 3,276,000; or, finally, which is a great deal more, 96,961,740 years: for we find all theſe different calculations.

It is viſible enough, that theſe extravagant numbers can be nothing elſe but aſtronomical periods, contrived to give the conjunction of the planets in certain conſtellations, or calculations which have ſome relation to the ideas of the Tao ſſe, concerning the perpetual deſtructions and reproductions of worlds. In fact, ſome have endeavoured to make theſe numbers agree with the period of Tchao-cang-tſie, a famous philoſopher in the days of Song, who had undertaken to determine the period of the duration of the world; for the ſyſtem of the deſtruction and reproduction of worlds was very current, not only in the ſect of Ju or of the learned, but alſo among the Bonzes, Ho-chang or the religious of Fo, and among the Tao-ſſe or followers of Lao-Kiune, that is to ſay, among the three great ſects, who have the moſt influence in the empire. Tchao-cang-tſie eſtabliſhed then a great period of 129,000 years, called *Yuene*, compoſed of twelve equal parts, called *hoei*, or *conjunctions*, which were each of 10,800 years. In the firſt conjunction, ſaid he, heaven was formed by little and little, by the motion which the Tai-ki, or the Supreme Being, impreſſed upon matter which was formerly at perfect reſt. During the ſecond conjunction, the earth was produced in the ſame manner. At the middle of the third conjunction, man and all other beings began to ſpring up, in the manner that plants and trees are produced in the iſlands, which afterwards preſerve their ſeveral kinds by their ſeeds. At the middle of the eleventh conjunction, all things ſhall be deſtroyed, and the world ſhall fall back again into its primitive chaos, from whence it ſhall not ariſe till after the twelfth conjunction is expired.

It is not difficult at preſent to conceive, that the Tao-ſſe had invented that prodigious number of reigns before Fou-hi, for no other reaſon, but to fill up that interval, which, according to them, had elapſed from the production of man, to the beginning of the Chineſe monarchy, that is to ſay, to the reign of Fou-hi. The ſame calculator determined the half of Yuene, or of his great period of 129,000 years, at the reign of Yao.

Theſe Tao-ſſe, as was ſaid already, laid down theſe ten ages or ten Ki as an indiſputable principle; each Ki comprehended ſeveral dynaſties, whoſe duration they determined as they thought fit, and as their calculation required: but if they were at liberty to increaſe or diminiſh the duration of the ten Ki, it was not the ſame as to their number, which was in ſome ſort a fundamental principle of their ſect, from which they were not allowed to depart.

Some miſſionaries, to whom this doctrine of Tao-ſſe was not unknown, imagined, that they diſcerned in theſe ten Ki, the ten generations before Noah; and as the writers cited by Lopi, and by Cong-ing-ta, ſay, that of theſe ten Ki, ſix were before Fou-he, and four after him; theſe ſame miſſionaries have imagined, that Fou-hi was Enoch. It muſt be owned, in the mean time, that Tchine-huene and ſeveral others do not obſerve the ſame order; that they place Chine-nong in the ninth Ki, Hoang-ti in the tenth, *&c.* By this computation Hoang-ti would be Noah, and Fou-hi Methuſelah, which contradicts their hypotheſis.

The opinion which conſiders the ten Ki of the Chineſe as the ten generations which preceded Noah, is very ingenious, and not improbable. Towards the end of the reign of Tcheou, about 300 years before the Chriſtian æra, ſome Jews travelled into China, who might have made the writings of Moſes known there, and, of conſequence, the ten generations which preceded the deluge: beſides, this knowledge was common to the Chaldeans, who might have penetrated into China before the Jews.

CHINEY, a city of the Auſtrian Netherlands, on the confines of the biſhopric of Liege, about twelve miles ſouth-eaſt of Namur: E. long. 5°, N. lat. 50° 20′.

CHINON, a town of France in the province of the Orleanois, about twenty three miles ſouth-weſt of Tours; E. long. 20′, and N. lat. 47° 15′.

CHIO, Chios, Xio, or Scio, an Aſiatic iſland, lying near the coaſt of Ionia, in Natolia or Leſſer Aſia, about one hundred miles weſt of Smyrna. It is called by the Turks Sakiſaduci, and is about one hundred miles in circumference; being chiefly inhabited by Chriſtians of the Greek church, who are ſaid to have three hundred churches in the iſland.

Chio is alſo the capital of the above iſland, ſituated on the eaſt coaſt: E. long. 27°, and N. lat. 38°.

CHIONANTHUS, or snow-drop-tree, in botany, a genus of the diandria-monogynia claſs. The calix divided into four oval ſegments; and the drupa contains but one ſeed. There are two ſpecies, *viz.* the virginica and zeylonica, both natives of the Indies.

CHIOZZO, or Chioggio, a town on an iſland of the ſame name, in the gulph of Venice, by which there is a paſſage into the Lagunes, ſituated about twelve miles ſouth of the city of Venice.

CHIPPENHAM, a borough-town in Wiltſhire, about twenty-two miles north-weſt of Saliſbury: W. long. 2° 12′, and N. lat. 51° 25′. It ſends two members to parliament.

CHIPPING, or Much-Wiccomb, a borough-town of Buckinghamſhire, about ten miles ſouth of Aileſbury: W. long. 42′, and N. lat. 51° 35′. It ſends two members to parliament.

CHIROGRAPHY, a writing under one's own hand.

CHIROMANCY, a ſpecies of divination, drawn from the different lines and lineaments of a perſon's hand; by which means, it is pretended, the inclinations may be diſcovered.

CHIRONIA, in botany, a genus of the pentandria monogynia claſs. The corolla is rotated; the piſtillum declines; the ſtaminæ are inſerted into the tube of the corolla; the antheræ are ſpiral; and the pericarpium is bilocular. There are eight ſpecies, none of them natives of Britain.

CHIRONOMY, in antiquity, the art of repreſenting any paſt tranſaction by the geſtures of the body, more eſpecially by the motions of the hands: this made a part of liberal education; it had the approbation of Socrates, and was ranked by Plato among the political virtues.

CHIROTONY, among eccleſiaſtical writers, denotes the impoſition of hands uſed in conferring prieſtly orders.

However, it is proper to remark, that chirotony originally was a method of electing magiſtrates, by holding up the hands.

CHIRVAN, a province of Perſia, lying on the weſtern coaſt of the Caſpian ſea.

CHIRURGERY. See Surgery.

CHISLEY-LAND, in agriculture, a ſoil of a middle nature between ſandy and clayey land, with a large admixture of pebbles.

CHISSEL, an inſtrument much uſed in carpentry, maſonry, joinery, ſculpture, *&c.* and diſtinguiſhed according to the breadth of the blade into half-inch chiſſels, quarter-inch chiſſels, *&c.* They have alſo different names according to the different uſes to which they are applied; as, 1. The former, uſed by carpenters, *&c.* juſt after the work is ſcribed: it is ſtruck with a mallet. 2. The paring-chiſſel, which is uſed in paring off the irregularities made by the former: this is preſſed with the workman's ſhoulder. 3. The ſkew-former cleanſes acute angles with the point of its narrow edge. 4. The mortice-chiſſel, uſed in cutting deep ſquare holes in wood, for mortices: it is narrow, but thick and ſtrong, to endure hard blows. 5. Socket-chiſſels, having their ſhank made with a hollow ſocket at top, to receive a ſtrong wooden ſprig fitted into it with a ſhoulder. 6. Ripping chiſſel, having a blunt edge, with no baſil, uſed in tearing two pieces of woop aſunder. And, 7. the gouge. See Gouge.

CHITAU, in the materia medica, a kind of lignum-aloes, of a reddiſh colour. See Lignum-aloes.

CHIVALRY, in law, is a tenure of ſervice, whereby the tenant is bound to perform ſome noble or military office to his lord; and is either regal, when held only of the king; or common, ſuch as may be held of a common perſon as well as the king: the former is properly called ſerjeanty, and the latter eſcuage.

A ſtatute of Charles II. aboliſhes all tenures by chivalry, in capite, *&c.* and ordains that all tenures ſhall be conſtrued to be free and common ſoccage.

CHIVES, in botany. See Antheræ.

CHIUSI, a city of Italy, in the dutchy of Tuſcany, ſituated on the confines of the pope's territories, about thirty-five miles ſouth-eaſt of Sienna: E. long. 13°, and N. lat. 33°.

CHLAMYS, in antiquity, a military habit worn by the ancients over the tunica. It belonged to the patricians, and was the ſame in the time of war that the toga was in the time of peace. This ſort of gown was called picta, from the rich embroidery with figures in Phrygian-work; and purpurea, becauſe the ground-work was purple. The chlamydes of the emperors were all purple, adorned with a golden or embroidered border.

CHLORIS, in ornithology, the trivial name of a ſpecies of Loxia. See Loxia.

CHLOROSIS, in medicine, a diſeaſe commonly called the green-ſickneſs, incident to young girls. See Medicine.

CHOCOLATE, in commerce, a kind of paſte, or cake, prepared of certain ingredients, the baſis of which is the cacao-nut.

The Indians, in their firſt making of chocolate, uſed to roaſt the cacao in earthen pots; and having afterwards cleared it of the huſks, and bruiſed it between two ſtones, they made it into cakes with their hands. The Spaniards improved this method: when the cacao is properly roaſted, and well cleaned, they pound it in a mortar, to reduce it into a coarſe maſs which they afterwards grind on a ſtone, till it be of the utmoſt fineneſs: the paſte being ſufficiently ground, is put quite hot into tin moulds, in which it congeals in a very little time. The form of theſe moulds is arbitrary; the cylindrical ones, holding two or three pounds, are the moſt proper, becauſe the bigger the cakes are, the longer they will keep. Obſerve, that theſe cakes are very liable to take any good or bad ſcent, and therefore they muſt be carefully wrapt up in paper, and kept in a dry place. Complaints are made, that the Spaniards mix with the cacao nuts too great a quantity of cloves and cinnamon, beſides other drugs without number, as muſk, ambergriſe, *&c.* The grocers of Paris uſe few or none of theſe ingredients; they only chuſe the beſt nuts, which are called Caracca, from the place from whence they are brought, and with theſe they mix a very ſmall quantity of cinnamon, the freſheſt vanilla, and the fineſt ſugar, but very ſeldom any cloves. Among us in England, the chocolate is made of the ſimple cacao, excepting that ſometimes ſugar, and ſometimes vanilla is added.

Chocolate ready made, and cacao paſte, are prohibited to be imported from any part beyond the ſeas. If made and ſold in Great Britain, it pays inland-duty 1 s. 6 d. per ℔. avoirdupoiſe: it muſt be incloſed in papers containing one pound each, and produced at the exciſe-office, to be ſtamped. Upon three days notice given to the officer of exciſe, private families may make chocolate for their own uſe, provided no leſs than half an hundred weight of nuts be made at one time.

CHOENIX, a dry meaſure, containing a forty-eighth part of a medimnus, or ſix buſhels. Hence the celebrated proverb of Pythagoras, *Super chœnice ne ſedeas.*

CHOIR, that part of the church or cathedral where choiriſters ſing divine ſervice: it is ſeparated from the chancel, where the communion is celebrated; and alſo from the nave of the church, where the people are placed: the patron is ſaid to be obliged to repair the choir of the church.

CHOLEDOCHUS, in anatomy. See Vol. i. p. 265.

CHOLER. See Bile.

CHOLERA *morbus*, in medicine. See Medicine.

CHONDRILLA, in botany, a genus of the ſyngeneſia polygamia æqualis claſs. The calix is caliculated; the receptacle is naked; the pappus is ſimple, and furniſhed with a ſtipes; and the floſcules are numerous. There is but one ſpecies, *viz.* the jancæa, a native of Germany.

CHONDROPTERYGII, in ichthyology, a term formerly applied to the order of fiſhes, now called amphibia nantes by Linnæus. See Amphibia.

CHOPIN, or Chopine, a liquid meaſure, uſed both in Scotland and France, and equal to half their pint. See Pint, and Measure.

CHORASSAN, a province of Perſia, on the north-eaſt, adjoining to Uſbec Tartary; this was the ancient Bactria, and the native country of the late Kouli Kan.

CHORD, in geometry, a right line drawn from one part of an arch of a circle to the other. Hence,

Chord *of an arch* is a right line joining the extremes of that arch. See Trigonometry.

Chords, or Cords, in muſic, are ſtrings, by the vibration of which the ſenſation of ſound is excited, and by the diviſions of which the ſeveral degrees of tune are determined.

Chord is alſo uſed in muſic for the note or tone to be touched or ſounded: in this ſenſe the fifth is ſaid to conſiſt of five chords or ſounds.

CHORDAPSUS, in medicine, a diſeaſe of the inteſtines, when to the touch they feel like ſtretched cords: it is the ſame with the iliac paſſion.

CHORDEE, in medicine and ſurgery, a ſymptom attending a gonorrhœa, conſiſting in a violent pain under the frenum, and along the duct of the urethra, during the erection of the penis, which is incurvated downwards. Theſe erections are frequent and involuntary. See Medicine.

CHOREUS, in ancient poetry. See Trochee.

CHORGES, or Gorges, a town of Dauphiny, in France, about ſix miles eaſt of Gap: E. long. 6°, and N. lat. 44° 36′.

CHORIAMBUS, in ancient poetry, a foot conſiſting of four ſyllables, whereof the firſt and laſt are long, and the two middle ones are ſhort; or, which is the ſame thing, it is made up of a trochæus and iambus: ſuch is the word nōbĭlĭtās.

CHORION, in anatomy, the exterior membrane which inveſts the fœtus in the uterus.

CHOROBATA, or Chorobates, a kind of water-level among the ancients, of the figure of the letter T, according to Vitruvius's deſcription.

CHOROGRAPHY, the art of making a map of ſome country or province.

CHORUS, in dramatic poetry, one or more perſons preſent on the ſtage during the repreſentation, and ſuppoſed to be by-ſtanders without any ſhare in the action.

Tragedy in its origin was no more than a ſingle chorus, who trod the ſtage alone, and without any actors, ſinging dithyrambics or hymns in honour of Bacchus. Theſpis, to relieve the chorus, added an actor, who rehearſed the adventures of ſome of their heroes; and Æſchylus, finding a ſingle perſon too dry an entertainment, added a ſecond, at the ſame time reducing the ſinging of the chorus, to make more room for the recitation. But when once tragedy began to be formed, the recitative, which at firſt was intended only as an acceſſory part to give the chorus a breathing time, became a principal part of the tragedy. At length, however, the chorus became inſerted and incorporated into the action: ſometimes it was to ſpeak, and then their chief, whom they called coryphæus, ſpoke in behalf of the reſt: the ſinging was performed by the whole company; ſo that when the coryphæus ſtruck into a ſong, the chorus immediately joined him.

The chorus ſometimes alſo joined the actors in the courſe of the repreſentation, with their plaints and lamentations on account of any unhappy accidents that befel them: but the proper function, and that for which it ſeemed chiefly retained, was to ſhew the intervals of the acts: while the actors were behind the ſcenes, the chorus engaged the ſpectators; their ſongs uſually turned on what was exhibited, and were not to contain any thing but what was ſuited to the ſubject, and had a natural connection with it; ſo that the chorus concurred with the actors for advancing the action. In the modern tragedies the chorus is laid aſide, and the fiddles ſupply its place. Mr Dacier looks on this retrenchment as of ill conſequence, and thinks it robs tragedy of a great part of its luſtre; he therefore judges it neceſſary to re-eſtabliſh it, not only on account of the regularity of the piece, but alſo to correct, by prudent and virtuous reflections, any extravagancies that might fall from the mouths of the actors, when under any violent paſſion.

Mr Dacier obſerved alſo, that there was a chorus, or grex, in the ancient comedy; but this is ſuppreſſed in the new comedy, becauſe it was uſed to reprove vices by attacking particular perſons; as the chorus of the tragedy was laid aſide to give the greater probability to thoſe kind of intrigues which require ſecrecy.

Chorus, in muſic, is when, at certain periods of a ſong, the whole company are to join the ſinger in repeating certain couplets, or verſes.

CHOTZIM, a frontier-town of Moldavia, on the confines of Poland, ſituated on the river Nieſter, and ſubject to the Turks: E. long. 27°, and N. lat. 48°.

CHOUG, a town of Syria, upon the road from Aleppo to Sayde, called by ſome travellers Shoggle.

CHOUGH, in ornithology. See Corvus.

CHREMNITZ, the principal of the mine-towns in Upper Hungary, ſituated about ſixty-eight miles north-eaſt of Preſburg, and ſubject to the houſe of Auſtria: E. long. 19°, and N. lat. 48° 45′.

CHREMPS, in ichthyology. See Sparus.

CHRISM, oil conſecrated by the biſhop, and uſed in the Romiſh and Greek churches in the adminiſtration of baptiſm, confirmation, ordination, and extreme unction.

Order of CHRIST, a military order, founded by Dionyſius I. king of Portugal, to animate his nobles againſt the Moors.

The arms of this order are gules, a patriarchal croſs, charged with another croſs argent: they had their reſidence at firſt at Caſtromarin, afterwards they removed to the city of Thomar, as being nearer to the Moors of Andaluſia and Eſtremadura.

Christ is alſo the name of a military order in Livonia, inſtituted in 1205, by Albert biſhop of Riga. The end of this inſtitution was to defend the new Chriſtians, who were converted every day in Livonia, but were perſecuted by the heathens. They wore on their cloaks a ſword with a croſs over it, whence they were alſo denominated brothers of the ſword.

Christ-burgh, a town of Poland, near the lake Drauſen, and about three Poliſh miles from Marienburgh.

Christ-church, a borough town of Hampſhire, thirty miles ſouth-weſt of Winceſter, near the ſea-coaſt: W. long. 2°, N. lat. 50° 40′. It ſends two members to parliament.

Christ-*thorn*, in botany. See Rhamnus.

Moſt CHRISTIAN *king*, one of the titles of the king of France.

The French antiquaries trace the origin of this appellation up to Gregory the Great, who, writing a letter to Charles Martlet, occaſionally gave him that title, which his ſucceſſors have ſince retained.

CHRISTIAN *religion*, that inſtituted by Jeſus Chriſt. See RELIGION.

CHRISTIANS, thoſe who profeſs to believe the Chriſtian religion. See RELIGION.

CHRISTIANS *of St John*, a ſect of Chriſtians very numerous in Balſara and the neighbouring towns: they formerly inhabited along the river Jordan, where St John baptized, and it was from thence they had their name. They hold an anniverſary feaſt of five days, during which they all go to the biſhop, who baptizes them with the baptiſm of St John. Their baptiſm is alſo performed on rivers, and that only on Sundays; they have no notion of the third perſon in the Trinity, nor have they any canonical book, but abundance full of charms, *&c.* Their biſhoprics deſcend by inheritance, as our eſtates do, though they have the ceremony of an election.

CHRISTIANS *of St Thomas*, a ſort of Chriſtians in a peninſula of India, on this ſide of the gulf: they inhabit chiefly at Cranganor, and the neighbouring country: theſe admit of no images, and receive only the croſs, to which they pay a great veneration: they affirm, that the ſouls of the ſaints do not ſee God till after the day of judgment: they acknowledge but three ſacraments, *viz.* baptiſm, orders, and the euchariſt: they make no uſe of holy oils in the adminiſtration of baptiſm, but after the ceremony anoint the infant with an unction compoſed of oil and walnuts, without any benediction. In the euchariſt, they conſecrate with little cakes made of oil and ſalt, and inſtead of wine make uſe of water in which raiſins have been infuſed.

CHRISTIANA, a town of Norway, in the province of Aggerhuys, ſituated on a bay of the ſea, a hundred miles north of Gottenburgh: E. long. 10° 15′, N. lat. 59° 30′.

CHRISTIANOPLE, a port-town of Sweden, ſituated on the Baltic ſea, in the territory of Bleking, and province South Gothland, about thirteen miles north-eaſt of Carleſcroon: E. long. 15° 40′, and N. lat. 57°.

CHRISTIANSBURGH, a Daniſh factory upon the gold-coaſt of Africa, near Acra.

CHRISTIANSTADT, a town of Sweden, ſituated on the river Helles, in the territory of Bleking, and province of South Gothland, forty-five miles weſt of Carleſcroon: E. long. 14° 40′, N. lat 56° 30′.

CHRISTMAS, a feſtival of the Chriſtian church, obſerved on the 25th of December, in memory of the nativity of Jeſus Chriſt.

CHRISTOPHER-*herb*, in botany. See CHRISTOPHORIANA.

CHRISTOPHERS, or *St* CHRISTOPHERS, one of the Caribbee iſlands, to which Columbus gave his Chriſtian name: W. long. 62°, N. lat. 71° 30′.

It is about twenty miles long, and ſeven broad; and has a high mountain in the middle, from whence ſome rivulets run down. Its produce is chiefly ſugar, cotton, ginger, and indigo. It is a Britiſh colony, and lies about ſixty miles weſt of Antego.

CHRISTOPHORIANA, in botany. See ACTÆA.

CHROASTACES, in natural hiſtory, a genus of pellucid gems, comprehending all thoſe of variable colours, as viewed in different lights; of which kinds are the opal and the aſteria, or oculus cati. See OPAL, and ASTERIA.

CHROMA, in muſic, a note or character of time, uſually termed a quaver.

Chroma is alſo a graceful way of ſinging, or playing with quavers and trilloes.

CHROMATIC, in the ancient muſic, the ſecond of the three kinds into which the conſonant intervals were ſubdivided into their concinnous parts. The other two kinds are enharmonic and diatonic.

CHROMATIC, in painting, a term uſed to ſignify the colouring, which makes the third part in the art of painting.

CHROMIS, in ichthyology. See SPARUS.

CHRONIC, or CHRONICAL, among phyſicians, an appellation given to diſeaſes that continue a long time, in contradiſtinction to thoſe that ſoon terminate, and are called *acute*. See MEDICINE.

CHRONICLE, in matters of literature, a ſpecies or kind of hiſtory, diſpoſed according to the order of time, and agreeing in moſt reſpects with annals. See ANNALS.

Books of CHRONICLES, in the canon of ſcripture, two ſacred books, called by the Greeks *paralipomena*, that is, remains, additions, or ſupplements, as containing many circumſtances omitted in the other hiſtorical books.

CHRONOGRAM, a ſpecies of falſe wit, conſiſting in this, that a certain date or epocha is expreſſed by numeral letters of one or more verſes: ſuch is that which makes the motto of a medal ſtruck by Guſtavus Adolphus, in 1632.

ChrIſtVs DVX, ergo trIVMphVs.

CHRONOLOGY, the ſcience or doctrine of time, in ſo far as it regards hiſtory, whether civil or eccleſiaſtical.

The buſineſs of chronology, is to aſcertain and adjuſt the various epochas, æras, and other periods mentioned in hiſtory; ſo that the revolutions of empires and kingdoms, and other remarkable events, may be truly ſtated. For the principles of chronology, ſee ASTRONOMY, *Of the diviſion of time*.

CHRONOMETER, in general, denotes any inſtrument or machine, uſed in meaſuring time; ſuch are dials, clocks, watches, *&c.* See CLOCK, DIAL, *&c.*

CHRONOSCOPE, denotes much the ſame with chronometer. See the preceding article.

CHROSTASIMA, in natural hiſtory, a genus of pellucid gems, comprehending all thoſe which appear of one ſimple and permanent colour in all lights: ſuch are the diamond, carbuncle, ruby, garnet, amethyſt, ſapphire, beryl, emerald, and the topaz. See DIAMOND, CARBUNCLE, *&c.*

CHRYSAETUS, in ornithology. See Falco.

CHRYSALIS, in natural hiſtory, a ſtate of reſt and ſeeming inſenſibility which butterflies, moths, and ſeveral other kinds of inſects, muſt paſs through before they arrive at their winged or moſt perfect ſtate. See Natural History.

CHRYSANTHEMOIDES, in botany. See Osteospermum.

CHRYSANTHEMUM, in botany, a genus of plants belonging to the ſyngeneſia polygamia ſuperflua claſs. The receptacle is naked, it has no pappus; the calix is hemiſpherical and imbricated; and the ſcales on the margin are membranaceous. There are nineteen ſpecies, two of which are natives of Britain, *viz.* the ſegetum, or corn mary-gold; and the leucanthemum, or ox-eye daiſy.

CHRYSOBALANUS, in botany, a genus of the icoſandria monogynia claſs. The corolla conſiſts of five petals; the calix has five teeth; and the drupa contains a nut with five furrows. There is but one ſpecies, *viz.* the icaco, a native of America.

CHRYSOBERYL, a kind of beryl with a tincture of yellow. See Beryl.

CHRYSOCOLLA, in natural hiſtory, a ſpecies of green ochres. See Ochra.

CHRYSOCOMA, in botany, a genus of plants belonging to the ſyngeneſia polygamia æqualis claſs. The receptacle is naked; the pappus is ſimple; the calix is imbricated and hemiſpherical; and the ſtylus is hardly longer than the floſcules. There are nine ſpecies, none of which are natives of Britain.

CRYSOGONUM, or Moth-mullein, in botany, a genus of plants belonging to the ſyngeneſia polygamia neceſſaria claſs. The receptacle is paleaceous; the pappus is monophyllous, and three-teethed; the calix conſiſts of five leaves; and the ſeeds are caliculated, and invalved in four leaves. There is but one ſpecies, a native of Virginia.

CHRYSOLITE, in natural hiſtory, a gem which the ancients knew under the name of the topaz; and the true chryſolite of the ancients, which had its name from its fine gold-yellow colour, is now univerſally called topaz by modern jewellers. See Topaz.

Chrysolite-*paſte*, a kind of glaſs made in imitation of natural chryſolite, by mixing two ounces of prepared cryſtal, with ten ounces of red-lead, adding twelve grains of crocus martis made with vinegar; and then baking the whole for twenty-four hours, or longer, in a well luted cucurbit.

CHRYSOMELA, in zoology, a genus of inſects, belonging to the order of coleoptera. The antennæ are ſhaped like bracelets, and thicker on the outſide; and neither the breaſt nor the elytra are marginated. There are no leſs than 122 ſpecies, principally diſtinguiſhed by differences in their colour.

CHRYSOPHYLLUM, in botany, a genus of the pentandria monogynia claſs. The corolla is bell-ſhaped, and divided into ten ſegments, which alternately ſpread wider; and the berry contains ten ſeeds. There are but two ſpecies, both natives of America.

CHRYSOPRASUS, or Chrysoprasius, the tenth of the precious ſtones, mentioned in the Revelations, as forming the ſoundation of the heavenly Jeruſalem.

The chryſopraſius is a ſpecies of praſius, of a pale but pure green colour, with an admixture of yellow.

CHRYSOSPLENIUM, in botany, a genus of the decandria digynia claſs. The calix is divided into four or five coloured ſegments; it has no corolla; and the capſule has two beaks, and one cell containing many ſeeds. The ſpecies are two, *viz.* the alternifolium, or alternate-leaved golden ſaxifrage; and the oppoſitifolium, or common golden-ſaxifrage; both natives of Britain.

CHRYSTAL, or Crystal. See Crystal.

CHUB, or Chubb. in ichthyology. See Cyprinus.

CHURCH, has different ſignifications, according to the different ſubjects to which it is applied. 1. It is underſtood of the collective body of Chriſtians, or all thoſe over the face of the whole earth who profeſs to believe in Chriſt, and acknowledge him to be the Saviour of mankind. This is what the ancient writers call the catholic or univerſal church. Sometimes the word church is conſidered in a more extenſive ſenſe, and divided into ſeveral branches; as the church militant, is the aſſembly of the faithful on earth; the church triumphant, that of the faithful already in glory; to which the Papiſts add the church patient, which, according to their doctrines, is that of the faithful in purgatory.

2. Church is applied to any particular congregation of Chriſtians, who aſſociate together and concur in the participation of all the inſtitutions of Jeſus Chriſt, with their proper paſtors and miniſters. Thus we read of the church of Antioch, the church of Alexandria, the church of Theſſalonica, and the like.

3. Church denotes a particular ſect of Chriſtians diſtinguiſhed by particular doctrines and ceremonies. In this ſenſe, we ſpeak of the Romiſh church, the Greek church, the reformed church, the church of England, &c.

The Latin or weſtern church, comprehends all the churches of Italy, France, Spain, Africa, the north, and all other countries whither the Romans carried their language. G. Britain, part of the Netherlands, of Germany, and of the North, have been ſeparated from hence ever ſince the time of Henry VIII. and conſtitute what we call the reformed church, and what the Romaniſts call the weſtern ſchiſm.

The Greek or eaſtern church, comprehends the churches of all the countries anciently ſubject to the Greek or eaſtern empire, and through which their language was carried; that is, all the ſpace extended from Greece to Meſopotamia and Perſia, and thence into Egypt. This church has been divided from the Roman, ever ſince the time of the emperor Phocas.

The Gallican church, denotes the church of France, under the government and direction of their reſpective biſhops and paſtors. This church has always enjoyed certain franchiſes and immunities, not as grants from popes, but as derived to her from her firſt original, and which ſhe has taken care never to relinquiſh. Theſe liberties depend upon two maxims; the firſt, that the pope has no authority or right to command or order any thing either in general or in particular, in which the temporalities and civil rights of the kingdom are concerned; the ſecond, that notwithſtanding the pope's ſupremacy is owned in caſes purely ſpiritual, yet, in France, his power is limited and regulated by the decrees and canons of ancient councils received in that realm.

4. The word church is uſed to ſignify the body of eccleſiaſtics, or the clergy, in contradiſtinction to the laity. See CLERGY.

5. Church is uſed for the place where a particular congregration or ſociety of Chriſtians aſſemble for the celebration of divine ſervice. In this ſenſe, churches are variouſly denominated, according to the rank, degree, diſcipline, *&c.* as metropolitan church, patriarchal church, cathedral church, parochial church, collegiate church, *&c.* See METROPOLIS, PATRIARCH, *&c.*

CHURCH-*reeves*, the ſame with church-wardens.

CHURCH-STRETTON, a market-town of Shropſhire, about twelve miles ſouth of Shrewſbury: W. long. 2° 50′, N. lat. 52° 35′.

CHURCH-*wardens*, formerly called church-reeves, are officers choſen yearly, in Eaſter week, by the miniſter and pariſhoners of every pariſh, to look after the church, church-yard, church-revenues, *&c.* alſo to obſerve the behaviour of the pariſhoners in relation to ſuch miſdemeanors as appertain to the cenſure or juriſdiction of the eccleſiaſtical court.

They are to be choſen by the joint conſent of the miniſter and his pariſhoners; and by cuſtom, the miniſter may chuſe one, and the pariſhoners another; or, if there be a cuſtom for it, the pariſhoners may elect both, though it is againſt the canon. They were ſworn into their office by the archdeacon; and if he refuſes to ſwear a church-warden, a mandamus may iſſue out to compel him: for as the church-wardens have a truſt repoſed in them by the pariſh, as temporal officers, the pariſhoners are the proper judges of their abilities to ſerve, and not the archdeacon who ſwears them.

The church wardens are a corporation to ſue, and be ſued, for the goods of the church: they are to take care of the repairs of the church; and if they erect or add any thing new to the ſame, they muſt have the conſent of the pariſhoners, or veſtry; and if in the church, the licenſe of the ordinary: they have, with conſent of the miniſter, the placing of the pariſhoners in the ſeats of the body of the church, appointing gallery keepers, *&c.* reſerving to the ordinary a power to correct the ſame. In London, the church-wardens have this authority in themſelves: there alſo they are bound to fix fire-cocks, keep engines, *&c.* in their pariſhes, under the penalty of 10 l.

Beſides their ordinary power, the church-wardens have the care of the benefice during its vacancy: they are to join with the overſeers of the poor in making rates for their relief, ſetting up trades for employing them, placing out poor apprentices, ſettling poor perſons, *&c.* It is their duty to collect the charity-money upon briefs read in churches; they are to ſign the certificates of thoſe perſons who receive the ſacrament, to qualify them to bear offices, *&c.*

CHURCHING *of women after child-birth*, an office in the liturgy, containing a thankſgiving to be uſed by women after being delivered from the great pain and peril of child-birth.

CHURN-OWL, in ornithology. See CAPRIMULGUS.

CHURN-WORM, in zoology. See GRYLLOTALPA.

CHUSAN, or CHEUXAN, an iſland on the eaſtern coaſt of China, near the province of Chekiam: E. long. 124°, N. lat. 30° 40′.

CHUSISTAN, a province in the ſouth-weſt part of Perſia, bounded by the gulph of Perſia on the ſouth, and by the province of Eyraca Agem on the north.

CHUTON, CHUTTON, a market-town of Somerſetſhire, about ſeven miles north eaſt of Wells: W. long. 2° 36′, N. lat. 51° 25′.

CHYLE, in the animal œconomy, a milky fluid, ſecreted from the aliments by means of digeſtion.

The principles of the chyle ſeem to be ſulphureous, mucilaginous, ſaline, and aqueous. It is a kind of natural emulſion, both with regard to the colour, the ingredients, and the manner of preparation. There is this difference between the artificial and natural emulſion, that the latter is far more pure, and is prepared with much greater apparatus, not by the ſudden expreſſion of part of the liquid, but by a gentle and ſucceſſive percolation. The chyle is made ſooner or later, according to the difference of the temperaments, ſtrength, aliments and cuſtoms: therefore how many hours chylification requires, cannot be certainly determined. When the chyle enters the villous oſcula of the lacteals, it is not a fluid extracted merely from the aliment and drink, but a mixture of fluids; that is, the ſaliva and thinner mucus of the mouth, and the two fluids of the œſophagus, one proceeding from the villous membrane of the tube itſelf, the other from its glands. To theſe may be added the glutinous fluid of the ſtomach, the pancreatic juice, the fluid of peyer's glands, which are very numerous in the ſmall inteſtines. Hence the reaſon appears, why men may live upon bread and water, why the oriental nations uſe rice in the room of all kinds of pulſe, and why acids, ſpirituous liquors, ſaline things, and many vegetable juices, herbs, roots, acrid and aromatic ſubſtances, are the leaſt fit to generate chyle.

CHYLIFICATION, the formation of the chyle, or the act whereby the food is changed into chyle.

Chylification commences by comminuting the aliment in the mouth, mixing it with ſaliva, and chewing it with the teeth; by theſe means the food is reduced into a kind of pulp, which, being received into the ſtomach, mixes with the juices thereof; and thus diluted, begins to ferment or putrify, and, aſſuming a very different form from what it had before, grows either acid or rancid. Here it meets with a juice ſeparated from the blood by the glands of that part, whoſe excretory ducts open into the cavity of the ſtomach: by the commixture of theſe liquors, whether of ſaliva or the juice of the ſtomach, a proper menſtruum is compoſed, by which the parts of the aliment are ſtill more and more divided by its inſinuating into their pores, and acquire ſtill a greater likeneſs to the animal fluids. The ſtomach, by means of its muſcular fibres, contracting itſelf, does gradually dicharge its contents by the pylorus into the duodenum; in which gut, after a ſmall ſemicircular deſcent, it meets with the pancreatic juice and bile; both which joining it, renders ſome part of the aliment more fluid, by ſtill disuniting the groſſer part from the more pure, and here the chylifaction is made perfect. The bile which abounds with lixivial ſalts, and apt to entangle with the groſſer parts of the concocted aliment, ſtimulates the guts, and cleanſes their cavities of the mucous matter ſeparated from the blood by the glands of the guts, and lodged in their cavities; which not only moiſtens the inſide of the guts, but defends the mouth of the lacteal veſſels from being injured by alien bodies which often paſs that way.

The contents of the inteſtines move ſtill on, by means of the periſtaltic motion of the guts; whilſt thoſe thinner parts, fitted to the pores of the lacteal veſſels, are abſorbed by them: the thicker move ſtill more ſlowly on, and by the many ſtops they continually meet with by the connivant valves, all the chyle or thin parts are at length entirely abſorbed: the remains being merely excrementitious, are only fit to be protruded by ſtool.

In the paſſage through the ſmall inteſtines, the finer part of the maſs, which we call the chyle (as has been already obſerved) enters the orifices of the lacteal veſſels of the firſt kind, wherewith the whole meſentery is intermixed, which either alone, or together with the meſeraic veins, diſcharge themſelves into the glands, at the baſis of the meſentery.

Then the chyle is taken up by the lacteals of the ſecond kind, and is conveyed into glands between the two tendons of the diaphragm, called Pecquet's reſervatory; whence it is carried to the heart by the thoracic duct, and the ſubclavian vein: and here it firſt mixes with the blood, and in time becomes aſſimilated thereto.

CHYLOSIS, among phyſicians, the act of reducing the aliment in the ſtomach to chyle.

CHYME, or Chymus, in the common ſignification of the word, denotes every kind of humour which is incraſſated by concoction, under which notion it comprehends all the humours fit or unfit for preſerving and nouriſhing the body, whether good or bad. It frequently imports the fineſt part of the chyle, when ſeparated from the fæces, and contained in the lacteal and thoracic duct.

CHYMISTRY, or Chemistry. See Chemistry.

CHYMOLOGI, an appellation given to ſuch naturaliſts as have employed their time in inveſtigating the properties of plants from their taſte and ſmell.

CHYMOSIS, in medicine, the act of making or preparing chyme. See Chyme.

Chymosis is alſo a diſtortion of the eye-lids, ariſing from an inflammation; alſo an inflammation of the cornea tunica in the eye.

CIALIS, the name of the capital of a kingdom of that name in independant Tartary, ſituated on the road from Samarcand to China.

CIBDELOPLACIA, in natural hiſtory, a genus of ſpars debaſed by a very large admixture of earth: they are opaque, formed of thin cruſts, covering vegetables and other bodies, by way of incruſtations.

Of this genus we have the following ſpecies: 1. A greyiſh-white one, with a rough ſurface. 2. A whitiſh brown one: both theſe are friable. 3. A hard, pale-brown kind, which is the oſtecolla of the ſhops. 4. The whitiſh-grey kind, with a ſmooth ſurface: this is the unicornu foſſile and ceratites of authors. 5. The whitiſh-brown coralloide kind.

CIBDELOSTRACIA, in natural hiſtory, terrene ſpars, deſtitute of all brightneſs and tranſparence, formed into thin plates, and uſually found coating over the ſides of fiſſures, and other cavities of ſtone, with congeries of them of great extent, and of plain or botroyide ſurfaces.

Of theſe there are uſually reckoned ſeven kinds; the firſt is the hard, browniſh-white cibdeloſtracium, found in Germany; the ſecond is the hard, whitiſh cibdeloſtracium, with thin cruſts, and a ſmoother ſurface, found alſo in the Harts-foreſt in Germany: the third is the hard, pale-brown cibdeloſtracium, with numerous very thin cruſts, found in ſubterranean caverns in many parts of England as well as Germany: the fourth is the white, light, and friable cibdeloſtracium, found alſo in Germany, but very rarely in any part of England: the fifth is the light, hard, pale-brown cibdeloſtracium, with a ſmooth ſurface, found in almoſt all parts of the world: the ſixth is the whitiſh, friable, cruſtaceous cibdeloſtracium, with a rougher ſurface, frequent in Germany and England; and the ſeventh is the browniſh-white, friable cibdeloſtracium, with a duſty ſurface, found in ſeveral parts of Ireland, as well as Germany.

CICADIA, in zoology, a genus of inſects belonging to the order of hemiptera. The beak is inflected; the antennæ are ſetaceous; the four wings are membranaceous and deflected; and the feet, in moſt of the ſpecies, are of the jumping kind. The ſpecies are fifty-one. The larvæ of ſeveral of this genus evacuate great quantities of a frothy matter upon the branches and leaves of plants, in the midſt of which they conſtantly reſide.

CICATRICULA, among natural hiſtorians, denotes a ſmall whitiſh ſpeck in the yolk of an egg, ſuppoſed to be the firſt rudiments of the future chick.

CICATRIX, in ſurgery, a little ſeam or elevation of callous fleſh riſing on the ſkin, and remaining there after the healing of a wound or ulcer. It is commonly called a ſcar. See Surgery.

CICATRIZANTS, in pharmacy, medicines which aſſiſt nature to form a cicatrix. Such are arminian bole, powder of tutty, diſiccativum rubrum, &c.

Cicatrizants are otherwiſe called eſcharotics, epulotics, incarnatives, agglutinants, &c.

CICELY. See Myrrhis.

CICER, or Chick-pea, in botany, a genus of the diadelphia decandria claſs. The calix is divided into five ſegments, of the ſame length with the corolla, the four uppermoſt ſegments lying upon the vexillum; and the legumen or pod is turgid, rhomboidal, and contains two ſeeds. There is but one ſpecies, *viz.* the arietinum, a native of Spain.

CICERBITA, in botany. See Sonchus.

CICHORIUM, or Succory, in botany, a genus of the ſyngeneſia polygamia æqualis claſs. The receptacle is paleaceous; the calix is caliculated; and the pappus has five teeth on its margin. The ſpecies are three, only one of which, *viz.* the intybus, or wild cichory, is a native of Britain. The leaves and root are detergent, aperient, and attenuating.

CICINDELIA, in zoology, a genus of inſects belonging to the order of coleoptera. The antennæ are ſetaceous; the jaws are prominent, and furniſhed with teeth; the eyes are a little prominent; and the breaſt is roundiſh and marginated. There are fourteen ſpecies.

CICONIA, in ornithology. See Ardea.

CICUTA, in botany, a genus of the pentandria digynia claſs. The fruit is furrowed and ovated. The ſpecies are three, only one of which, *viz.* the viroſa, or long-leaved water-hemlock, is a native of Britain.

Cicuta is alſo a ſynonime of the conium. See Conium.

CICUTARIA, in botany, a ſynonime of the æthuſa, phellandrium, *&c.*

CIDARIS, in antiquity, the mitre uſed by the Jewiſh high-prieſts. The Rabbins ſay, that the bonnet uſed by prieſts in general was made of a piece of linen-cloth ſixteen yards long, which covered their heads like a helmet or a turbant: and they allow no other difference between the high-prieſt's bonnet, and that of other prieſts, than this, that one is flatter and more in the form of a turbant; whereas that worn by ordinary prieſts, roſe ſomething more in a point.

Cidaris, in conchyliology, the trivial name of a ſpecies of echinus. See Echinus.

CIFALU, or Cefaledi, a port-town of Sicily, thirty-ſix miles eaſt of Palermo: E. long. 13° 32′, N. lat. 38° 30′.

CILIA, the Eye-lashes, in anatomy. See Vol. I. p. 291.

CILIARE, or Ligamentum Ciliare, in anatomy. See Vol. I. p. 290.

CILIARIS, in anatomy. See Vol. I. p. 291.

CILIATED *leaf*, among botanical writers, one ſurrounded all the way with parallel filaments, ſomewhat like the hairs of the eye-lids.

CILICIUM, in Hebrew antiquity, a ſort of habit made of coarſe ſtuff, formerly in uſe among the Jews in times of mourning and diſtreſs. It is the ſame with what the Septuagint and Hebrew verſions call ſackcloth.

CILLEY, the capital of a territory of the ſame name in Stiria, and the circle of Auſtria in Germany: E. lon. 15° 35′, N. lat. 46° 35′.

CIMA, or Sima, in architecture, the ſame with cymatium or ogee. See Ogee.

CIMEX, or Bug, in zoology, a genus of inſects belonging to the order of hemiptera. Linnæus enumerates no leſs than 121 ſpecies. The lectularius, or common houſe-bug, is a well known inſect. The methods of expelling them are various; as, oil of turpentine, the ſmoke of corn-mint, of narrow-leaved wild-creſs, of herb-robert, of the reddiſh agaric, of muſtard, of Guiney pepper, of peats or turf, *&c.* But cleanlineſs is the only remedy againſt vermin of every kind.

CIMOLIA *terra*, in natural hiſtory, a ſpecies of white marle, which is ponderous and friable, and makes a conſiderable efferveſcence with aqua fortis.

CINALOA, a province of Mexico, in North America, lying on the Pacific Ocean, oppoſite to the ſouth end of California.

CINAN, a city of China, the metropolis of the province of Zantung, ſituated in 37° N. lat. and 30′ eaſt of Pekin.

CINCHONA, in botany, a genus of the pentandria monogynia claſs. The corolla is bell-ſhaped; and the capſule is below the flower, and opens at the baſe. There is but one ſpecies, *viz.* the officinalis, a native of Peru. The Peruvian bark, which is the bark of this tree, is brought to us in pieces of different ſizes, ſometimes rolled up into ſhort thick quills, and ſometimes flat: the outſide is browniſh, and generally covered in part with a whitiſh moſs; the inſide is of a yellowiſh, reddiſh, or ruſty iron colour. It has a lightly aromatic ſmell, ſomewhat muſty, yet not diſagreeable; a bitteriſh, aſtringent taſte, which dwells long upon the tongue, accompanied with a degree of aromatic warmth. The ſmall, thin, flat pieces are by ſome accounted the beſt; by others, the quill ſort, with the roughеſt coat, eſpecially if of a bright cinnamon colour on the inſide; though the large flat pieces, whether rough or ſmooth, of a lighter or darker colour, are often of equal goodneſs. The beſt bark is that which is ſtrongeſt in ſmell and taſte: this likewiſe proves friable betwixt the teeth, and does not ſeparate into fibres; it breaks, not ſhivery, but cloſe and ſmooth.

The virtues of this bark, as a febrifuge, were diſcovered by the Indians about the year 1500: Europe did not become acquainted with it till 1649: nor was it received into general practice till ſeveral years after this; ſome ill conſequences enſuing from its imprudent uſe, having brought it for a time into diſrepute. At preſent, it is looked upon as the moſt effectual remedy in intermittent fevers of almoſt every kind, and ſafe in all ages and conſtitutions; provided it be judiciouſly and ſeaſonably adminiſtered, and due regard be had to the circumſtances of the diſeaſe. The modern practice, previous to the uſe of this medicine, uſually gives an emetic at the beginning of a paroxyſm: in ſome caſes a cathartic, and in plethoric habits venæſection, are premiſed: theſe render the bark not only more ſafe, but likewiſe more certain and ſpeedy in its operation: where theſe evacuations are neglected, or not ſufficiently plentiful, the diſeaſe, if of long ſtanding, ſcarce yields to the *cortex*; or if it appears at length ſubdued, yet the patient does not recover his ſtrength, and ſoon ſuffers a relapſe. The uſe of the bark is begun at the end of a paroxyſm, and repeated, in the quantity of half a dram (more or leſs, according to the circumſtances of the patient) every third or fourth hour during the intermiſſion: where the fever is of the bilious kind, and accompanied with great heat, a little nitre is joined: in all caſes, moderate exerciſe generally promotes its effect. At firſt, it uſually looſens the belly, and ſometimes operates as if a cathartic had been taken; and by this means ſupplies the omiſſion of evacuations before its exhibition: if the purging continues, the medicine does not anſwer the purpoſes intended by it: in ſuch caſe, a little opium is added, which effectually ſuppreſſes the flux: if after this the patient continues too coſtive, recourſe is had to glyſters. The looſeneſs, however, ought not to be ſtopt too ſoon: on the contrary, where the bark does not itſelf produce this effect, it is neceſſary, as Dr Mead informs us, to join to it a little rhubarb, ſo as to occaſion for a time two ſtools a day; by this means the diſeaſe is more effectually cured, and leſs ſubject to be followed by a dropſy, or ill habit of body: after a dram or two of rhubarb have been taken, it is to be diſcontinued, and the bark exhibited by itſelf. After the fever has been removed, the medicine is continued for ſome time longer, to prevent a relapſe; and evacuations, unleſs abſolutely neceſſary, abſtained from. The diſeaſe is nevertheleſs ſeldom completely cured before ſome very conſiderable evacuation, either by ſtool, urine, or perſpiration, enſues: if this does not ſucceed ſpontaneouſly, cathartics, diuretics, or diaphoretics, are given in conjunction with the bark; otherwiſe the patient continues weak, and without appetite, till either the diſeaſe returns, or changes into one of a different kind.

In ſymptomatic agues, hectic and purulent fevers, cacochymic habits, and where the hypochondres are ſwelled and diſtended, this medicine is improper, and for the moſt part prejudicial. Its manifeſt aſtringency forbids its uſe in obſtructions of the abdominal viſcera, or ſuppreſſion of any critical evacuation; until the obſtruction is firſt removed, or the evacuation had its due courſe.

In acute, inflammatory, or malignant fevers, the bark does not ſeem to have any good effect. Nevertheleſs, in the decline of long nervous fevers, or after a remiſſion, when from bad habit, old age, fatigue, or the like, the patient is extremely weak, and the pulſe low, the *cortex* proves a medicine of excellent ſervice; provided that there is no extravaſation, that the veſſels remain entire, and pus is not already formed.

Peruvian bark has likewiſe been found eminently ſerviceable in gangrenes and mortifications, proceeding either from an internal or external cauſe. In all the caſes of this kind, where it proved ſucceſsful, it occaſioned a kind ſuppuration, which degenerated when the uſe of the medicine was diſcontinued, and again turned kindly upon reſuming it. Some have been hence induced to try the *cortex* in variolous caſes, where either the puſtules did not rightly ſuppurate, or petechiæ ſhewed a diſpoſition to a gangrene; and here likewiſe it anſwered expectation: the empty veſicles filled with matter, watery ſanies changed into thick white pus, the petechiæ became gradually of a pale colour, and at length diſappeared, and the pox began to turn ſooner than was expected.

The bark has been applied likewiſe, and not without ſucceſs, to the cure of periodic head-achs, hyſteric and hypochondriac fits, and other diſorders, which have regular intermiſſions. By its aſtringency and aromatic quality, it ſtrengthens the whole nervous ſyſtem, and proves uſeful in weakneſs of the ſtomach, and ſundry chronical diſorders, proceeding from too great laxity of the fibres. In obſtinate uterine fluxes, and old gleets, bark joined with chalybeates has notable effects.

The virtues of Peruvian bark reſide chiefly in a reſinous ſubſtance, and hence are extracted in perfection by rectified ſpirit. By ſtrong coction in water, the reſin is melted out, and mingled with the water; which whilſt hot appears tranſparent, but in cooling grows turbid, and depoſites great part of the reſin to the bottom. Water elevates in diſtillation the aromatic part of the bark; pure ſpirit brings over nothing. Hence an aqueous extract proves not only leſs in quantity, but likewiſe inferior in quality to one made with rectified ſpirit. Proof-ſpirit extracts the virtues of this drug in tolerable perfection, in the cold; heat enables it to take up more than it can retain when cold. Spirit of ſal ammoniac, prepared with fixt alkaline ſalts, gains very little from the *cortex*, either with or without heat: the ſpirit prepared with quicklime, and the dulcified ſpirit, in a few hours become ſtrongly impregnated with its ſmell and taſte.

The officinal preparations of bark are an extract reſin, ſpirituous tincture, tincture in volatile ſpirit, and compound tincture. It is an ingredient alſo in the ſtomachic tincture.

The ſubſtances uſually joined with bark in preſcription ſeem calculated either to promote its efficacy, or merely for reducing it into the intended form; without much regard to its agreeableneſs, and the conveniency of taking it: this is nevertheleſs a point of great conſequence, as its taſte, and the quantity which is neceſſary, make the patient too frequently loath it, before enough has been taken to produce the deſired effect. If deſigned to be given in the ſolid form of a bolus, electuary, *&c.* it ſhould be made up, not, as is cuſtomary, with ſyrups, but with mucilages: with the former, it ſticks about the mouth and fauces, whence its taſte remains for a conſiderable time; with the latter, it paſſes freely, ſcarce leaving any taſte in the mouth. Aromatics do not prevent the taſte of the bark from diſcovering itſelf; extract of liquorice very effectually conceals it. The extract of logwood alſo, joined to that of bark, and a proper quantity of mucilage, form a very elegant and agreeable compoſition.

CINCLUS, in ornithology. See TRINGA.

CINCTURE, or Ceinture, in architecture, a ring, liſt, or orlo at the top and bottom of the ſhaft of a column, ſeparating the ſhaft at one end from the baſe, and at the other from the capital. See Architecture.

CINERARIA, in ornithology. See Motacilla.

CINNABAR, in natural hiſtory, is either native or factitious. The native cinnabar is an ore of quick-ſilver, moderately compact, very heavy, and of an elegant, ſtriated red colour. In this ore the quick-ſilver is blended in different proportions with ſulphur. It is ſo rich an ore, as to be no other than mercury impregnated with a ſmall quantity of ſulphur, juſt enough to reduce it to that ſtate, being commonly more than ſix parts of mercury to one of ſulphur; and even the pooreſt cinnabar yields one half mercury: it is of a very bright, glittering appearance, when freſh broken, and is uſually found lodged in a bluiſh, indurated clay, though ſometimes in a greeniſh talcy ſtone.

For the method of ſeparating mercury from cinnabar, ſee Mercury.

Factitious Cinnabar, a mixture of mercury and ſulphur ſublimed, and thus reduced into a fine red glebe. The beſt is of a high colour, and full of fibres, like needles.

The receipt for making it, according to the late college-diſpenſatory, is as follows. Take of purified quick-ſilver, twenty-five ounces; of ſulphur, ſeven ounces; melt the ſulphur, and ſtir the quick-ſilver into it while fluid; if it take fire, let it be immediately extinguiſhed, by covering it with another veſſel. When cold, let it be rubbed into a fine powder. Let this powder be put into a ſubliming veſſel, and ſetting it over a gentle fire, raiſe it by degrees till the whole is ſublimed into a red, ſtriated, heavy maſs, which perfectly reſembles native cinnabar. This, as well as the native cinnabar, is excellent in epilepſies, and in all complaints of the head and nerves. But the factitious is rather to be preferred, as it doth not excite nauſeas, vomitings, and other diſorders which ariſe from vitriolic and perhaps arſenical particles blended by nature among ſome of the maſſes of the native mineral.

Cinnabar is likewiſe uſed by painters as a colour, and is rendered more beautiful, by grinding it with gum-water and a little ſaffron.

CINNAMON-TREE, in botany. See Laurus.

Cinnamon-water is made by diſtilling the bark firſt infuſed in ſpirit of wine, brandy, or white-wine.

Clove-Cinnamon is the bark of a tree growing in Brazil, which is often ſubſtituted for real cloves.

White Cinnamon, called alſo Winter's bark, is the bark of a tree frequent in the iſlands of St Domingo, Guadalupe, *&c.* of a ſharp biting taſte like pepper. Some uſe it inſtead of nutmeg; and in medicine it is eſteemed a ſtomachic and antiſcorbutic.

CINOLOA, or Cinaloa, the capital of the province of Cinaloa, in North America, about thirty miles eaſt of the bay of California: W. long. 113°, and N. lat. 25°. See Cinaloa.

CINQUEFOIL, *quinquefolium*, in botany. See Potentilla.

CINQUE-PORTS, an appellation given to five port-towns, ſituated on the coaſt of Kent and Suſſex, over-againſt France, and famous in Engliſh hiſtory.

The cinque-ports are Haſtings, Dover, Hithe, Romney, and Sandwich; which have had large privileges granted them, on account of their former great importance, being then not only the keys of the kingdom, but conſiderable for their maritime ſtrength: thus, we are told, that they were obliged to provide eighty ſhips at their own charge for forty days, as often as the king ſhould have occaſion in his wars.

Cinque-port is alſo a particular kind of fiſhing-net much uſed in ſtanding water, ſo called on account of the five entrances into it.

CINTRA, a cape and mountain of Portugal, in the province of Eſtremadura, uſually called the rock of Liſbon, ſituated on the north ſide of the entrance of the river Tagus: W. long. 10° 15', N. lat. 39°.

CINYRA, or Cinnor, in Jewiſh antiquity, generally tranſlated cithara, lyra, *&c.* a muſical inſtrument uſed before the flood, and invented by Jubah the ſon of Lamech.

CION, or Cyon, among gardeners, denotes a young ſprig, or ſprout of a tree.

CIPHER, or Cypher, one of the Arabic characters, or figures, uſed in computation, formed thus, 0. See Arithmetic.

Cipher is alſo a kind of enigmatic character, compoſed of ſeveral letters interwoven, which are generally the initial letters of the perſons names for whom the ciphers are intended.

Cipher denotes likewiſe certain ſecret characters diſguiſed and varied, uſed in writing letters that contain ſome ſecret, not to be underſtood but by thoſe between whom the cipher is agreed on.

CIPPUS, in antiquity, a low column, with an inſcription, erected on the high roads, or other places, to ſhew the way to travellers, to ſerve as a boundary, to mark the grave of a deceaſed perſon, *&c.*

CIRCÆA, or Enchanters-nightſhade, in botany, a genus of the diandria-monogynia claſs. The corolla conſiſts of two petals; the corolla has likewiſe two leaves; and the capſule contains but one ſeed. The ſpecies are three, two of which are natives of Britain, *viz.* the lutitiana, or enchanters-nightſhade; and the alpina, or mountain enchanters-nightſhade.

CIRCASSIA, a country ſituated between 40° and 50° E. long. and between 45° and 50° N. lat.

It is bounded by Ruſſia on the north, by Aſtracan and the Caſpian-ſea on the eaſt, by Georgia and Dageſtan on the ſouth, and by the river Don and the Palus Meotis on the weſt.

The Circaſſian Tartars form a kind of republic, but ſometimes put themſelves under the protection of Perſia, and ſometimes of Ruſſia, or the Turks. They live moſtly in tents, removing from place to place for the benefit of paſturage; and are chiefly remarkable for the beauty of their children, the ſeraglios of Turky and Perſia being uſually ſupplied with boys and young virgins from this and the neighbouring country of Georgia.

CIRCENSIAN GAMES, a general term under which was comprehended all combats exhibited in the Roman circus, in imitation of the Olympic games in Greece. Moſt of the feaſts of the Romans were accompanied with Circenſian games; and the magiſtrates, and other officers of the republic, frequently preſented the people with them, in order to procure their favour. The grand games were held five days, commencing on the 15th of September. There were ſix kinds of games exhibited: the firſt was wreſtling, and fighting with ſwords, with ſtaves, and with pikes; the ſecond was racing; the third, leaping; the fourth, quoits, arrows, and ceſtus; all which were on foot; the fifth was horſe-courſing: the ſixth courſes of chariots.

CIRCIA, in ornithology, a ſpecies of anas, called in engliſh the ſummer-teal, and all over of a duſky yellowiſh brown, with black feet.

CIRCINALIS, in botany, a name uſed by ſome for adiantum, maiden-hair. See ADIANTUM.

CIRCLE, in geometry, a plane figure comprehended by a ſingle curve line, called its circumference, to which right lines drawn from a point in the middle, called the centre, are equal to each other. To find the area of a circle, ſee PRACTICAL GEOMETRY.

CIRCLES *of the ſphere*. See GEOGRAPHY and ASTRONOMY.

CIRCLES *of latitude*. See GEOGRAPHY.

CIRCLES *of longitude*. See GEOGRAPHY.

Horary CIRCLES, in dialling, are the lines which ſhew the hours on dials, though theſe be not drawn circular, but nearly ſtreight. See DIALLING.

Horary CIRCLE, on the globe. See GEOGRAPHY.

Polar CIRCLE. See GEOGRAPHY.

CIRCLE, in logic, or *logical* CIRCLE, is when the ſame terms are proved *in orbem* by the ſame terms; and the parts of the ſyllogiſm alternately by each other, both directly and indirectly.

CIRCLES *of the empire*, ſuch provinces and principalities of the German empire as have a right to be preſent at diets. Maximilian I. divided the empire into ſix, and ſome years after into ten circles. This laſt diviſion was confirmed by Charles V. The circles, as they ſtand in the Imperial Matricola, are as follows, Auſtria, Burgundy, the Lower Rhine, Bavaria, Upper Saxony, Franconia, Swabia, Upper Rhine, Weſtphalia, and the Lower Saxony.

CIRCOLO MEZZO, in the Italian muſic, denotes a diminution of four quavers or ſemiquavers, which repreſent a ſemicircle, proceeding by conjoint degrees.

CIRCUIT, in law, ſignifies a longer courſe of proceedings than is needful to recover the thing ſued for.

CIRCUIT, alſo ſignifies the journey, or progreſs, which the judges take twice every year, through the ſeveral counties of England and Wales, to hold courts and adminiſter juſtice, where recourſe cannot be had to the king's courts at Weſtminſter: hence England is divided into ſix circuits, *viz.* the Home circuit, Norfolk circuit, Midland circuit, Oxford circuit, Weſtern circuit, and Northern circuit.

In Wales there are but two circuits, North and South Wales: two judges are aſſigned by the king's commiſſion to every circuit.

CIRCUIT *court*, in Scots law, the judges of the ſupreme criminal court, or court of juſticiary, are divided into three ſeparate courts, conſiſting of two judges each; and the kingdom into as many diſtricts. In certain boroughs of every diſtrict, each of theſe courts by rotation are obliged to hold two courts in the year, in ſpring and autumn; which are called circuit courts. See SCOTS LAW, *Of the ſupreme judges and courts of Scotland*.

CIRCULAR, in a general ſenſe, any thing that is deſcribed or moved in a round, as the circumference of a circle, or ſurface of a globe.

CIRCULAR NUMBERS, called alſo ſpherical ones, according to ſome, are ſuch whoſe powers terminate in the roots themſelves.

Thus, for inſtance, 5 and 6, all whoſe powers do end in 5 and 6, as the ſquare of 5 is 25, the ſquare of 6 is 36, *&c.*

CIRCULAR SAILING is the method of ſailing by the arch of a great circle. See NAVIGATION.

CIRCULATION, the act of moving round, or in a circle: thus we ſay, the circulation of the blood, *&c.*

CIRCULATION *of the blood*, the natural motion of the blood in a living animal, whereby that fluid is alternately carried from the heart into all parts of the body, by the arteries, from whence it is brought back to the heart again by the veins.

This motion is chiefly cauſed by the the dilatation and contraction of this organ, and is the principle on which life depends; for when it ceaſes in any part, it dies; when it is diminiſhed, the operations are weak; and, when it ceaſes totally, life is extinguiſhed.

All the veins diſcharge themſelves into the ventricles of the heart; from hence all the arteries ariſe: the blood expelled out of the right ventricle muſt be carried, through the pulmonary artery, into the lungs; from which it muſt be returned, by the pulmonary veins, to the left ventricle; from the left ventricle the blood, thus imported, is, by the conſtriction of that part, again expelled into the aorta, and by it diſtributed all over the reſt of the body, and thence is returned again to the right ventricle by the cava, which completes the circulation.

This circulation becomes actually viſible, with the aſſiſtance of a microſcope, eſpecially in fiſh, frogs, *&c.* wherein the inoſculation, or union of the extremities of the arteries with thoſe of the veins, together with the globules of the blood flowing from the one into the other, may be plainly ſeen.

The auricles of the heart being large hollow muſcles, furniſhed with a double ſeries of ſtrong fibres, proceeding with a contrary direction to the oppoſite tendons, the one adhering to the right ventricle, the other to the ſinus venoſus; as alſo with innumerable veins and arteries; by the contractile force of theſe auricles, the blood will be vigorouſly expreſſed and driven into the right ventricle, which, upon this contraction, is rendered flaccid, empty, and diſpoſed to admit it.

Now, if the right ventricle, thus full of blood, by the contraction of its fibres, preſs the blood towards the aperture again, the venous blood at the ſame time pouring in, will drive it back again into the cavity, and mix it more intimately, till, riſing up againſt the parietes, it raiſe the valvulæ tricuſpides, which are ſo connected to the fleſhy columns extended on the oppoſite ſide, as that, when laid quite down, they cannot cloſe the parietes of the right ventricle; theſe it thruſts towards the right auricle, till being there joined, they ſtop the paſſage very cloſely, and prevent any return.

By the ſame means, the ſame blood riſes into the three ſemilunar valves, placed in the extremity of the other mouth, and lying open to the pulmonary artery; theſe it ſhuts cloſe againſt the ſides of the artery, and leaves a paſſage into the artery alone: the blood carried by this artery into the lungs, and diſtributed by its branches through the whole ſubſtance thereof, is firſt admitted into the extremities of the pulmonary vein, called arteria venoſa; whence paſſing into four large veſſels, which unite together, it is brought to the left ſinus venoſus, or trunk of the pulmonary vein, by the force of whoſe muſculous ſtructure it is driven into the left ventricle, which, on this occaſion, is relaxed, and by that means prepared to receive it.

Hence, as before, it is driven into the left ventricle, which is relaxed by the ſame means; and by the valvulæ mitrales opening, admit it into the left ventricle, and hinder its flux into the pulmonary vein: from hence it is forced into the aorta, at whoſe orifice there are three ſemilunar valves, which alſo prevent a reflux, by cloſing the ſame.

The motion of the blood in living animals is attended with the following phenomena: 1. Both the venous ſinuſes are filled, and grow turgid at the ſame time. 2. Both auricles grow flaccid at the ſame time, and both are filled at the ſame time with blood, impelled by the contractile force of its correſpondent muſcular venous ſinus. 3. Each ventricle contracts and empties itſelf of blood at the ſame time; and the two great arteries are filled and dilated at the ſame time. 4. As ſoon as the blood, by this contraction, is expelled, both ventricles being empty, the heart grows larger and broader. 5. Upon which the muſcular fibres of both venous ſinuſes contract, and expreſs the blood contained in them into the ventricle of the heart. 6. In the mean time the venous ſinuſes are again filled as before, and the auricles, *&c.* return into their former habitude. 7. This alteration continues till the animal begins to languiſh under the approach of death, at which time the auricles and venous ſinuſes make ſeveral palpitations, for one contraction of the ventricle.

In a fœtus, the apparatus for the circulation of the blood is ſomewhat different from that in adults. The ſeptum, which ſeparates the two auricles of the heart, is pierced through with an aperture, called the foramen ovale, and the trunk of the pulmonary artery, a little after it has left the heart, ſends out a tube into the deſcending aorta, called the communicating canal. The fœtus being born, the foramen ovale cloſes by degrees, and the canal of communication dries up, and becomes a ſimple ligament.

As to the velocity of the circulating blood, and the time wherein the circulation is completed, ſeveral computations have been made. By Dr Keil's account, the blood is driven out of the heart into the aorta with a velocity which would carry it twenty-five feet in a minute: but this velocity is continually abated in the progreſs of the blood, in the numerous ſections or branches of the arteries, ſo that before it arrive at the extremities of the body, its motion is greatly diminiſhed. The ſpace of time wherein the whole maſs of blood ordinarily circulates, is variouſly determined. Some ſtate it thus: Suppoſing the heart to make two thouſand pulſes in an hour, and that at every pulſe there is expelled an ounce of blood; as the whole maſs of blood is not ordinarily computed to exceed twenty-four pounds, it muſt be circulated ſeven or eight times over in the ſpace of an hour.

The circulation of the blood was firſt diſcovered in England, in the year 1728, by Dr Harvey.

CIRCULATION *of the ſap of vegetables.* See Vol. I. p. 45.

CIRCULATION, in chemiſtry, is an operation whereby the ſame vapour, raiſed by fire, falls back, to be returned and diſtilled ſeveral times.

CIRCULATION *of money.* See COMMERCE, and MONEY.

CIRCULUS, in chemiſtry, an iron inſtrument in form of a ring, which being heated red hot, and applied to the necks of retorts and other glaſs veſſels, till they grow hot, a few drops of cold water thrown upon them, or a cold blaſt, will make the necks fly regularly and evenly off.

Another method of doing this, is to tie a thread, firſt dipt in oil of turpentine, round the place where you would have it break; and then ſetting fire to the thread, and afterwards ſprinkling the place with cold water, the glaſs will crack exactly where the thread was tied.

CIRCUMAJENTES MUSCULI, or **OBLIQUI MUSCULI**, in anatomy. See Vol. I. p. 290.

CIRCUMAMBIENT, an appellation given to a thing that ſurrounds another on all ſides; chiefly uſed in ſpeaking of the air.

CIRCUMCISION, the act of cutting off the prepuce; a ceremony in the Jewiſh and Mahommetan religions, wherein they cut off the foreſkin of their males, who are to profeſs the one or the other law.

Among the Jews, the time for performing this rite was the eighth day, that is, ſix full days after the child was born: the law of Moſes ordained nothing with reſpect to the perſon by whom, the inſtrument with which, or the manner how, the ceremony was to be performed; the inſtrument was generally a knife of ſtone. The child is uſually circumciſed at home, where the father, or godfather, holds him in his arms, while the operator takes hold of the prepuce with one hand, and with the other cuts it off; a third perſon holds a porringer, with ſand in it, to catch the blood; then the operator applies his mouth to the part, and having ſucked the blood, ſpits it into a bowl of wine, and throws a ſtyptic powder upon the wound. This ceremony was uſually accompanied with great rejoicings and feaſting, and it was at this time that the child was named in preſence of the company. The Jews invented ſeveral ſuperſtitious cuſtoms at this ceremony, ſuch as placing three ſtools, one for the circumciſor, the ſecond for the perſon who holds the child, and the third for Elijah, who, they ſay, aſſiſts inviſibly at the ceremony, *&c.*

The Jews diſtinguiſhed their proſelytes into two ſorts, according as they became circumciſed, or not: thoſe who ſubmitted to this rite were looked upon as children of Abraham, and obliged to keep the laws of Moſes; the uncircumciſed were only bound to obſerve the precepts of Noah, and were called noachidæ.

This ceremony, however, was not confined to the Jews: Herodotus and Philo Judæus obſerve, that it obtained alſo among the Egyptians and Ethiopians. Herodotus ſays, that the cuſtom was very ancient among each people, ſo that there was no determining which of them borrowed it from the other. The ſame hiſtorian relates, that the inhabitants of Colchis alſo uſed circumciſion; whence he concludes, that they were originally Egyptians.

The Turks never circumciſe till the ſeventh or eighth year, as having no notion of its being neceſſary to ſalvation. The Perſians circumciſe their boys at thirteen, and their girls from nine to fifteen. Thoſe of Madagaſcar cut the fleſh at three ſeveral times; and the moſt zealous of the relations preſent, catches hold of the preputium, and ſwallows it.

Circumciſion is practiſed on women by cutting off the foreſkin of the clitoris, which bears a near reſemblance and analogy to the preputium of the male penis. We are told that the Egyptian captive women were circumciſed; and alſo the ſubjects of Preſter John.

CIRCUMCISION is alſo the name of a feaſt, celebrated on the firſt of January, in commemoration of the circumciſion of our Saviour.

CIRCUMDUCTION, in Scots law. When parties in a ſuit are allowed a proof of addigeamus after the time limited by the judge for taking that proof is elapſed, either party may apply for circumduction of the time of proving; the effect of which is, that no proof can afterwards be brought, and the courſe muſt be determined as it ſtood when circumduction was obtained. See SCOTS LAW, title *Pobation*.

CIRCUMFERENCE, in a general ſenſe, denotes the line or lines bounding a plane figure. However, it is generally uſed in a more limited ſenſe, for the curve line which bounds a circle, and otherwiſe called a periphery; the boundary of a right-lined figure being expreſſed by the term perimeter.

CIRCUMFERENTOR, an inſtrument uſed by ſurveyors, for taking angles. See PRACTICAL GEOMETRY.

CIRCUMFLEX, in grammar, one of the accents. See ACCENT.

CIRCUMGYRATION, denotes the whirling motion of any body round a center: ſuch is that of the planets round the ſun.

CIRCUMLOCUTION, a paraphraſtical method of expreſſing one's thoughts, or ſaying that in many words which might have been ſaid in few.

CIRCUMPOLAR *ſtars*, an appellation given to thoſe ſtars, which by reaſon of their vicinity to the pole move round it without ſetting.

CIRCUMSCRIBED, in geometry, is ſaid of a figure which is drawn round another figure, ſo that all its ſides or planes touch the inſcribed figure.

CIRCUMSCRIPTION, in natural philoſophy, the termination, bounds, or limits of any natural body.

CIRCUMSTANCE, a particularity which, though not eſſential to any action, yet doth ſome way effect it.

CIRCUMSTANTIBUS, in law, a term uſed for ſupplying and making up the number of jurors (in caſe any impanelled appear not, or appearing are challenged by any party) by adding to them ſo many of the perſons preſent as will make up the number, in caſe they are properly qualified.

CIRCUMVALLATION, or *line of* CIRCUMVALLATION, in the art of war, is a trench bordered with a parapet, thrown up quite round the beſieger's camp, by way of ſecurity againſt any army that may attempt to relieve the place, as well as to prevent deſertion.

CIRCUMVOLUTION, in architecture, denotes the torus of the ſpiral line of the ionic volute.

CIRCUS, in antiquity, a great building of a round or oval figure, erected by the ancients, to exhibit ſhews to the people.

The Roman circus was a large oblong edifice, arched at one end, encompaſſed with porticoes, and furniſhed with two rows of ſeats, placed aſcending over each other. In the middle was a kind of foot-bank, or eminence, with obeliſks, ſtatues, and poſts at each end. This ſerved them for the courſes of their bigæ and quadrigæ.

Thoſe that have meaſured the circus ſay, that it was 2187 feet long, and 960 broad; ſo that it was the greateſt building in Rome: ſome ſay it would contain 150,000 people, others 260,000, or 300,000.

CIRCUS, in zoology, See FALCO.

CIRENCESTER, a borough-town of Glouceſterſhire, ſituated on the river Churn, fifteen miles ſouth eaſt of Glouceſter: W. long. 2°, noth lat. 51° 42′ It ſends two members to parliament.

CIRLUS, in ornithology. See EMBERIZA.

CIRRI, among botaniſts, fine ſtrings or thread like filaments, by which ſome plants faſten themſelves to walls, trees, *&c.* ſuch are thoſe of ivy.

CIRRI, in ichthyology, certain oblong and ſoft appendages, not unlike little worms, hanging from the under jaws or mouths of ſome fiſhes: theſe cirri, commonly tranſlated *beards*, afford marks to diſtinguiſh the different ſpecies of the fiſhes on which they are found.

CIRSIUM, in botany. See SERRATULA.

CIRSOCELE, a ſpecies of hernia. See MEDICINE and SURGERY.

CISALPINE, any thing on this ſide the Alps. Thus the Romans divided Gaul into ciſalpine and tranſalpine.

CISLEU, in Hebrew chronology, the ninth month of their eccleſiaſtical, and the third of the civil year, anſwering nearly to our November.

CISMAR, a town of lower Saxony, in Germany, at a little diſtance from the Baltic ſea.

CISSAMPELOS, in botany, a genus of the diœcia monadelphia claſs. The calix of the male has four leaves; the corolla is wanting; the nectarium is rotated; and the ſtamina are four connected together. The calix of the female conſiſts of one ligulated roundiſh leaf; it has no corolla; the ſtyli are three; and the fruit is a berry containing one ſeed. There are three ſpecies, all natives of America

CISSOID, in geometry, a curve of the ſecond order, firſt invented by Diocles, whence it is called the ciſſoid of Diocles. See FLUXIONS.

CISSUS, in botany, a genus of the tetrandria monogynia claſs. The berry contains but one ſeed, and is ſurrounded by the corolla and calix, which are both divided into four ſegments. The ſpecies are five, all natives of the Indies.

CISTERCIANS, in church-hiſtory, a religious order founded in the eleventh century by St Robert, a benedictine. They became ſo powerful, that they governed almoſt all Europe, both in ſpirituals and temporals. Cardinal de Vitri deſcribing their obſervances, ſays, they neither wore ſkins nor ſhirts; nor ever eat fleſh, except in ſickneſs; and abſtained from fiſh, eggs, milk, and cheeſe: they lay upon ſtraw-beds, in their tunics and cowls: they roſe at midnight to prayers: they ſpent the day in labour, reading and prayer: and in all their exerciſes obſerved a continual ſilence. The habit of the Ciſtercian monks is a white robe, in the nature of a caſſock, with a black ſcapulary and hood, and is girt with a wooden girdle. The nuns wear a white tunic, and a black ſcapulary and girdle.

CISTERN, denotes a ſubterraneous reſervoir of rain-water; or a veſſel ſerving as a receptacle for rain or other water, for the neceſſary uſes of a family.

There are likewiſe lead-ciſterns, jar-ciſterns, *&c.* See PLUMBERY and JAR.

Authors mention a ciſtern of Conſtantinople, the vaults of which are ſupported by two rows of pillars, 212 in each row, each pillar being two feet in diameter. They are planted circularly, and in radii tending to that of the center.

CISTUS, in botany, a genus of the polyandria monogynia claſs. The corolla conſiſts of five petals, and the calix of five leaves, two of them being leſs than the other two. The ſpecies are 37, and only five of them natives of Britain, *viz.* the guttulus, or annual ciſtus; the helianthemum, or dwarf ciſtus, or ſun-flower; the ſurreianus, or narrow-leaved ciſtus; the polii-folius, or mountain dwarf ciſtus; and the hirſutus, or hoary dwarf ciſtus.

CITADEL, a place fortified with four, five, or ſix baſtions, built on a convenient ground near a city, that it may command it in caſe of a rebellion.

CITATION, in eccleſiaſtical courts, is the ſame with ſummons in civil courts. See SUMMONS.

CITATION is alſo a quotation of ſome law, authority, or paſſage of a book.

CITHARA, in antiquity, a muſical inſtrument, the preciſe ſtructure of which is not known; ſome think it reſembled the Greek delta Δ; and others, the ſhape of a half moon. At firſt it had only three ſtrings, but the number was at different times increaſed to eight, to nine, and laſtly to twenty-four. It was uſed in entertainments and private houſes, and played upon with a plectrum or quill, like the lyre.

CITHAREXYLON, in botany, a genus of the didynamia angioſpermia claſs. The calix is bell-ſhaped, and has five teeth; the corolla is funnel ſhaped; and the berry contains two ſeeds. There are two ſpecies, both natives of America.

CITHARISTA, or CITHAROEDUS, one who played on the cithara.

CITILLE, in zoology, the trivial name of a ſpecies of mus. See MUS.

CITIZEN, a native or inhabitant of a city, veſted with the freedom and liberties of it.

A citizen of Rome was diſtinguiſhed from a ſtranger, becauſe he belonged to no certain commonwealth ſubject to the Romans. A citizen is either by birth or election; and ſons may derive the right from their fathers. To make a good Roman citizen, it was neceſſary to be an inhabitant of Rome, to be inrolled in one of the tribes, and to be capable of dignities. Thoſe to whom were granted the rights and privileges of Roman citizens, were only honorary citizens. It was not lawful to ſcourge a citizen of Rome.

CITRINELLA, in ornithology. See EMBERIZA.

CITRINUS, in natural hiſtory, a kind of ſprig cryſtal, of a fine yellow colour, which being ſet in rings is often miſtaken for a topaz.

CITRON-TREE, in botany. See CITRUS.

CITRULLUS, in botany. See CUCURBITA.

CITRUS, in botany, a genus of the polyadelphia icoſandria claſs. The calix is divided into five ſegments; the petals are five, and oblong; and the fruit is a berry, conſiſting of nine cells. The ſpecies are three, *viz.* the medica, or lemon-tree, a native of Aſia; the aurantium, or orange-tree, a native of the Indies; and the trifoliata, a native of Japan.

CITTADELLA, the capital of the iſland of Minorca, about twenty-three miles weſt of Port-mahon: E. long. 3° 30′, N. lat. 40°.

CITTADELLAPIEVE, a town of Italy, in the territories of the pope, near the lake of Peruſa.

CIVENCHEU, a city of China, the ſecond metropolis of the province of Fokien, in 25° N. lat. and 2° 9′ eaſt of Pekin.

CIVES, the Engliſh name of a ſpecies of onion, growing in tufts, and ſeldom exceeding ſix inches in height: they never produce any bulbs, and are much uſed in ſallads in ſpring.

CIVET, a ſoft unctuous matter produced in the manner of muſk, in bags growing from the lower part of the belly of a civet-cat. See Castor.

Civet-cat, the Engliſh name of the animal which produces the civet. See Castor.

CIVIC crown, was a crown given by the ancient Romans to any ſoldier who had ſaved the life of a citizen in any engagement.

CIVIDAD *de las Palmas*, the capital of all the Canary iſlands, ſituated in the iſland of Canary.

Cividad-real, a city of Spain, in the province of New Caſtile: it is the capital of La Mancha, ſituated on the river Guadiana, ſixty miles ſouth of Toledo: W. long. 4° 20′, N. lat. 39°.

CIVIL, in a general ſenſe, ſomething that regards the policy, public good, or peace of the citizens, or ſubjects of the ſtate; in which ſenſe we ſay, civil government, civil law, civil right, civil war, *&c.*

Civil, in a legal ſenſe, is alſo applied to the ordinary procedure in an action, relating to ſome pecuniary matter or intereſt, in which ſenſe it is oppoſed to criminal.

Civil death, any thing that cuts off a man from civil ſociety, as a condemnation to the gallies, perpetual baniſhment, condemnation to death, outlawry, and excommunication.

Civil law, is properly the peculiar law of each ſtate, country, or city: but what we uſually mean by the civil law, is a body of laws compoſed out of the beſt Roman and Grecian laws, compiled from the laws of nature and nations, and, for the moſt part, received and obſerved throughout all the Roman dominions for above 1200 years. See Law.

Civil war, a war between people of the ſame ſtate, or the citizens of the ſame city.

Civil year is the legal year, or annual account of time, which every government appoints to be uſed within its own dominions, and is ſo called in contradiſtinction to the natural year, which is meaſured exactly by the revolution of the heavenly bodies.

CIVILIAN, in general, denotes ſomething belonging to the civil law; but more eſpecially the doctors and profeſſors thereof are called civilians.

CIVITA-CASTELLANA, a city of Italy, in St Peter's patrimony, ſituated near the river Tiber, twenty-five miles north of Rome: E. long. 13°, N. lat. 42° 15′.

Civita Vecchia, a port-town and fortreſs of Italy, in St Peter's patrimony, ſituated on a bay of the Mediterranean, thirty miles north-weſt of Rome: E. long. 12° 30′, N. lat. 42°.

It is the ſtation of the galleys belonging to the pope, who has lately declared it a free port.

CLACK, among country-men. To clack wool, is to cut off the ſheep's mark, which makes the weight leſs, and yields leſs cuſtom to the king.

CLACKMANNAN, the capital of Clackmannanſhire, in Scotland, ſituated on the northern ſhore of the Forth, about twenty five miles north-weſt of Edinburgh: W. long. 3° 40′, N. lat. 56° 15′.

The county of Clackmannan is joined with that of Kinroſs, which each in their turn chuſe a member to repreſent them in parliament.

CLAGENFURT, or **Clagenfort**, the capital of Carinthia, in the circle of Auſtria in Germany, 120 miles ſouth-weſt of Vienna: E. long. 14°, N. lat. 47°.

CLAIM, in law, a challenge of intereſt in any thing that is in poſſeſſion of another.

CLAKIS, in ornithology, a ſynonime of the anas bernicla. See Anas

CLAMP *in a ſhip*, denotes a piece of timber applied to a maſt or yard, to prevent the wood from burſting; and alſo a thick plank lying fore and aft under the beams of the firſt orlop, or ſecond deck, and is the ſame that the riſing timbers are to the deck.

Clamp is likewiſe the term for a pile of unburnt bricks built up for burning. Theſe clamps are built much after the ſame manner as arches are built in kilns, *viz.* with a vacuity betwixt each brick's breadth for the fire to aſcend by; but with this difference, that inſtead of arching, they truſs over, or over-ſpan; that is, the end of one brick is laid about half way over the end of another, and ſo till both ſides meet within half a brick's length, and then a binding brick at the top finiſhes the arch

Clamp-nails, ſuch nails as are uſed to faſten on clamps in the building or repairing of ſhips.

CLAMPING, in joinery, is the fitting a piece of board with the grain, to another piece of board croſs the grain. Thus the ends of tables are commonly clamped, to prevent their warping.

CLANDESTINA, in botany. See Lathræa.

CLANDESTINE, any thing done without the knowledge of the parties concerned, or without the proper ſolemnities Thus a marriage is ſaid to be clandeſtine, when performed without the publication of bans, the conſent of parents, *&c.*

CLANGULA, in ornithology. See Anas.

CLAP, in medicine, the firſt ſtage of the venereal diſeaſe, more uſually called a gonorrhœa. See Medicine

CLARAMONT-powder, a kind of earth, called *Terra de Baira*, from the place where it is found: it is famous at Venice, for its efficacy in ſtopping hæmorrhages of all kinds, and in curing malignant fevers.

Precept of **CLARE CONSTAT**, in Scots law, the warrant of a ſuperior for entering and infefting the heir of his former vaſſal, without the interpoſition of an inqueſt. See Scots Law, title, *Succeſſion in heritable Rights.*

CLARE, a market-town of Suffolk, thirteen miles ſouth of Bury: E long. 35′, N. lat. 52° 15′. It gives the title of earl to the duke of Newcaſtle.

Clare is alſo the capital of a county of the ſame name in the province of Connaught, in Ireland, ſituated about ſeventeen miles north-weſt of Limerick: W. long. 9°, N. lat. 52° 40′.

CLARENCIEUX, the ſecond king at arms, ſo called from the duke of Clarence, to whom he firſt belonged; for Lionel third ſon to Edward III. having by his

wife

wiſe the honour of Clare, in the county of Thomond, was afterwards declared duke of Clarence; which dukedom afterwards eſcheating to Edward IV. he made this earl a king at arms. His office is to marſhal and diſpoſe of the funerals of all the lower nobility, as baronets, knights, eſquires, on the ſouth ſide of the Trent; whence he is ſometimes called Surroy, or South-roy, in contradiſtinction to Norroy.

CLARENDON. The conſtitutions of Clarendon, are certain eccleſiaſtical laws drawn up at Clarendon, near Saliſbury. They were ſixteen in number, all tending to reſtrain the power of the clergy, and readily aſſented to by all the biſhops and barons, the archbiſhop Becket excepted, who oppoſed them at firſt, but was afterwards prevailed upon to ſign them. The pope Alexander III. declared againſt and annulled moſt of them.

CLARENZA, the capital of a duchy of the ſame name in the Morea: it is a ſea-port town, ſituated on the Mediterranean, twenty-ſix miles ſouth of Petras: E. long. 21° 40′, N. lat. 37° 40′.

CLARET, a name given by the French to ſuch of their red wines as are not of a deep or high colour. See WINE.

CLARICHORD, or MANICHORD, a muſical inſtrument in form of a ſpinnet.

It has forty-nine or fifty ſtops, and ſeventy ſtrings, which bear on five bridges, the firſt whereof is the higheſt, the reſt diminiſhing in proportion. Some of the ſtrings are in uniſon, their number being greater than that of the ſtops. There are ſeveral little mortoiſes for paſſing the jacks, armed with braſs-hooks, which ſtop and raiſe the chords inſtead of the feather uſed in virginals and ſpinnets: but what diſtinguiſhes it moſt is, that the chords are covered with pieces of cloth, which render the ſound ſweeter, and deaden it ſo, that it cannot be heard at any conſiderable diſtance: whence it comes to be particularly in uſe among the nuns, who learn to play, and are unwilling to diſturb the ſilence of the dormitory.

CLARIFICATION, in chemiſtry, the act of clearing and fining any fluid from all heterogeneous matter or feculencies. See CHEMISTRY.

CLARION, a kind of trumpet, whoſe tube is narrower, and its tone acuter and ſhriller than that of the common trumpet. It is ſaid that the clarion, now uſed among the Moors and Portugueſe, who borrrowed it from the Moors, ſerved anciently for a treble to ſeveral tumpets, which ſounded tenor and baſs.

CLARION, in heraldry, a bearing as repreſented in Plate LXV. fig. 5. he bears ruby, three clarions topaz, being the arms of the earl of Bath, by the name of Granville: Guillim is of opinion, that theſe three clarions are a kind of old-faſhioned trumpets; but others ſay, that they rather reſemble the rudder of a ſhip; others, a reſt for a lance.

CLARO-OBSCURO, or CLAIR-OBSCURE, in painting, the art of diſtributing to advantage the lights and ſhadows of a piece, both with regard to the eaſing of the eye, and the effect of the whole piece.

CLARO-OBSCURO, or CHIARO-SCURO, is alſo uſed to ſignify a deſign conſiſting only of two colours, moſt uſually black and white, but ſometimes black and yellow; or it is a deſign waſhed only with one colour, the ſhadows being of a duſky brown colour, and the lights heightened up with white.

The word is alſo applied to two prints of two colours, taken off at twice, whereof there are volumes in the cabinets of the curious in prints.

CLARY, in botany. See SALVIA.

CLARY-WATER, a ſpirit drawn from an infuſion of the herb clary in ſpirit of wine, being a very pleaſant and excellent cordial.

CLASMIUM, in natural hiſtory, conſtitutes a diſtinct genus of gypſums by itſelf, being more ſoft, dull, and opake, than other kinds: it neither gives fire with ſteel, nor ferments with aqua fortis; but calcines readily in the fire, and affords a very valuable plaſter.

CLASS, an appellation given to the moſt general ſubdiviſions of any thing: thus, animal is ſubdivided into the claſſes quadrupeds, birds, fiſhes, &c. which are again ſubdivided into ſerieſes or orders; and theſe laſt into genera. See NATURAL HISTORY, and BOTANY.

CLASS is alſo uſed in ſchools, in a ſynonymous ſenſe with form, for a number of boys all learning the ſame thing.

CLASSIC, or CLASSICAL, an epithet chiefly applied to authors read in the claſſes at ſchools.

This term ſeems to owe its origin to Tullius Servius, who, in order to make an eſtimate of every perſon's eſtate, divided the Roman people into ſix bands, which he called claſſes. The eſtate of the firſt claſs was not to be under 200 l. and theſe by way of eminence were called *claſſici*, claſſics: hence authors of the firſt rank came to be called claſſics, all the reſt being ſaid to be *infra claſſem*: thus Ariſtotle is a claſſic author in philoſophy; Aquinus, in ſchool-divinity, &c.

CLATHRUS, in botany, a genus of the cryptogamia fungi claſs. This fungus is roundiſh, and full of cancelli. The ſpecies are four, none of them natives of Britain.

CLATTE, in heraldry, an appellation given to irregular lines, not reducible to thoſe commonly uſed. See LINE.

CLAVARIA, in botany, a genus of the cryptogamia fungi claſs. It is ſmooth and oblong. The ſpecies are eight, ſeven of which are natives of Britain, *viz.* the piſtillaris, or ſimple clavaria; the ophiogloſſoides, or black clavaria; the digitata, or fingered clavaria; the hypoxylon, or flat clavaria; the coralloides, or yellow clavaria; the faſtigiata, or ſtinking clavaria; and the muſcoides, or pointed clavaria.

CLAVES INSULÆ, a term uſed in the iſle of Man; where all weighty and ambiguous cauſes are referred to a jury of twelve, who are called *claves inſulæ*, the keys of the iſland.

CLAVICLES, in anatomy. See Vol. I. p. 175.

CLAVIS properly ſignifies a key, and is ſometimes uſed in Engliſh to denote an explanation of ſome obſcure paſſages in any book or writing.

CLAUSE, in grammar, denotes a member of a period, or ſentence.

CLAUSE ſignifies alſo an article, or particular ſtipulation in a contract, a charge or condition in a teſtament, *&c.*

CLAUSENBURG, a large city of Tranſilvania, ſituated on the river Samos, about fifty-five miles north-weſt of Hermanſtat: E. long. 20° 50′, N. lat. 47° 10′.

CLAVUS, in antiquity, an ornament upon the robes of the Roman ſenators and knights, which was more or leſs broad, according to the dignity of the perſon: hence the diſtinction of tunica auguſti-clavia and laticlavia.

CLAVUS, in medicine and ſurgery, is uſed in ſeveral ſignifications: 1. Clavus hyſtericus, is a ſhooting pain in the head, between the pericranium and cranium, which affects ſuch as have the green-ſickneſs. 2. Clavus oculorum, according to Celſus, is a callous tubercle on the white of the eye, taking its denomination from its figure. 3. Clavus imports indurated tubercles of the uterus. 4. Clavus imports a chirurgical inſtrument of gold, mentioned by Amatus Luſitanus, deſigned to be introduced into an exulcerated palate, for the better articulation of the voice. 5. Clavus is a callus or corn on the foot.

CLAW, among zoologiſts, denotes the ſharp-pointed nails with which the feet of certain quadrupeds and birds are furniſhed.

Crab's CLAWS, in pharmacy, See CRAB's CLAWS.

CLAY, in natural hiſtory, a genus of earths, the characters of which are theſe: they are firmly coherent, weighty, and compact; ſtiff, viſcid, and ductile to a great degree, while moiſt; ſmooth to the touch, not eaſily breaking between the fingers, nor readily diffuſible in water, and when mixed not readily ſubſiding from it

CLAYTONIA, in botany, a genus of the pentandria monogynia claſs. The calix conſiſts of two valves; the corolla has five petals; the ſtigma is trifid; and the capſule has three valves, and contains three ſeeds. The ſpecies are two, none of them natives of Britain.

Cape CLEAR, a promontory in a little iſland on the ſouth-weſt coaſt of Ireland.

CLEAVERS, in botany. See GALLIUM.

CLEBURY, a market-town of Shropſhire, about 25 miles ſouth-eaſt of Shrewſbury: W. long. 2° 30′, and N. lat. 52° 27′.

CLECHE, in heraldry, a kind of croſs, charged with another croſs of the ſame figure, but of the colour of the field. See Plate LXV. fig. 6.

CLEDGE, among miners, denotes the upper ſtratum of fuller's earth.

CLEF, or CLIFF, in muſic, a mark ſet at the beginning of the lines of a ſong, which ſhews the tone or key in which the piece is to begin; or it is a letter marked on any line, which explains the reſt.

CLEIDOMASTOIDEUS, in anatomy. See Vol. I. p. 215.

CLEMA, in antiquity, a twig of the vine, which ſerved as the badge of a centurion's office.

CLEMATIS, in botany, a genus of the polyandria polygynia claſs. It has no calix; the petals are four; and the ſeeds are caudated. There are twelve ſpecies, none of them natives of Britain.

CLEOME, in botany, a genus of plants belonging to the tetradynamia ſiliquoſa claſs. It has three nectariferous glands, one at each ſinus of the calix, excepting the loweſt; the ſiliqua or pod has two valves and one cell. There are fifteen ſpecies, none of them natives of Britain.

CLEPSYDRA, a water-clock, or inſtrument to meaſure time by the fall of a certain quantity of water.

CLERGY, a general name given to the body of eccleſiaſtics of the Chriſtian church, in contradiſtinction to the laity.

The diſtinction of Chriſtians into clergy and laity, was derived from the Jewiſh church, and adopted into the Chriſtian by the apoſtles themſelves: whenever any number of converts were made, as ſoon as they were capable of being formed into a congregation or church, a biſhop or preſbyter, with a deacon, were ordained to miniſter to them. Of the biſhops, prieſts, and deacons, the clergy originally conſiſted; but in the third century, many inferior orders were appointed, as ſubſervient to the office of deacon, ſuch as ſubdeacons, acolythiſts, readers, *&c.*

Benefit of CLERGY, is an ancient privilege, whereby one in orders claimed to be delivered to his ordinary, to purge himſelf of felony: this purgation was to be by his own oath, affirming his innocency, and the oath of twelve compurgators, as to their belief of it, before a jury of twelve clerks: if the clerk failed in his purgation, he was deprived of his character, whereby he became a mere layman; or he was to be kept in priſon till a pardon was obtained: but if he purged himſelf, he was ſet at liberty.

CLERK, a word originally uſed to denote a learned man, or man of letters; whence the term became appropriated to church-men, who were from thence called clerks, or clergymen; the nobility and gentry being uſually bred up to the exerciſe of arms, and none left but the eccleſiaſtics to cultivate the ſciences.

CLERK is alſo applied to ſuch as by their courſe of life, exerciſe their pens in any court or office, of which there are various kinds: thus,

CLERK *of the bails*, an officer in the court of king's bench, whoſe buſineſs it is to file all bail-pieces taken in that court, where he always attends.

CLERK *of the check*, an officer belonging the king's court, ſo called, becauſe he has the check and controulment of the yeomen that belong to the king, queen, or prince. He likewiſe, by himſelf or deputy, ſets the watch in the court. There is alſo an officer in the navy of the ſame name, belonging to the king's yards.

CLERK *of the crown*, an officer, in the king's bench, who frames, reads, and records all indictments againſt offenders, there arraigned or indicted of any public crime. He is likewiſe termed clerk of the crown-office, in which capacity he exhibits informations by order of the court, for divers offences.

CLERK *of the crown*, in chancery, an officer whoſe buſineſs it is conſtantly to attend the lord-chancellor, in perſon or by deputy, to write and prepare for the great ſeal ſpecial matters of ſtate by commiſſion, both ordinary and extraordinary, *viz.* commiſſions of lieutenancy, of juſtices of aſſize, oyer and terminer, goal-delivery, and of the peace; all general pardons, granted either at the king's coronation, or in parliament: the writs of parliament, with the names of the knights, citizens, and burgeſſes, are alſo returned into his office. He alſo makes out ſpecial pardons, and writs of execution on bonds of ſtatute-ſtaple forfeited.

CLERK *of the deliveries*, an officer of the tower, whoſe function is to take indentures for all ſtores and ammunition iſſued from thence.

CLERK *of the errors*, in the court of common pleas, an officer who tranſcribes and certifies into the king's bench, the tenor of the record of the action on which the writ of error, made out by the curſitor, is brought there to be determined. In the king's bench, the clerk of the errors tranſcribes and certifies the records of cauſes, by bill, in that court, into the exchequer. And the buſineſs of the clerk of the errors in the exchequer, is to tranſcribe the records certified thither out of the king's bench, and to prepare them for judgment in the exchequer-chamber.

CLERK *of the eſſoins*, in the court of common pleas, keeps the eſſoin-roll, or enters eſſoins: he alſo provides parchment, cuts it into rolls, marks the number on them, delivers out all the rolls to every officer, and receives them again when written. See ESSOIN.

CLERK *of the eſtreats*, an officer in the exchequer, who every term receives the eſtreats out of the lord-treaſurer's remembrancer's office, and writes them out, to be levied for the crown.

CLERK *of the green cloth*. See GREEN-CLOTH.

CLERK *of the hamper*, or *hanaper*, an officer in chancery, whoſe buſineſs is to receive all money due to the king for the ſeals of charters, letters patent, commiſſions, and writs; alſo the fees due to the officers for enrolling and examining them.

CLERK-*comptroller of the king's houſehold*, an officer of the king's court, authoriſed to allow or diſallow the charges of purſuivants, meſſengers of the green cloth, &c. to inſpect and controul all defects of any of the inferior officers; and to ſit in the counting-houſe with the lord-ſteward and other officers of the houſehold, for regulating ſuch matters.

CLERK *of the king's ſilver*, an officer of the common pleas, to whom every fine is brought, after it has paſſed the office of the cuſtos brevium; and who enters the effect of writs of covenant, into a book kept for that purpoſe, according to which all the fines of that term are recorded in the rolls of the court.

CLERK *of the market*, an officer of the king's houſe, to whom is given the charge of the king's meaſures and weights, the ſtandards of thoſe that ought to be uſed all over England.

CLERK *of the nichils*, or *nihils*, an officer of the exchequer, who makes a roll of all ſuch ſums as are nichilled by the ſheriffs upon their eſtreats of green wax, and delivers them in to the remembrancer of the treaſury, to have execution done upon them for the king. See NIHIL.

CLERK *of the outlawries*, an officer of the common pleas, and deputy to the attorney-general, for making out all writs of capias utlagatum, after outlawry, to which there muſt be the king's attorney's name.

CLERK *of the paper-office*, an officer belonging to the king's bench, whoſe buſineſs is to make up the paper-books of ſpecial pleadings in that court.

CLERK *of the peace*, an officer belonging to the ſeſſions of the peace, whoſe buſineſs is to read indictments, inrol the proceedings, and draw the proceſs: he likewiſe certifies into the king's bench, tranſcripts of indictments, outlawries, attainders and convictions had before the juſtices of peace, within the time limited by ſtatute, under a certain penalty. This office is in the gift of the cuſtos rotulorum, and may be executed by deputy.

CLERK *of the pells*, an officer that belongs to the exchequer, whoſe buſineſs is to enter every teller's bill into a parchment roll called *pellis receptorum*, and to make another roll of payments called *pellis exituum*.

CLERK *of the petty bag*, an officer of the court of chancery, whereof there are three, the maſter of the rolls being the chief: their buſineſs is to record the return of all inquiſitions out of every ſhire, to make out patents of cuſtomers, gaugers, comptrollers, &c. liberates upon extents of ſtatutes-ſtaple, *conge d'elires* for biſhops, ſummons of the nobility, clergy, and burgeſſes to parliament, and commiſſions directed to knights and others, of every ſhire, for aſſeſſing ſubſidies and taxes.

CLERK *of the pipe*, an officer of the exchequer, who having the accounts of all debts due to the king delivered out of the remembrancer's office, charges them in a great roll folded up like a pipe. He writes out warrants to ſheriffs, to levy the ſaid debts on the goods and chattels of the debtors: and if they have no good, then he draws them down, to the treaſurer's remembrancer, to write eſtreats againſt their lands.

CLERK *of the pleas*, an officer of the exchequer, in whoſe office all the officers of the court, having ſpecial privilege, ought to ſue, or be ſued, in any action. In this office alſo actions at law may be proſecuted by other perſons, but the plaintiff ought to be tenant or debtor to the king, or ſome way accountable to him. The under clerks are attorneys in all ſuits.

CLERKS *of the privy-ſeal*, four officers that attend the lord privy-ſeal, for writing and making out all things that are ſent by warrant from the ſignet to the privy-ſeal, and to be paſſed the great-ſeal; and likewiſe to make out privy-ſeals, upon ſpecial occaſions of his majeſty's affairs, as for loan of money, or the like.

CLERK *of the rolls*, an officer of the chancery, whoſe buſineſs is to make ſearches after, and copies of deeds, officers, &c,

CLERK *of the ſignet*, an officer continually attending upon his majeſty's principal ſecretary, who has the cuſtody of the privy-ſignet, as well for ſealing the king's private letters, as thoſe grants which paſs the king's hand by bill ſigned. There are four of theſe officers, who have their diet at the ſecretary's table.

Clerk, or Writer, *to the ſignet*, in Scots law. See Scots Law, title 3.

Six Clerks, officers in chancery, next in degree below the twelve maſters, whoſe buſineſs is to inrol commiſſions, pardons, patents, warrants, *&c.* which paſs the great ſeal: they were anciently clerici, and forfeited their places if they married. Theſe are alſo attorneys for parties in ſuits depending in the court of chancery.

Clerk *of the treaſury*, an officer belonging to the court of common pleas, who has the charge of keeping the records of the court, makes out all records of *niſi prius*, and likewiſe all exemplifications of records being in the treaſury. He has the fees due for all ſearches; and has under him an under-keeper, who always keeps one key of the treaſury door.

Clerk *of the warrants*, an officer of the common pleas, whoſe buſineſs is to enter all warrants of attorney for plaintiffs and defendants in ſuit; and to inroll deeds of bargain and ſale, that are acknowledged in court, or before a judge. His office is likewiſe to eſtreat into the exchequer all iſſues, fines, eſtreats, and amercements, which grow due to the crown in that court.

CLERMONT, a city and biſhop's ſee of France, in the territory of Auvergne. and province of Lyonois, about ſeventy-five miles weſt of Lyons: E. long. 3° 20′ and N. lat. 45° 42′.

CLERODENDRUM, in botany, a genus of the didynamia-angioſpermia claſs. The calix is bell-ſhaped, and divided into five ſegments; the tube of the corolla is filiform; the limbus is divided into five equal parts; the ſtamina are very long; and the berry contains but one ſeed. The ſpecies are two, both natives of the Indies.

CLEROMANCY, a ſort of divination performed by throwing lots, which were generally black and white beans, little clods of earth, or pebbles; alſo dice, or ſuch like things, diſtinguiſhed by certain characters. They caſt the lots into a veſſel, and having made ſupplication to the gods to direct them, drew them out, and, according to the characters, conjectured what ſhould happen to them.

CLETHRA, in botany, a genus of the decandria monogynia claſs. The calix is divided into five ſegments; the petals are five; the ſtigma is trifid; and the capſule has three cells and three valves. There is but on ſpecies, *viz.* the alnifolia, a native of Carolina.

CLEVES, or Clef, the capital of the dutchy of Cleve, in the circle of Weſtphalia, in Germany, ſituated near the weſtern ſhore of the river Rhine: E. long. 5° 36′, and N. lat. 51° 40′. It is ſubject to the king of Pruſſia.

CLEVELAND, a diſtrict in the north-riding of Yorkſhire, from which the noble family of Fitzroy takes the title of duke.

CLIENT, among the Romans, a citizen who put himſelf under the protection of ſome great man, who, in reſpect of that relation, was called patron.

This patron aſſiſted his client with his protection, intereſt, and goods; and the client gave his vote for his patron, when he ſought any office for himſelf or his friends. Clients owed reſpect to their patrons, as theſe owed them their protection.

The right of patronage was appointed by Romulus, to unite the rich and poor together in ſuch a manner, as that one might live without contempt, and the other without envy; but the condition of a client, in courſe of time, became little elſe but a moderate ſlavery.

Client is now uſed for a party in a lawſuit, who has turned over his cauſe into the hands of a counſellor or ſollicitor.

CLIFFORTIA, in botany, a genus of the diœcia polyandria claſs. The calix of the male conſiſts of three leaves; it has no corolla; and the ſtamina are about thirty. The calix of the female conſiſts likewiſe of three leaves; and the corolla is wanting; the ſtyli are two; and the capſule is bilocular, and contains one ſeed. The ſpecies are four, all natives of Æthiopia.

CLIMACTERIC, among phyſicians, a critical year in a perſon's life, in which he is ſuppoſed to ſtand in great danger of death.

According to ſome, every ſeventh year is a climacteric; but others allow only thoſe years produced by multiplying 7 by the odd number 3, 5, 7, and 9, to be climacterical. Theſe years, they ſay, bring with them ſome remarkable change with reſpect to health, life, or fortune; the grand climacteric is the ſixty-third year; but ſome, making two, add to this the eighty firſt: the other remarkable climacterics are the ſeventh, twenty-firſt, thirty-fifth, forty ninth, and fifty ſixth.

CLIMATE, in geography, a ſpace upon the ſurface of the terreſtrial globe, contained between two parallels, and ſo far diſtant from each other, that the longeſt day in one differs half an hour from the longeſt day in the other parallel. See Geography.

CLIMAX, or Gradation, in rhetoric, a figure wherein the word or expreſſion which ends the firſt member of a period begins the ſecond, and ſo on; ſo that every member will make a diſtinct ſentence, taking its riſe from the next foregoing, till the argument and period be beautifully finiſhed; as in the following gradation of Dr Tillotſon. “After we have practiſed good actions a while, they become eaſy; and when they are eaſy, we begin to take pleaſure in them; and when they pleaſe us, we do them frequently; and by frequency of acts, a thing grows into a habit; and confirmed habit is a ſecond kind of nature; and ſo far as any thing is natural, ſo far it is neceſſary; and we can hardly do otherwiſe; nay, we do it many times, when we do not think of it.”

CLINCH, in the ſea-language, that part of a cable which is bended about the ring of the anchor, and then ſeized, or made faſt.

CLINCHING, in the ſea-language, a kind of ſlight caulking uſed at ſea, in a proſpect of foul weather, about the poſts: it conſiſts in driving a little oakum into their ſeams, to prevent the water's coming in at them.

CLINIC, a term applied by the ancient church-hiſtorians, to thoſe who received baptiſm on their death-bed.

Clinic *medicine*, was particularly uſed for the method of viſiting and treating ſick perſons in bed, for the more exact diſcovery of all the ſymptoms of their diſeaſe.

CLINOIDES, in anatomy. See Vol. I. p. 158.

CLINOPODIUM, in botany, a genus of the didynamia gymnoſpermia claſs. The involucrum is hoary. The ſpecies are three, only one of which is a native of Britain, *viz.* the vulgare, or great wild baſil.

CLIO, in zoology, a genus of inſects belonging to the order of vermes molluſca; the body is oblong, and fitted for ſwimming; and it has two membranaceous wings placed oppoſite to each other. The ſpecies are three, principally diſtinguiſhed by the ſhape of their vagina, and are all natives of the ocean.

CLIPEUS, in natural hiſtory, a name given to the flat depreſſed centroniæ, from their reſembling a ſhield. See Centronia.

CLITORIA, in botany, a genus of the diadelphia decandria claſs. The vexillum is large, open, plaited, and covers the alæ. The ſpecies are five, all natives of the Indies.

CLITORIS, in anatomy. See Vol. I. p. 276.

CLOACA, in Roman antiquity, the common ſewer, by which the filth of the city of Rome was carried away.

CLOCK, a kind of movement, or machine, ſerving to meaſure time.

The invention of clocks is attributed to Pacificus, archdeacon of Verona, who lived in the time of Lotharius: others aſcribe it to Boetius, about the year 510: be that as it will, it is certain, that the art of making clocks, ſuch as are now in uſe, was either firſt invented, or at leaſt retrieved in Germany, about 230 years ago; and the invention of pendulum clocks, ſo late as the laſt age, is diſputed between Huygens and Galileo. For the principles of *Clock* and *Watch Work*, ſee Watch.

CLOGHER, a city and biſhop's ſee of Ireland, in the county of Tyrone, and province of Ulſter, ſituated twelve miles weſt of Armagh: W. long. 7° 30′, and N. lat. 54° 16′.

CLOISTER, an habitation ſurrounded with walls, and inhabited by religious.

In a more general ſenſe, it is uſed for a monaſtery of religious of either ſex. In the firſt ſenſe, it is the principal part of a regular monaſtery, being a ſquare ſurrounded with walls or buildings. It is commonly placed between the church, the chapter-houſe, and refectory, underneath the dormitory.

CLOSE, in heraldry. When any bird is drawn in a coat of arms with its wings cloſe down about it, (*i. e.* not diſplayed), and in a ſtanding poſture, they blazon it by this word *cloſe*; but if it be flying, they call it *volant*. See Volant.

CLOT-*bird*. See Fringilla.

CLOTH, in commerce, a manufacture made of wool, wove in the loom.

Cloths are of divers qualities, fine or courſe. The goodneſs of cloth, according to ſome, conſiſts in the following particulars. 1. That the wool be of a good quality, and well dreſſed. 2. It muſt be equally ſpun, carefully obſerving that the thread of the warp be finer and better twiſted than that of the woof. 3. The cloth muſt be well wrought, and beaten on the loom, ſo as to be every where equally compact. 4. The wool muſt not be finer at one end of the piece than in the reſt. 5. The liſts muſt be ſufficiently ſtrong, of the ſame length with the ſtuff, and muſt conſiſt of good wool, hair, or oſtrich-feathers; or, what is ſtill better, of Daniſh dog's hair. 6. The cloth muſt be free from knots, and other imperfections. 7. It muſt be well ſcoured with fuller's earth, well fulled with the beſt white ſoap, and afterwards waſhed in clear water. 8. The hair or nap muſt be well drawn out with the teazel, without being too much opened. 9. It muſt be ſhorn cloſe without making it thread-bare. 10. It muſt be well dried. 11. It muſt not be tenter-ſtretched, to force it to its juſt dimenſions. 12. It muſt be preſſed cold, not hot preſſed, the latter being very injurious to woolen cloth.

Manufacturing of white cloths which are intended for dying.

The beſt wool for the manufacturing of cloths are thoſe England and Spain, eſpecially thoſe of Lincolnſhire and Segovia. To uſe thoſe wools to the beſt advantage, they muſt be ſcoured, by putting them into a liquor ſomewhat more than lukewarm, compoſed of three parts fair water, and one of urine. After the wool has continued long enough in the liquor to ſoak, and diſſolve the greaſe, it is drained and well waſhed in running water. When it feels dry, and has no ſmell but the natural one of the ſheep, it is ſaid to be duly ſcoured.

After this it is hung to dry in the ſhade, the heat of the ſun making it harſh and inflexible: when dry, it is beat with rods upon hurdles of wood, or on cords, to cleanſe it from duſt, and the groſſer filth; the more it is thus beat and cleanſed, the ſofter it becomes, and the better for ſpinning. After beating, it muſt be well picked, to free it from the reſt of the filth that had eſcaped the rods.

It is now in a proper condition to be oiled, and carded on large iron cards, placed ſlopewiſe. Olive oil is eſteemed the beſt for this purpoſe: one fifth of which ſhould be uſed for the wool intended for the woof, and a ninth for that deſigned for the warp. After the wool has been well oiled, it is given to the ſpinners, who firſt card it on the knee with ſmall fine cards, and then ſpin it on the wheel, obſerving to make the thread of the warp ſmaller by one third than that of the woof, and much compacter twiſted.

The thread thus ſpun, reeled, and made into ſkeins, that deſigned for the woof is wound on little tubes, pieces of paper, or ruſhes, ſo diſpoſed, as that they may be eaſily put in the eye of the ſhuttle. That for the warp is wound on a kind of large wooden bobbins, to diſpoſe it for warping. When warped, it is ſtiffened with ſize, the beſt of which is that made of ſhreds of parchment, and when dry, is given to the weavers, who mount it on the loom.

The warp thus mounted, the weavers, who are two to each loom, one on each ſide, tread alternately on the treddle, firſt on the right ſtep, and then on the left, which raiſes and lowers the threads of the warp equally; between which they throw tranſverſely the ſhuttle from the one to the other: and every time that the ſhuttle is thus thrown, and a thread of the woof inſerted within the warp, they ſtrike it conjunctly with the ſame frame, wherein is faſtened the comb or reed, between whoſe teeth the threads of the warp are paſſed, repeating the ſtroke as often as is neceſſary.

The weavers having continued their work till the whole warp is filled with the woof, the cloth is finiſhed; it is then taken off the loom by unrolling it from the beam whereon it had been rolled in proportion as it was wove; and now given to be cleanſed of the knots, ends of threads, ſtraws, and other filth, which is done with iron nippers.

In this condition it is carried to the fullery, to be ſcoured with urine, or a kind of potter's clay, well ſteeped in water, put along with the cloth in the trough wherein it is fulled. The cloth being again cleared from the earth or urine, is returned to the former hands to have the leſſer filth, ſmall ſtraws, *&c.* taken off as before: then it is returned to the fuller to be beat and fulled with hot water, wherein a ſuitable quantity of ſoap has been diſſolved; after fulling, it is taken out to be ſmoothed, or pulled by the liſts lengthwiſe, to take out the wrinkles, crevices, *&c.*

The ſmoothing is repeated every two hours, till the fulling be finiſhed, and the cloth brought to its proper breadth: after which it is waſhed in clear water, to purge it of the ſoap, and given wet to the carders to raiſe the hair or nap on the right ſide with the thiſtle or weed. After this preparation the cloth-worker takes the cloth, and gives it its firſt cut or ſhearing: then the carders reſume it, and after wetting, give it as many more courſes with the teazle, as the quality of the ſtuff requires, always obſerving to begin againſt the grain of the hair, and to end with it; as alſo to begin with a ſmoother thiſtle, proceeding ſtill with one ſharper and ſharper, as far as the ſixth degree.

After theſe operations, the cloth being dried, is returned to the cloth-worker, who ſheers it a ſecond time, and returns it to the carders, who repeat their operation as before, till the nap be well ranged on the ſurface of the cloth, from one end of the piece to the other.

The cloth thus wove, ſcoured, napped, and ſhorn, is ſent to the dyer; when dyed, it is waſhed in fair water, and the worker takes it again wet as it is, lays the nap with a bruſh on the table, and hangs it on the tenters, where it is ſtretched both in length and breadth ſufficiently to ſmooth it, ſet it ſquare, and bring it to its proper dimenſions, without ſtraining it too much; obſerving to bruſh it afreſh, the way of the nap, while a little moiſt, on the tenters.

When quite dry, the cloth is taken off the tenters, and bruſhed again on the table, to finiſh the laying of the nap; after which it is folded, and laid cold under a preſs, to make it perfectly ſmooth and even, and give it a gloſs.

Laſtly, the cloth being taken out of the preſs, and the papers, *&c.* for gloſſing it removed, it is in a condition for ſale or uſe. With regard to the manufacture of mixt cloths, or thoſe wherein the wools are firſt dyed, and then mixt, ſpun and wove of the colours intended, the proceſs, except what relates to the colour, is moſtly the ſame with that juſt repreſented.

CLOUD, a collection of vapours ſuſpended in the atmoſphere. See PNEUMATICS.

CLOVE-TREE, in botany. See CARYOPHYLLUS.

CLOVE, a term uſed in weights of wool. Seven pounds make a clove.

In Eſſex, eight pounds of cheeſe and butter go to the clove.

CLOVE-JULY-FLOWER. See CARYOPHYLLUS.

CLOVER-GRASS, in botany. See TRIFOLIUM.

CLOYNE, a city and biſhop's ſee of Ireland, in the county of Cork, and province of Munſter, about fifteen miles eaſt of Cork: W. long. 8°, and N. lat. 51° 40′.

CLUPEA, or herring, in ichthyology, a genus belonging to the order of abdominales. The upper jaw is furniſhed with a ſerrated myſtache; the branchioſtege membrane has eight rays; a ſcaly ſerrated line runs along the belly from the head to the tail; and the belly-fins have frequently nine rays. There are 11 ſpecies, *viz.*

1. The harengus, or common herring, has no ſpots, and the under jaw is longer than the upper one. A herring dies immediately after it is taken out of the water, whence the proverb ariſes, *As dead as a herring*. The fleſh is every where in great eſteem, being fat, ſoft, and delicate, eſpecially if it is dreſt as ſoon as caught; for then it is incomparably better than on the next day. There are vaſt quantities of theſe fiſh taken, ſalted, ſmoak-dried, and conſumed all over Europe. They make a progreſs every year from the ſeas near the north of Scotland, into the Britiſh channel, coming in purſuit of worms and ſmall fiſh, which at that time abound there. There is alſo plenty near Norway and Denmark, from whence they proceed annually as far as the coaſt of Normandy.

The herring-fiſhery is begun both by the Engliſh and Dutch towards the latter end of June; and the Dutch alone employ no leſs than one thouſand ſhips therein, called buſſes, from forty-five to ſixty ton each. The beſt time for catching herrings is from the latter end of September, to the latter end of October; and the nets they make uſe of, are about twenty five yards long, and five deep. They ſometimes faſten ſo many of theſe nets together, as will take in a mile in compaſs. They judge where the herrings lie by the hovering and motion of the ſea-birds, which continually purſue them, in expectation of prey. The fiſhermen row very gently along, letting the nets fall into the ſea, and taking their courſes as near as they can againſt the tide; that ſo, when they draw their nets, they may have the aſſiſtance of the tide. As ſoon as any boat has got its load, it makes to the ſhore, and delivers its load to thoſe that waſh and gut them.

Herrings are put into a tub with ſalt or brine, where they lie for twenty-four hours, and are then taken out and put into wicker baſkets and waſhed. After this, they are ſpitted on ſharp wooden ſpits, and hung up in a chimney, built for that purpoſe, at ſuch diſtances, that the ſmoke may have free acceſs to them all. Theſe places will hold ten or twelve thouſand at a time; and they kindle billets on the floor in order to dry them. This done, they ſhut the doors, having before ſtopped up all the air-holes. This they repeat every quarter of an hour, inſomuch that a ſingle laſt of herrings requires five hundred billets to dry them. A laſt is ten barrels, and each barrel contains about one thouſand herrings. When they are ſmoke-dried in this manner, they are called red herrings. Salt herrings, and pickled herrings, are cured after a different manner; the laſt of which were formerly beſt done by the Dutch; but now the Scotch and Engliſh are become their rivals in that trade. Herrings always ſwim in ſhoals, delighting to be near the ſhore. They ſpawn but once a year, that is about the beginning of November; a little before which, like moſt other fiſh, they are in higheſt ſeaſon.

There are likewiſe herrings on the coaſt of North America, but they are not ſo plenty as in Europe; and they never go farther ſouth than the rivers of Carolina. There are none near Spain, Portugal, in the Mediterranean, nor on the coaſt of Africa.

2. The ſprattus has 13 rays in the back-fin. It is a native of the European ſeas, and has a great reſemblance to the herring, only it is of a leſs ſize.

3. The aloſa, has a forked ſnout, and black ſpots on the ſides. It is found in the European ſeas.

4. The encraſicolus, or anchovy, has its upper jaw longer than the under one, and is found in the European ſeas. It is about three inches long, and is frequently uſed as a pickle.

5. The atherinoides has a ſhining line on each ſide, and ſmall belly-fins. It is a native of Surinam.

6. The thriſſa has 28 rays in the fin at the anus. It is found in the Indian ocean.

7. The ſima has yellow fins, thoſe of the belly being very ſmall. The mouth is flat; the upper jaw is very ſhort; the body is of a ſhining ſilver colour; and the fins are yellow. It is a native of Aſia.

8. The ſternicla has no belly-fins, and the body is broad. It is a native of Surinam.

9. The myſtus is ſhaped like a ſword, and the fins at the anus are united. It is found in the Indian ocean.

10. The tropica has a wedge-like tail, and a white, broad, compreſſed body; and the tail is wedge-ſhaped. It is found at Aſcenſion iſland.

11. The ſinenſis is very like the common herring, but broader. It has no teeth, and is a native of China.

CLUSIA, in botany, a genus of the polygamia monœcia claſs. The calix of the male conſiſts of ſix leaves; the corolla has five petals; and the ſtamina are numerous. The calix and corolla of the female are the ſame as thoſe of the male; the nectarium includes the germen and united antheræ; and the capſule has five cells, five valves, and a ſtuffed pulp. The ſpecies are four, all natives of America.

CLUTIA, in botany, a genus of the diœcia gynandria claſs. The calix and corolla, both of the male and female, conſiſt of five leaves; the ſtyli are three; and the capſule has three cells and one ſeed.

CLYDE, a river in Scotland, which, ariſing in Annandale, runs north-weſt by Lanerk, Hamilton, and Glaſgow, and falls into the Frith of Clyde, over-againſt the iſle of Bute.

CLYMENUM, in botany. See LATHYRUS.

CLYPEOLA, in botany, a genus of the tetradynamia ſiliculoſa claſs. The pod is emarginated, roundiſh, entire, compreſſed, and deciduous. The ſpecies are two, none of them natives of Britain.

CLYPEUS, or CLYPEUM, a ſhield or buckler. See SHIELD.

CLYSSUS, an extract prepared, not from one, but ſeveral bodies mixt together: and, among the moderns, the term is applied to ſeveral extracts procured from the ſame body, and then mixed together. Thus, if from wormwood we draw the water, ſpirit, oil, ſalt, and tincture, and according to the rules of art re-unite theſe into a maſs compounded of them all, and containing the joint virtues of all, we have a clyſſus of wormwood.

CLYSTER, is a liquid remedy, to be injected chiefly at the anus into the larger inteſtines. It is uſually adminiſtered by the bladder of a hog, ſheep, or ox, perforated at each end, and having at one of the apertures an ivory pipe faſtened with pack-thread. But the French, and ſometimes the Dutch, uſe a pewter ſyringe, by which the liquor may be drawn in with more eaſe and expedition than in the bladder, and likewiſe more forcibly expelled into the large inteſtines. This remedy ſhould never be adminiſtered either too hot or too cold, but tepid; for either of the former will be injurious to the bowels.

Clyſters are prepared of different ingredients, according to the different intentions propoſed.

Clyſters are ſometimes uſed to nouriſh and ſupport a patient who can ſwallow little or no aliment, by reaſon of ſome impediment in the organs of deglutition. In which caſe they may be made of broth, milk, ale, and decoctions of barley and oats with wine. The Engliſh introduced a new kind of clyſter, made of the ſmoke of tobacco, which has been uſed by ſeveral other nations, and appears to be of conſiderable efficacy when other clyſters prove ineffectual, and particularly in the iliac paſſion, in the *hernia incarcerata*, and for the recovery of drowned perſons.

CNEORUM, in botany, a genus of the triandria monogynia claſs. The calix has three teeth; and the corolla has three equal petals. There is but one ſpecies, *viz.* the tricoccum, a native of Spain.

CNICUS, or Saffron flower, in botany, a genus of the ſyngeneſia polygamia æqualis claſs. The calix is ovated, and imbricated with ſpinous branches; and the corollæ are equal. The ſpecies are ſeven, none of them natives of Britain.

COA, in botany. See Hippocratea.

COACH, a commodious vehicle for travelling, ſo well known as to need no deſcription. Their invention was owing to the French about the reign of Francis I.

COAGULATION, in a general ſenſe, imports a certain change in the ſtate of any liquor, by means of which, inſtead of retaining its fluidity, it becomes more or leſs conſiſtent, according to the degree of coagulation.

COAGULUM, is the ſame with what in Engliſh we call runnet, or rather the curd formed thereby.

COAL, or Pit-coal, in natural hiſtory. See Lithanthrax.

Cannel-Coal, in natural hiſtory. See Ampelites.

Small-Coal, a ſort of charcoal prepared from the ſpray and bruſh-wood ſtripped off from the branches of coppice-wood, ſometimes bound in bavins for that purpoſe, and ſometimes charred without binding, and then it is called coming it together.

COALITION, the re-union of the parts of a body before ſeparated.

COAT, or Coat of Arms, in heraldry, a habit worn by the ancient knights over their arms both in war and tournaments, and ſtill borne by heralds at arms. It was a kind of ſur-coat, reaching as low as the navel, open at the ſides with ſhort ſleeves, ſometimes furred with ermine and hair, upon which were applied the armories of the knights embroidered in gold and ſilver, and enamelled with beaten tin-coloured black, green, red, and blue; whence the rule never to apply colour on colour, nor metal on metal. The coats of arms were frequently open, and diverſified with bands and fillets of ſeveral colours, alternately placed, as we ſtill ſee cloths ſcarleted, watered, *&c.* Hence they were called deviſes, as being divided and compoſed of ſeveral pieces ſewed together; whence the words *falſe*, *pale*, *chevron*, *bend*, *croſs*, *ſaltier*, *lozenge*, &c. which have ſince become honourable pieces, or ordinaries of the ſhield. See Cross, Bend, Chevron, *&c.*

Coats of arms and banners were never allowed to be worn by any but knights and ancient nobles.

Coat, in anatomy. See Part VI.

Coat *of* Mail. See Mail.

COATI, in zoology, a ſynonime of a ſpecies of viverra and urſus. See Viverra and Ursus.

COBALT, in chemiſtry, a genus of foſſils, of the order of the aſphurelata: it is a denſe, compact, and ponderous mineral, very bright and ſhining, and much reſembling ſome of the antimonial ores. See Antimony, and Chemistry, p. 139, 140, 141.

It is ſometimes found of a deep blueiſh-black, very heavy and hard, and of a granulated ſtructure, looking like a piece of pure iron where freſh broken: at other times it is found more compact, not granulated, but reſembling a maſs of melted lead on the ſurface. Theſe are the more ordinary appearances of cobalt, beſides which there are other accidental varieties of it, being ſometimes found of a florid red, or a red debaſed by mixtures of grey, black, or yellow; and in this ſtate, it either forms an uniform maſs, or a beautifully ſtriated and ridged one.

From this mineral are produced the ſeveral kinds of arſenic, zaffre, and ſmalt. See Chemistry, p. 145.

COBELLA, in zoology, the trivial name of a ſpecies of coluber. See Coluber.

COBITIS, the loache, in ichthyology, a genus of fiſhes belonging to the order of abdominales. The eyes are in the upper part of the head. The branchioſtege membrane has from four to five rays; and the body is nearly of an equal thickneſs throughout. The ſpecies are five, *viz.* the anablops, with two cirri, a depreſſed head, and prominent eyes. It is found on the coaſts of Surinam. 2. The barbatula, with ſix cirri, and a compreſſed ſmooth head. 3. The tænia, with ſix cirri, and a prickle below the eye. The above two are found in the freſh-waters of Europe. 4. The foſſilis, with eight cirri, and a prickle above the eye. It is a native of Europe. 5. The heteroclita, has no cirri; and the back-fin and that at the anus are full of white ſpots. It is a native Carolina.

COBLENTZ, a large city of Germany, in the archbiſhopric of Triers, and circle of the Lower Rhine, ſituated at the confluence of the Rhine and Moſelle, fifty-two miles north-eaſt of Triers, and thirty-ſix ſouth of Cologne: E. long. 7° 15′, N. lat. 50° 30′.

COBLON, a port-town of the hither India, ſituated on Coromandel-coaſt, twelve miles ſouth of Fort St George: E. long. 80°, N. lat. 12. 50′.

COBWEB, in phyſiology, the fine net-work which ſpiders ſpin out of their own bowels, in order to catch their prey. See Aranea.

COCCEIRA in botany. See Theobroma.

COCCIFEROUS plants, the ſame with bacciferous. See Bacciferous.

COCCINELLA, in zoology, a genus of inſects, of the coleoptera order. The antennæ are ſulclavated, and truncated; the polypi are ſhaped like a hart; the body is of a hemiſpherical figure; the breaſt and elytra are marginated; and the belly is plain. The ſpecies are forty-nine, moſtly diſtinguiſhable by the number and colour of the ſpots on their wings, and the plants upon which they live.—The coccinella cacti, a native of the warmer parts of America, is the famous cochineal animal, ſo highly valued in every part of the world for the incomparable beauty of its red colour, which it equally communicates to wool, ſilk, linen, and cotton. It is bred on a plant known in Oaxaca in New Spain, and all thoſe parts where it abounds, by the name of nopal, or nopalleca, the Indian fig-tree, which, except in the difference of the foliage, reſembles the tunos, ſo common in the kingdom of Andaluſia; the leaf of the tuna being broad, flat and prickly, and that of the nopal, oblong, with ſeveral eminences; and inſtead of ſpines has a fine ſmooth membrane, of a permanent and lively green.

The method of planting the nopal is by making rows of holes about half a yard deep, and about two yards diſtant from one another. In each of theſe holes is placed one or two leaves of the nopal, in a flat poſition, and then covered with earth. This leaf ſoon after ſhoots up into a ſingle ſtem, which during its growth divides into ſeveral branches, and theſe ſucceſſively produce freſh leaves, the largeſt being neareſt to the ſtem, which is full of knots, as are alſo the branches, and from theſe the leaves have their origin. The uſual height of this plant is about three yards, which it ſeldom exceeds. The ſeaſon when the nopal diſplays all its beauty and vigour, is like that of other plants, from the ſpring to the autumn, which at Oaxaca and other parts of North America is at the ſame time as in Spain. Its bloſſom is ſmall, of a bright red, and in the ſhape of a bud; from the centre of which proceeds the tuna, a name given to its fruit; and as this increaſes the bloſſom fades, till at length it falls. When the tuna, or fig, is ripe, the outward ſkin becomes white; but the pulp is ſo fully impregnated with a deep red, that it tinges the urine of thoſe who eat it of a blood colour, a circumſtance attended with no ſmall uneaſineſs to thoſe who are unacquainted with this particular. Few fruits, however, are either more wholeſome or pleaſant.

The ground where the nopal is intended to be planted, muſt be carefully cleanſed from all kinds of weeds, as they drain the ſoil of thoſe juices which the nopal requires. Alſo after the cochineal is taken from the plant, which is never done till the inſects are arrived at perfection, all the ſuperfluous leaves are plucked off, that they may be ſucceeded by others the following year. For it muſt be obſerved, that the cochineal which are bred on young plants thrive much better, and are of a finer quality, than thoſe produced on ſuch as have ſtood ſome years.

The cochineal was formerly imagined to be a fruit or ſeed of ſome particular plant; an error which probably aroſe from an ignorance of the manner in which it is propagated; but at preſent every one is convinced of its being an inſect, agreeably to its name, ſignifying a woodlouſe, which generally breeds in damp places, eſpecially in gardens. Theſe inſects, by rolling themſelves up, form a little ball ſomething leſs than a pea, and in ſome places are known by the name of Baquilas de San Anton, *i. e.* St Anthony's little cows: and ſuch is the figure of the cochineal, except that it has not the faculty of rolling itſelf up; and its magnitude, when at its full growth, does not exceed that of a tick, common in dogs and other animals.

Theſe inſects breed and are nouriſhed on the nopals, where their eggs are placed among the leaves; the juice of the plant, which is their ſole nouriſhment, becomes converted into their ſubſtance; when, inſtead of being thin and wateriſh, and, to all outward appearance, of little or no uſe, is rendered a moſt beautiful crimſon colour. The plant is in May or June in its moſt vigorous ſtate, and at this moſt favourable ſeaſon the eggs are depoſited: and in the ſhort ſpace of two months, from an animalcule, the inſect grows up to the ſize abovementioned; but its infant ſtate is expoſed to a variety of dangers; the violent blaſts of the north wind ſweep away the eggs from the foliage of the plant; and, what is equally fatal to their tender conſtitutions, ſhowers, fogs, and froſts, often attack them, and deſtroy the leaves, leaving the careful cultivator this only reſource, namely, that of making fires at certain diſtances, and filling the air with ſmoke, which frequently preſerves them from the fatal effects of the inclemency of the weather.

The breeding of cochineal is alſo greatly obſtructed by birds of differed kinds, which are very fond of theſe inſects; and the ſame danger is to be apprehended from the worms, *&c.* which are found among the plantations of nopals: ſo that unleſs conſtant care be taken to fright the birds away from the plantation, and to clear the ground of thoſe various kinds of vermin, which multiply ſo faſt in it, the owner will be greatly diſappointed in his expectations.

When the inſects are at their full growth, they are gathered and put into pots of earthen ware; but great attention is requiſite to prevent tnem from getting out, as, in that caſe, great numbers of them would be loſt; though there is no danger of it, where they are at liberty on the nopal leaves, thoſe being their natural habitation; and where they enjoy a plenty of delicious food; for, though they often remove from one leaf to another, they never quit the plant; nor is it uncommon to ſee the leaves entirely covered with them, eſpecially when they are arrived at maturity. When they have been confined ſome time in theſe pots, they are killed and put in bags. The Indians have three different methods of killing theſe inſects, one by hot water, another by fire, and a third by the rays of the ſun: and to theſe are owing the ſeveral gradations of the colour, which in ſome is dark, and in others bright; but all require a certain degree of heat. Thoſe therefore who uſe hot water are very careful to give it the requiſite heat, and that the quantity of water be proportioned to the number of inſects. The method of killing the creatures by fire is to put them on ſhovels into an oven moderately heated for that intention; the fine quality of the cochineal depending on its not being over dried at the time of killing the inſects: and it muſt be owned, that among the ſeveral ways made uſe of to deſtroy this valuable creature, that of the rays of the ſun ſeems to bid faireſt for performing it in the moſt perfect manner.

Beſides the precaution requiſite in killing the cochineal, in order to preſerve its quality, it is equally neceſſary to know when it is in a proper ſtate for being removed from the leaves of the nopal; but as experience only can teach the cultivator this neceſſary criterion, no fixed rule can be laid down. Accordinly in thoſe provinces where the cultivation of theſe inſects is chiefly carried on, thoſe gathered by Indians of one village differ from thoſe gathered in another; and even thoſe gathered by one perſon in the ſame village, are often different from thoſe gathered by another; every individual adhering to his own method.

The cochineal inſect may, in ſome circumſtances, be compared to the ſilk worm, particularly in the manner of depoſiting its eggs. The inſects deſtined for this particular are taken at a proper time of their growth and put into a box well cloſed, and lined with a coarſe cloth that none of them be loſt: and in this confinement they lay their eggs and die. The box is kept cloſe ſhut till the time of placing the eggs on the nopal, when, if any motion is perceived, it is a ſufficient indication that the animalcule has life, tho' the egg is ſo minute as hardly to be perceived; and this is the ſeed placed on the foliage of the nopal, and the quantity contained in the ſhell of a hen's egg is ſufficient for covering a whole plant. It is remarkable that this inſect does not, or at leaſt in any viſible manner, injure the plant, but extracts its nouriſhment from the moſt ſucculent juice, which it ſucks by means of its proboſcis through the fine teguments of the leaves.

The principal countries where the cochineal inſects are bred, are Oaxaca, Flaſcala, Chulula, Nueva Gallicia, and Chiapa, in the kingdom of New Spain; and Hambato, Loja, and Tucuman in Peru: but it is only in Oaxaca, that they are gathered in large quantities, and form a branch of commerce, the cultivation of theſe little creatures being there the chief employment of the Indians.

COCCOTHRAUSTES, in ornithology, the trivial name of a ſpecies of loxia. See Loxia.

COCCULUS INDICUS, the name of a poiſonous berry, too frequently uſed by brewers in order to render their malt liquors intoxicating. It is the fruit of the meniſpermum cocculus. See Menispermum.

COCCUS, in zoology, a genus belonging to the order of hemiptera. The roſtrum proceeds from the breaſt; the belly is briſtly behind; the wings of the male are erect; and the female has no wings. The ſpecies are twenty-two, denominated principally from the plants they frequent.

COCCYGÆUS musculus, in anatomy. See Vol. I. p. 220.

COCCYX, or Coccygis os, in anatomy. See Vol. I. p. 171.

COCHIN, a port-town of India, on the Malabar-coaſt, about on hundred miles ſouth of Calicut: W. long. 75°, and N. lat. 9° 30′. Here the Dutch have a factory, and a very ſtrong fort.

Cochn china, a kingdom of India, ſituated between 104° and 109° E. long. and between 10° and 17° N. lat. being bounded by the kingdom of Tonquin on the north, by the Indian ocean on the eaſt and ſouth, and by the kingdom of Cambodia on the weſt: it is upwards of four hundred miles long, and one hundred and fifty broad, producing chiefly ſilk and rice.

COCHINEAL. See coccinella.

COCHLEA, the snail-shell, in zoology. See Limax.

Cochlea, in anatomy. See Vol. I. p. 297.

COCHLEARIA, scurvy-grass, in botany, a genus of the tetradynamia ſiliculoſa claſs. The pod is emarginated, turgid, and ſcabrous; and the valves are obtuſe and gibbous. The ſpecies are eight, ſix of which are natives of Britain, *viz.* the officinalis, or common ſcurvy-graſs, the leaves of which are famous for curing the ſcurvy; the groenlandica, or Groenland ſcurvy-graſs; the anglica, or common ſea ſcuryy graſs; the danica, or Daniſh ſcurvy-graſs; the coronopus, or ſwine-creſſes; and the armoracia, or horſe-radiſh.

COCHLITES, in natural hiſtory, an appellation given to the petrified ſhells of the cochleæ, or ſnails.

COCK, in zoology, the Engliſh name of the males of gallinaceous birds, but more eſpecially uſed for the common dunghill-cock. See Phasianus.

Cock's-comb, in botany. See Phinanthus.

Cock-pit, a ſort of theatre upon which game-cocks fight.

Cock-pit, in a man of war, a place on the lower floor, or deck, abaft the main-capſtain, lying between the platform and the ſteward's room, where are partitions for the purſer, ſurgeon, and his mates.

Cock-swain, or Coxon, an officer on board a man of war, who has the care of the barge and all things belonging to it, and muſt be alſo ready with his crew to man the boat on all occaſions: he ſits at the ſtern of the boat, and ſteers.

COCKERMOUTH, a borough-town of Cumberland, ſituated on the river Derwent, near the Iriſh ſea, about twenty-five miles ſouth-weſt of Carliſle: W. lon. 3° 10′, and N. lat. 54° 35′. It ſends two members to parliament.

COCKET is a ſeal belonging to the king's cuſtom-houſe, or rather a ſcroll of parchment ſealed and delivered by the officers of the cuſtoms to merchants, as a warrant that their merchandiſes are cuſtomed.

It is alſo uſed for the office where goods tranſported were firſt entered, and paid their cuſtom, and had a cocket or certificate of diſcharge.

COCOA, or Cacao, in botany. See Theobroma.

COCOI, in ornithology. See Arctea.

COCONATO, a town of Italy in the province of Piedmont, about twenty miles eaſt of Turin; it is ſaid to be the birth-place of the famous Columbus, who diſcovered America: E. long. 8°, and N. lat. 44° 50′.

COCTION, a general term for all alterations made in bodies by the application of fire or heat.

COD, in ichthyology. See Gadus.

Cod is alſo a term uſed, in ſome parts of the kingdom, for a pod. See Pod.

Cod-cape, in geography, a promontory on the coaſt of New England, near the entrance of Boſton harbour: W. long. 69° 50′, and N. lat. 42°.

CODDY MODDY, the Engliſh name of a ſpecies of larus. See Larus.

CODE, a collection of the laws and conſtitutions of the Roman emperors, made by order of Juſtinian. See Law.

CODEX, in antiquity, denotes a book or tablet, on which the ancients wrote. It was of the bark of a tree, of ivory, of parchment, or of paper.

CODIA, among botaniſts, ſignifies the head of any plant, but more particularly a poppy-head, whence its ſyrup is called diacodium.

CODICIL is a writing by way of ſupplement to a will, when any thing is omitted which the teſtator would have added, or wants to be explained, altered, or recalled.

CODLIN, an apple uſeful in the kitchen, being proper for baking.

CODLING, an appellation given to the cod fiſh, when young. See Gadus

COECUM, in anatomy. See Vol. I. p. 260.

COEFFICIENTS, in algebra. See Vol. I. p. 80.

COELESTIAL, in general, denotes any thing belonging to the heavens: thus we ſay, cœleſtial obſervations, the cœleſtial globe, *&c.*

COELIAC *artery*, in anatomy. See Vol. I. p. 232.

Coeliac *paſſion*, in medicine, a kind of flux, or diarrhœa, wherein the aliments, either wholly changed, or only in part, paſs off by ſtool. See Medicine.

Coeliac *vein*, in anatomy See Vol. I. p. 245.

COELOMA, among phyſicians, a hollow ulcer ſeated in the cornea tunica of the eye.

COENOBITE, in church-hiſtory, a ſort of monks in the primitive Chriſtian church. They were ſo called from living in common; in which they differed from the anachorites, who retired from ſociety.

Coenobite, in a modern ſenſe, is a religious who lives in a convent or community, under certain rules.

COEUR, in heraldry, a ſhort line of partition in pale, in the centre of the eſcutcheon, which extends but a little way, much ſhort of the top and bottom, being met by other lines, which form an irregular partition of the eſcutcheon. See Plate LXV. fig. 7.

COEVORDEN, a town of the province of Overyſſel, ſtrongly fortified by the famous Coehorn, on account of its ſituation, it being the key to the provinces of Groningen and Friezland.

COFFEA, the Coffee-tree, in botany, a genus of the pentandria monogynia claſs. The corolla is hypocrateriform; the ſtamina are above the tube; the berry is below the flower, and contains two ſeeds, which are arillated. The ſpecies are two, *viz.* the arabica, a native of Arabia and Æthiopia; and the occidentalis, a native of America. The berries of both ſpecies have much the ſame qualities. This fruit is uſed rather as food than as a medicine. The medical effects expected from it are, to aſſiſt digeſtion, promote the natural ſecretions, and to prevent or remove a diſpoſition to ſleep.

Coffee pays on importation 1 l. 13 s. $6\frac{15}{100}$ d. the hundred weight; the drawback on exportation is 1 l. 10 s. $2\frac{25}{100}$ d. Upon payment of the above duty, the coffee is to be put into warehouſes; and upon delivery from thence, if to be conſumed in Great Britain, is to pay for every hundred weight 8 l. 8 s. if of the Britiſh plantations in America, and 11 l. 4 s. if it comes from any other place.

COFFERER *of the king's houſehold*, a principal officer in the court, next under the comptroller, who, in the counting-houſe, and elſewhere at other times, has a ſpecial charge and overſight of other officers of the houſe, for their good demeanor and charge in their offices, to all which he pays their wages.

COGENDE, a city of Tartary in Aſia, ſituated in 74° E. long. and 41° N. lat. remarkable for its commerce in muſk.

COGGLE. See Cogs.

COGGSHALL'*s ſliding rule.* See Sliding rule.

COGITATION, a term uſed by ſome for the act of thinking.

COGNATE, in Scots law, any male relation through the mother.

COGNATION, in the civil law, a term for that line of conſanguinity which is between males and females, both deſcended from the ſame father; as agnation is for the line of parentage between males only deſcended from the ſame ſtock.

COGNI, the capital of Caramania, in the leſſer Aſia, anciently called Iconium, about two hundred and fifty miles ſouth-eaſt of Conſtantinople: E. long. 33°, and N. lat. 38°.

COGNITIONIS CAUSA, in Scots law: When a creditor charges the heir of his debitor to enter, in order to conſtitute the debt againſt him, and the heir renounces the ſucceſſion, the creditor can obtain no decreet of conſtitution of that debt againſt the heir; but only a decreet ſubjecting the *hereditas jacens*, or the eſtate which belonged to the debitor, to his diligence: and this is called a decreet *cognitionis cauſa*. See Scots Law, title, *Compriſings and adjudications*.

COGNIZANCE, in heraldry. See Crest.

Cognizance, or **Connusance**, in law, has divers ſignifications: ſometimes it is an acknowledgment of a fine, or confeſſion of ſomething done; ſometimes the hearing of a matter judicially, as to take cognizance of a cauſe; and ſometimes a particular juriſdiction, as cognizance of pleas is an authority to call a cauſe or plea out of another court, which no perſon can do but the king, except he can ſhew a charter for it. This cognizance is a privilege granted to a city or town, to hold plea of all contracts, *&c.* within the liberty; and if any one is impleaded for ſuch matters in the courts at Weſtminſter, the mayor, *&c.* of ſuch franchiſe may demand cognizance of the plea, and that it be determined before them.

Cognizance is alſo uſed for a badge on a waterman's or ſerving-man's ſleeve, which is commonly the giver's creſt, whereby he is decerned to belong to this or that nobleman or gentleman.

COGS, or **Coggles**, a kind of flat-bottomed boats uſed in rivers.

COHABITATION, denotes the ſtate of a man and a woman who live together like huſband and wife, without being legally married.

By the common law of Scotland, cohabitation for year and day, or a complete twelvemonth, is deemed equivalent to matrimony.

CO-HEIR, one who ſucceeds to a ſhare of an inheritance, to be divided among ſeveral.

COHESION, in philoſophy, that action by which the particles of the ſame body adhere together, as if they were but one. See Mechanics.

COHORT, in Roman antiquity, the name of part of the Roman legion, comprehending about ſix hundred men. There were ten cohorts in a legion, the firſt of which exceeded all the reſt, both in dignity and number of men. When the army was ranged in order of battle, the firſt cohort took up the right of the firſt line, the reſt followed in their natural order, ſo that the third was in the centre of the firſt line of the legion, and the fifth on the left, the ſecond between the firſt and third, and the fourth between the third and fifth: the five remaining cohorts formed a ſecond line, in their natural order.

COIF, the badge of a ſerjeant at law, who is called ſerjeant of the coif, from the lawn-coif they wear under their caps when they are created ſerjeants.

The uſe of the coif was to cover the clerical tonſure. See Tonsure.

COIL. See Quoil.

COILON in the ancient Grecian theatres, the ſame with the cavea of the Romans. See Cavea.

COILOPHYLLUM, in botany. See Sarracena.

COIMBRA, a large city of Portugal, in the province of Beira, ſituated on the river Mondego, about nine-ſix miles north of Liſbon: W. long. 9°, and N. lat. 40° 20′.

COIN denotes all manner of the ſeveral ſtamps and ſpecies of money in any nation. See Money.

Coin, in architecture, a kind of dye cut diagonal-wiſe, after the manner of a flight of a ſtair-caſe, ſerving at bottom to ſupport columns in a level, and at top to correct the inclination of an entablature ſupporting a vault.

Coin is alſo uſed for a ſolid angle compoſed of two ſurfaces inclined towards each other, whether that angle be exterior, as the coin of a wall, a tree, *&c.* or interior, as the coin of a chamber or chimney. See Quoin.

COINAGE, or **Coining**, the art of making money, as performed either by the hammer or mill.

Formerly the fabric of coins was different from what it is at preſent. They cut a large plate of metal into ſeveral little ſquares, the corners of which were cut off with ſheers. After having ſhaped theſe pieces, ſo as to render them perfectly conformable, in point of weight, to the ſtandard piece, they took each piece in hand again, to make it exactly round, by a gentle hammering. This was called a planchet, and was fit for immediate coining. Then engravers prepared, as they ſtill do, a couple of ſteel maſſes in form of dyes, cut and terminated by a flat ſurface, rounded off at the edges. They engraved or ſtamped on it the hollow of a head, a croſs, a ſcutcheon, or any other figure, according to the cuſtom of the times, with a ſhort legend. As one of theſe dyes was to remain dormant, and the other moveable, the former ended in a ſquare priſm, that it might be introduced into the ſquare hole of the block, which, being fixed very faſt, kept the dye as ſteady as any vice could have done. The planchet of metal was horizontally laid upon this inferior maſs, to receive the ſtamp of it on one ſide, and that of the upper dye, wherewith it was covered, on the other. This moveable dye, having its round engraved ſurface reſting upon the planchet, had at its oppoſite extremity a flat ſquare, and larger ſurface, upon which they gave ſeveral heavy blows, with a hammer of an enormous ſize, till the double ſtamp was ſufficiently, in relievo, impreſſed on each ſide of the planchet. This being finiſhed, was immediately ſucceeded by another, and they thus became a ſtandard coin, which had the degree of fineneſs, the weight and mark, determined by the judgment of the inſpectors, to make it good current money. The ſtrong tempering which was and is ſtill given to the two dyes, rendered them capable of bearing thoſe repeated blows. Coining has been conſiderably improved and rendered expeditious, by ſeveral ingenious machines, and by a wiſe application of the ſureſt phyſical experiments to the methods of fining, dying, and ſtamping the different metals.

The three fineſt inſtruments the mint-man uſes, are the laminating engine, the machine for making the impreſſions on the edges of coins, and the mill.

After they have taken the laminæ, or plates of metal, out of the mould into which they are caſt, they do not beat them on the anvil, as was formerly done, but they make them paſs and repaſs between the ſeveral rollers of the laminating engine, which being gradually brought cloſer and cloſer to each other, preſently give the lamina its uniform and exact thickneſs. Inſtead of dividing the lamina into ſmall ſquares, they at once cut clean out of it as many planchets as it can contain, by means of a ſharp ſteel trepan, of a roundiſh figure, hollow within, and of a proportionable diameter, to ſhape and cut off the piece at one and the ſame time. After theſe planchets have been prepared and weighed with ſtandard pieces, filed or ſcraped to get off the ſuperfluous part of the metal, and then boiled and made clean, they arrive, at laſt, at the machine, (Plate LXVI. fig. 1.), which marks them upon the edge; and finally, the mill, (fig. 2.) which, ſqueezing each of them ſingly between the two dyes, brought near each other with one blow, forces the two ſurfaces or fields of the piece to fill exactly all the vacancies of the two figures engraved hollow. The engine which ſerves to laminate lead, gives a ſufficient notion of that which ſerves to flaten gold and ſilver laminæ between rollers of a leſſer ſize. See Laminating.

The principal pieces of the machine, (fig. 1.), to ſtamp coins on the edge, are two ſteel laminæ about a line thick. One half of the legend, or of the ring, is engraved on the thickneſs of one of the laminæ, and the other half on the thickneſs of the other; and theſe two laminæ are ſtraight, although the planchet marked with them be circular.

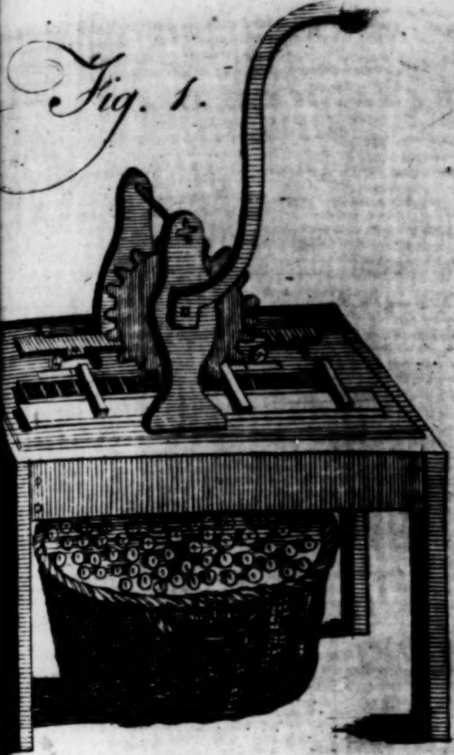
When they ſtamp a planchet, they firſt put it between the laminæ in ſuch a manner, as that theſe being each of them laid flat upon a copper-plate, which is faſtened upon a very thick wooden table, and the planchet being likewiſe laid flat upon the ſame plate, the edge of the planchet may touch the two laminæ on each ſide, and in their thick part.

One of theſe laminæ is immoveable, and faſtened with

Plate LXVI

COINING

Fig. 1.



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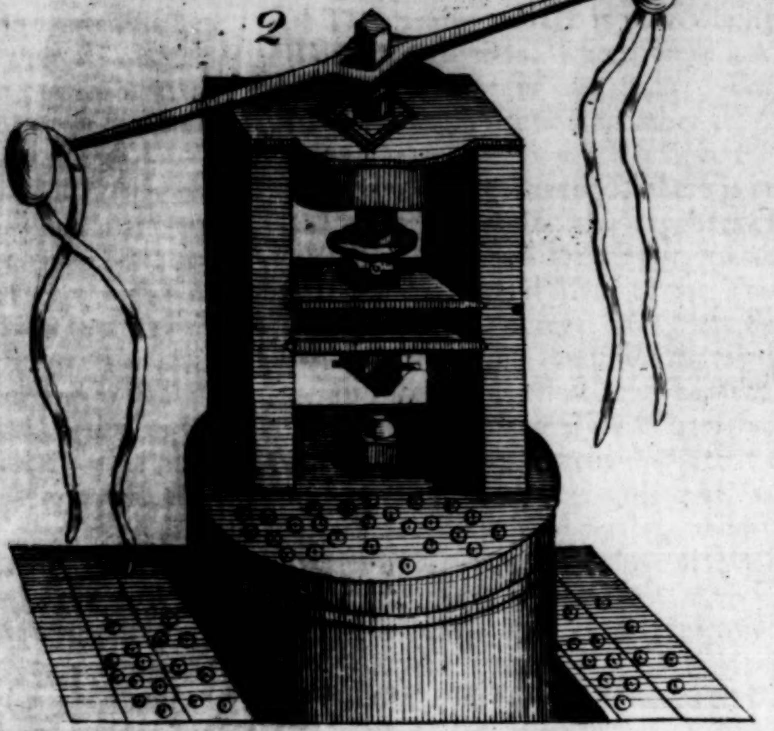

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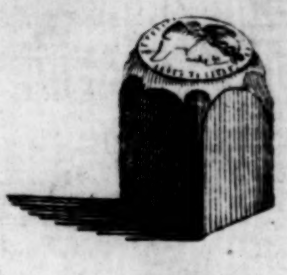

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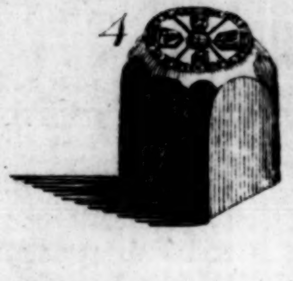
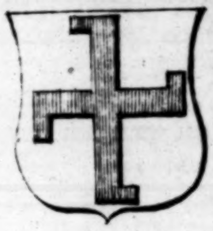
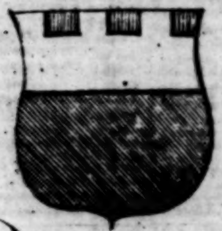


5 CRAMPONEE



6 CRENELLE



7 CROSSELETS

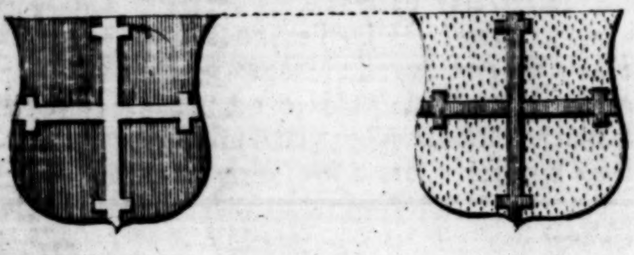


Fig. 8 ANTIENT CROWNS

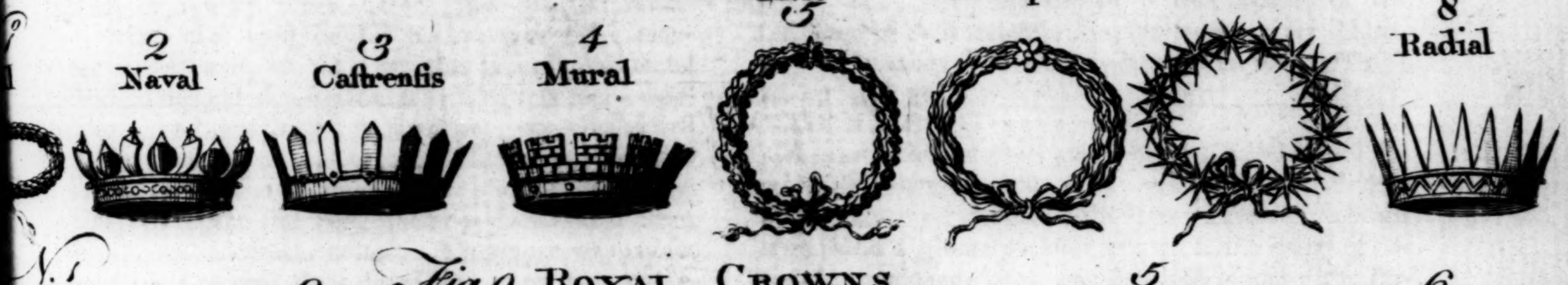

2
Naval
3
Caſtrenſis
4
Mural
Civic
5
6
Triumphant
7
Obſidionalis
8
Radial

Fig. 9. ROYAL CROWNS

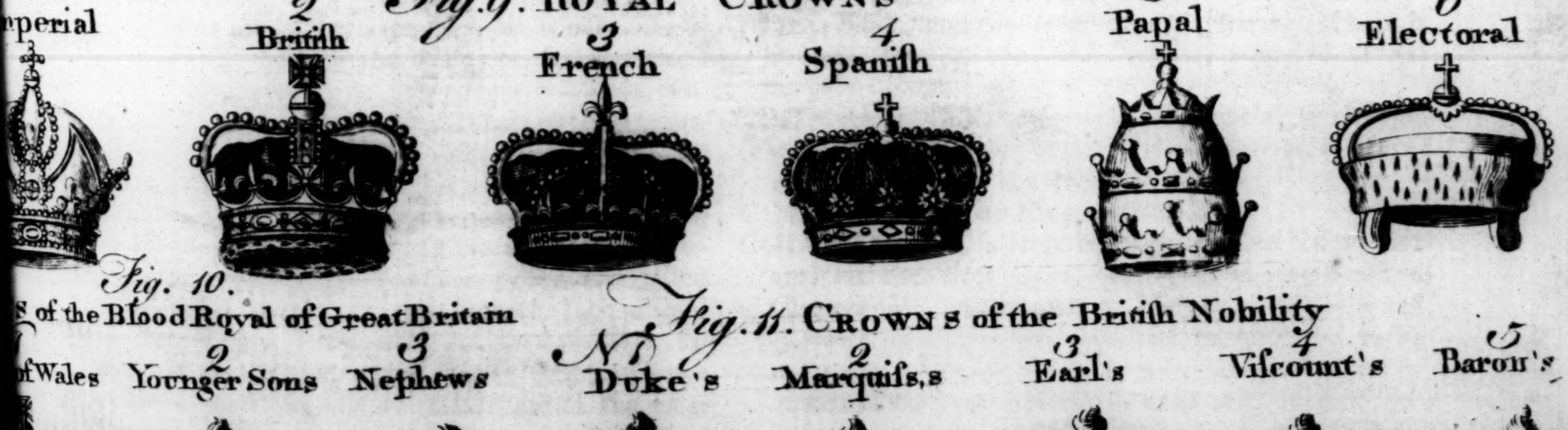

N. 1
perial
2
Britiſh
3
French
4
Spaniſh
5
Papal
6
Electoral

Fig. 10.
S of the Blood Royal of Great Britain

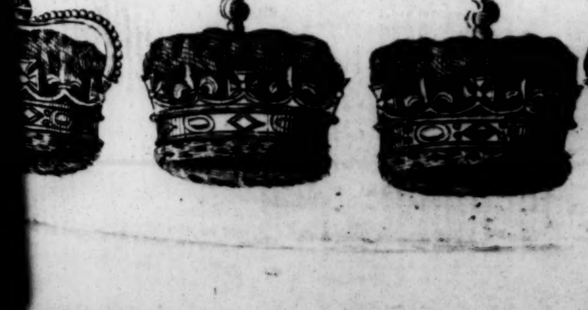
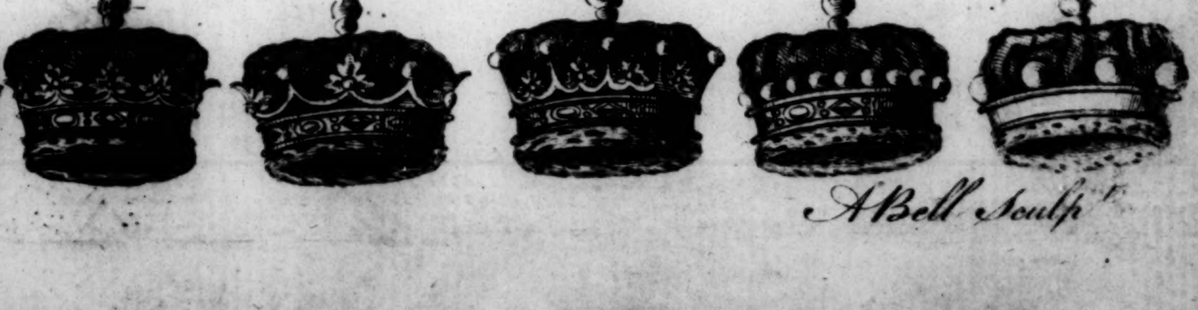

of Wales
2
Younger Sons
3
Nephews

Fig. 11. CROWNS of the Britiſh Nobility


N. 1
Duke's
2
Marquiſs,s
3
Earl's
4
Viſcount's
5
Baron's

A Bell Sculp.

4 AP 54

with ſeveral ſcrews; the other ſlides by means of a dented wheel, which takes into the teeth that are on the ſurface of the lamina. This ſliding lamina makes the planchet turn in ſuch a manner, that it remains ſtamped on the edge, when it has made one turn. Only crown and half-crown pieces can bear the impreſſion of letters on the thickneſs of their edges.

The coining engine or mill is ſo handy (fig. 2.) that a ſingle man may ſtamp twenty thouſand planchets in one day: gold, ſilver, and copper planchets, are all of them coined with a mill, to which the coining ſquares, (fig. 3.), commonly called dyes, are faſtened; that of the face under, in a ſquare box garniſhed with male and female ſcrews, to fix and keep it ſteady; and the other above, in a little box garniſhed with the ſame ſcrews, to faſten the coining ſquare. The planchet is laid flat on the ſquare of the effigy, which is dormant; and they immediately pull the bar of the mill by its cords, which cauſes the ſcrew ſet within it to turn. This enters into the female ſcrew, which is in the body of the mill, and turns with ſo much ſtrength, that by puſhing the upper ſquare upon that of the effigy, the planchet, violently preſſed between both ſquares, receives the impreſſion of both at one pull, and in the twinkling of an eye.

The planchet thus ſtampt and coined, goes through a final examination of the mint-wardens, from whoſe hands it goes into the world.

In the Coining *of medals*, the proceſs is the ſame, in effect, with that of money; the principal difference conſiſting in this, that money having but a ſmall relievo, receives its impreſſion at a ſingle ſtroke of the engine; whereas for medals, the height of their relievo makes it neceſſary that the ſtroke be repeated ſeveral times: to this end the piece is taken out from between the dyes, heated, and returned again; which proceſs in medallions and large medals, is repeated fifteen or twenty times before the full impreſſion be given, care muſt be taken, every time the planchet is removed, to take off the ſuperfluous metal ſtretched beyond the circumference with a file. Medallions, and medals of a high relievo, are uſually firſt caſt in ſand, by reaſon of the difficulty of ſtamping them in the preſs, where they are put only to perfect them; in regard the ſand does not leave them clear, ſmooth, and accurate enough. Therefore we may ſee that medals receive their form and impreſſion by degrees, whereas money receives them all at once.

Britiſh Coinage, both by the beauty of the engraving, and by the invention of the impreſſions on the edges, that admirable expedient for preventing the alteration of the ſpecies, is carried to the utmoſt perfection.

It was only in the reign of king William III. that the hammer-money ceaſed to be current in England, where till then it was ſtruck in that manner, as in other nations. Before the hammer ſpecies was called in, the Engliſh money was in a wretched condition, having been filed and clipped by natives as well as foreigners, inſomuch that it was ſcarce left of half the value: the retrieving this diſtreſſed ſtate of the Engliſh money is looked upon as one of the glories of king William's reign.

The Britiſh coinage is now wholly performed in the Tower of London, where there is a corporation for it, under the title of the mint. Formerly there were here, as there are ſtill in other countries, the rights of ſeinorage and braſſage: but ſince the eighteenth year of king Charles the Second, there is nothing taken either for the king, or for the expences of coining; ſo that weight is returned for weight, to any perſon who carries their gold and ſilver to the Tower.

The ſpecies coined in Great Britain are eſteemed contraband goods, and not to be exported. All foreign ſpecies are allowed to be ſent out of the realm, as well as gold and ſilver in bars, ingots, duſt, *&c.*

Barbary Coinage, particularly that of Fez and Tunis, is under no proper regulations, as every goldſmith, Jew, or even private perſon, undertakes it at pleaſure; which practice renders their money exceeding bad, and their commerce very unſafe.

Muſcovite Coinage. In Muſcovy there is no other coin ſtruck but ſilver, and that only in the cities of Muſcow, Novogrod, Twere, and Pleſkow, to which may be added Peterſburgh. The coinage of each of theſe cities is let out to farm, and makes part of the royal revenue.

Perſian Coinage. All the money made in Perſia is ſtruck with a hammer, as is that of the reſt of Aſia; and the ſame may be underſtood of America, and the coaſts of Africa, and even Muſcovy: the king's duty, in Perſia, is ſeven and a half *per cent.* for all the monies coined, which are lately reduced to ſilver and copper, there being no gold coin there, except a kind of medals, at the acceſſion of a new ſophi.

Spaniſh Coinage is eſteemed one of the leaſt perfect in Europe. It is ſettled at Seville and Segovia, the only cities where gold and ſilver are ſtruck.

COIRE, or Chur, the capital of the country of the Griſons, in Switzerland, ſituated on the river Rhine, fifty-three miles ſouth of Conſtance: E. long. 9° 25′, N. lat. 46° 40′.

COITION. See Generation.

COIX, or Job's tears, in botany, a genus of the monoecia triandria claſs. The calix of the male is a double-flowered glume, without any awn; the corolla is likewiſe a glume without an awn: the calix of the female is an open, oval, one-flowered glume; the ſtylus is bifid; and the ſeed is cartilaginous. There is but one ſpecies, *viz.* the latifolia, a native of Jamaica.

COKENHAUSEN, a fortreſs of Livonia, ſituated on the river Dwina, about thirty-two miles eaſt of Riga: E. long. 25°, N. lat. 57°.

COLATURE. See Filtration.

COLCHESTER, a large borough-town of Eſſex, ſituated on the river Coln, twenty miles north-eaſt of Chelmsford, on the road to Harwich: E. long. 1°, N. lat. 51° 55′. It ſends two members to parliament.

COLCHICUM, or Meadow-saffron, in botany, a genus of the hexandria trigynia claſs. The corolla is divided into ſix ſegments, and the tube is radicated; it has three inflated capſules united together. The ſpecies are three, only one of which, *viz.* the autumnale, or meadow-ſaffron, is a native of Britain.

COLD, in general, denotes the privation or abſence of heat; and, conſequently, thoſe who ſuppoſe heat to conſiſt in a briſk agitation of the component particles of the hot body, define cold to be ſuch a faint motion of theſe parts, as is either altogether or nearly imperceptible to our organs of feeling: in which ſenſe, cold is a mere term of relation between the cold body and the organs of ſenſation; and, in fact, the ſame body will be felt either hot or cold, according as the ſenſible organ is colder or hotter than it.

Cold, in medicine, is found to be productive of inflammatory diſorders, as coughs, pleuriſies, peripneumonies, rheumatic pains, conſumptions, *&c.* See Medicine.

COLDENIA, in botany, a genus of the tetrandria tetragynia claſs. The calix has four leaves; the corolla is tunnel-ſhaped; the fruit conſiſts of four ſeeds. There is but one ſpecies, a native of India.

COLD-FINCH. See Motacilla.

COLDSHIRE-IRON, that which is brittle when cold.

COLE-FISH. See Gadus.

Cole-mouse, in ornithology. See Parus.

COLEOPTERA, the name of Linnæus's firſt order of inſects. The inſects belonging to this order have four wings; the upper pair, which ſerve as covers to the other two, are cruſtaceous, with a ſtraight ridge or ſuture in the middle. See Natural History.

COLE-SEED, the ſeed of the *napus ſativa*, or long-rooted, narrow-leaved rapa, called, in Engliſh, navew, and comprehended by Linnæus among the braſſicas, or cabbage-kind. See Brassica.

This plant is cultivated to great advantage in many parts of England, on account of the nape-oil expreſſed from its ſeeds. It requires a rich and ſtrong ſoil, eſpecially in march or fenny lands, thoſe newly recovered from the ſea, or indeed any other land that is rank and fat, whether arable or paſture. The beſt ſeeds are brought from Holland, and ſhould be ſown about Midſummer, the very day that the land is plowed: a gallon will ſerve an acre.

Beſides the oil already mentioned, it is likewiſe cultivated for winter-food to cattle, and is a very good preparative of land for barley or wheat.

COLE-WORT. See Brassica.

COLIAS, in ichthyology. See Scomber.

COLIC, in medicine, a ſevere pain in the lower venter, ſo called, becauſe the diſorder was formerly ſuppoſed to be ſeated in the colon. See Medicine.

Colic-shell. See Syproea.

COLIR, an officer in China, who may properly be called an inſpector, having an eye over what paſſes in every court or tribunal of the empire.

In order to render him impartial, he is kept independent, by having poſt for life. The power of the colirs is ſuch, that they make even the princes of the blood tremble.

COLISEUM, in ancient architecture, an oval amphitheatre at Rome, built by Veſpaſian, wherein were ſtatues ſet up, repreſenting all the provinces of the empire: in the middle whereof ſtood that of Rome, holding a golden apple in her hand.

This ſtructure was ſo large, that it would hold near 100,000 ſpectators.

COLITES, in natural hiſtory, a name given by ſome writers to a kind of pebble, found in the ſhape of the human penis and teſtes, and that either ſeparately, or both together.

COLLAR, in Roman antiquity, a ſort of chain put generally round the neck of ſlaves that had run away, after they were taken, with an inſcription round it, intimating their being deſerters, and requiring their being reſtored to their proper owners, *&c.*

Collar, in a more modern ſenſe, an ornament conſiſting of a chain of gold, enamelled, frequently ſet with cyphers or other devices, with the badge of the order hanging at the bottom, wore by the knights of ſeveral military orders over their ſhoulders, on the mantle, and its figure drawn round their armories.

Thus, the collar of the order of the garter conſiſts of S S, with roſes enamelled red, within a garter enamelled blue, and the George at the bottom.

Lord Mayor's **Collar** is more uſually called chain.

Knights of the **Collar**, a military order in the republic of Venice, called alſo the order of St Mark, or the medal.

It is the doge and the ſenate that confer this order; the knights bear no particular habit, only the collar, which the doge puts around their neck, with a medal, wherein is repreſented the winged lion of the republic.

Collar *of a draught horſe*, a part of harneſs made of leather and canvas, and ſtuffed with ſtraw or wool, to be put about the horſe's neck.

COLLARAGE, a tax or fine laid for the collars of wine-drawing horſes.

COLLATERAL, any thing, place, country, *&c.* ſituated by the ſide of another.

Collateral, in genealogy, thoſe relations which proceed from the ſame ſtock, but not in the ſame line of aſcendants or deſcendants, but being, as it were, aſide of each other.

Thus, uncles, aunts, nephews, nieces and couſins, are collaterals, or in the ſame collateral line: thoſe in a higher degree, and nearer the common root, repreſent a kind of paternity with regard to thoſe more remote.

COLLATERAL *ſucceſſion*, in Scots law: When a defunct, for want of heirs deſcended of himſelf, is ſucceeded in his eſtate by a brother or ſiſter, or their deſcendents, the eſtate is ſaid to have gone to *collateral heirs*. See Scots Law, title, *Succeſſion in heretable rights*.

COLLATION, in the canon law, the giving or beſtowing of a benefice on a clergyman by a biſhop, who has it in his own gift or patronage.

Collation, in common law, the compariſon or preſentation of a copy to its original, to ſee whether or not it be conformable; or the report or act of the officer ſicer who made the compariſon. A collated act is equivalent to its original, provided all the parties concerned were preſent at the collation.

Collation, in Scots law, that right which an heir has of throwing the whole heritable and moveable eſtates of the deceaſed into one maſs, and ſharing it equally with the others in the ſame degree of kindred, when he thinks ſuch ſhare will be more than the value of the heritage to which he had an excluſive title. See Scots Law, title, *Succeſſion in moveables*.

Collation is alſo vulgarly uſed for a repaſt between dinner and ſupper.

COLLEAGUE, a partner or aſſociate in the ſame office or magiſtrature. See Adjunct.

COLLECTS, in an eccleſiaſtical ſenſe, the ſhort prayers into which the public devotions of the church are divided.

In the primitive church, the collects were repeated by the biſhop alone, after the joint prayers of the deacon and congregation.

COLLECTIVE, among grammarians, a term applied to a noun expreſſing a multitude, though itſelf be only ſingular; as an army, company, troop, *&c.* called collective nouns.

COLLECTOR, in general, denotes a perſon who gets or brings together things formerly diſperſed and ſeparated. Hence,

Collector, in matters of civil polity, is a perſon appointed by the commiſſioners of any duty, the inhabitants of a pariſh, *&c.* to raiſe or gather any kind of tax.

Collector, among botaniſts, one who gets together as many plants as he can, without ſtudying botany in a ſcientifical manner.

COLLEGATORY, in the civil law, a perſon who has a legacy left him in common with one or more other perſons.

COLLEGE, an aſſemblage of ſeveral bodies or ſocieties, or of ſeveral perſons into one ſociety.

College, among the Romans, ſerved indifferently for thoſe employed in the offices of religion, of government, the liberal, and even mechanical arts and trades; ſo that, with them, the word ſignified what we call a corporation or company.

Each of theſe colleges had diſtinct meeting-places or halls; and likewiſe, in imitation of the ſtate, a treaſury and common cheſt, a regiſter, and one to repreſent them upon public occaſions, and acts of government. Theſe colleges had the privilege of manumitting ſlaves, of being legates, and making by-laws for their own body, provided they did not claſh with thoſe of the government.

There are various colleges on foot among the moderns, founded on the model of thoſe of the ancients. Such are the three colleges of the empire, *viz.*

College *of electors, or their deputies*, aſſembled in the diet of Ratiſbon.

College *of princes*, the body of princes, or their deputies, at the diet of Ratiſbon.

College *of cities*, is, in like manner, the body of deputies which the imperial cities ſend to the diet.

College *of cardinals*, or the *ſacred* College, a body compoſed of the three orders of cardinals. See Cardinals.

College is alſo uſed for a public place endowed with certain revenues, where the ſeveral parts of learning are taught.

An aſſemblage of ſeveral of theſe colleges conſtitute an univerſity. The erection of colleges is part of the royal prerogative, and not to be done without the king's licenſe. See University.

College *of civilians*, commonly called *Doctors-commons*, founded by Dr Harvey, dean of the arches, for the profeſſors of the civil law reſiding in the city of London. The judges of the arches, admiralty, and prerogative court, with ſeveral other eminent civilians, commonly reſide here.

To this college belong thirty-four proctors, who make themſelves parties for their clients, manage their cauſes, give licenſes for marriages, *&c.*

In the common hall of Doctors-commons are held ſeveral courts, under the juriſdiction of the civil law, particularly the high court of admiralty, the court of delegates, the arches court of Canterbury, and the prerogative court of Canterbury, whoſe terms for ſitting are much like thoſe at Weſtminſter, every one of them holding ſeveral court-days; moſt of them fixed and known by preceding holidays, and the reſt appointed at the judge's pleaſure.

College *of phyſicians*, a corporation of phyſicians in London, whoſe number, by charter, is not to exceed eighty. The chief of them are called fellows, and the next candidates, who fill up the places of fellows as they become vacant by death, or otherwiſe. Next to theſe are the honorary fellows; and laſtly, the licentiates, that is, ſuch as being found capable, upon examination, are allowed to practiſe phyſic.

This college has ſeveral great privileges granted by charter and acts of parliament. No man can practiſe phyſic in, or within ſeven miles of London, without licenſe of the college, under the penalty of 5 *l.* Alſo, perſons practiſing phyſic in other parts of England are to have letters teſtimonial from the preſident and three elects, unleſs they be graduate phyſicians of Oxford or Cambridge. Every member of the college is authoriſed to practiſe ſurgery in London or elſewhere; and that they may be able at all times to attend their patients, they are freed from all pariſh-offices.

The college is governed by a preſident, four cenſors, and twelve electors. The cenſors have, by charter, power to ſurvey, govern, and arreſt all phyſicians, or others, practiſing phyſic in or within ſeven miles of London; to fine, amerce, and impriſon them at diſcretion; to ſearch apothecaries ſhops, *&c.* in and about London; to ſee if their drugs, *&c.* be wholeſome, and the compoſitions according to the form preſcribed by the college in their diſpenſaries; and to burn, or otherwiſe deſtroy, thoſe that are defective or decayed, and not fit for uſe.

In 1696, forty-two members of the college made a ſubſcription, to ſet on foot a diſpenſary for the relief of the ſick poor, who are adviſed gratis every day but

Sunday, and medicines ſold at the intrinſic value: ſince this they have erected two other diſpenſaries.

College *of juſtice*, in Scots law, the ſupreme civil court of Scotland; otherwiſe called *Court of ſeſſion*, or, *of council and ſeſſion*. See Scots Law, title, *Supreme judges and courts of Scotland*.

Sion College, or the college of the London clergy, was formerly a religious houſe, next to a ſpittal or hoſpital; and now it is a compoſition of both, *viz.* a college for the clergy of London, who were incorporated in 1631, at the requeſt of Dr White, under the name of the preſident and fellows of Sion-college; and an hoſpital of ten poor men, the firſt within the gates of the houſe, and the latter without.

This college conſiſts of a preſident, two deans, and four aſſiſtants, who are annually choſen from among the rectors and vicars in London, ſubject to the viſitation of the biſhop. They have one of the fineſt libraries in England, built and ſtocked by Mr Simpſon, chiefly for the clergy of the city, without excluding other ſtudents on certain terms; they have alſo a hall with chambers for the ſtudents, generally filled with the miniſters of the neighbouring pariſhes.

Greſham-College, or College *of philoſophy*, a college founded by Sir Thomas Greſham, who built the Royal-exchange; a moiety of the revenue whereof he gave in truſt to the mayor and commonalty of London, and their ſucceſſors for ever, and the other moiety to the company of mercers; the firſt to find four able perſons to read in the college divinity, aſtronomy, muſic, and geometry; and the laſt, three or more able men to read rhetoric, civil law, and phyſic; a lecture upon each ſubject is to be read in term-time, every day, except Sundays, in Latin, in the forenoon, and the ſame in Engliſh in the afternoon; only the muſic-lecture is to be read alone in Engliſh. The lecturers have each 50 *l. per annum*, and a lodging in the college.

In this college formerly met the royal ſociety, that noble academy, celebrated throughout the world for their improvements in natural knowledge. See Society.

College *of heralds*, commonly called the *heralds office*, a corporation founded by charter of king Richard III. who granted them ſeveral privileges, as to be free from ſubſidies, tolls, offices, &c. They had a ſecond charter from king Henry VI.; and a houſe built near Doctors-commons, by the earl of Derby, in the reign of king Henry VII. was given them by the duke of Norfolk, in the reign of queen Mary, which houſe is now rebuilt.

This college is ſubordinate to the earl-marſhal of England. They are aſſiſtants to him in his court of chivalry, uſually held in the common hall of the college, where they ſit in their rich coats of his majeſty's arms. See Herald.

COLLEGIATE *churches*, thoſe which though no biſhop's ſee, yet have the retinue of the biſhop, the canons and prebends. Such are, among us, Weſtminſter, Windſor, Rippon, Wolverhampton, Southwell, Mancheſter, &c. governed by deans and chapters.

COLLET, among jewelers, denotes the horizontal face or plane at the bottom of brilliants. See Brilliant.

Collet, in glaſs-making, is that part of glaſs veſſels which ſticks to the iron inſtrument wherewith the metal was taken out of the melting-pot: theſe are afterwards uſed for making green glaſs.

COLLETICS, in pharmacy, denote much the ſame with agglutinants or vulneraries. See Vulnerary.

COLLINSONIA, in botany, a genus of the decandria monogynia claſs. The corolla is unequal, the inferior lip being multifid and capillary. It has but one ſeed. There is only one ſpecies, a native of Canada.

COLLIQUAMENTUM, in natural hiſtory, an extreme tranſparent fluid in an egg, obſervable after two or three days incubation, containing the firſt rudiments of the chick. It is included in one of its own proper membranes, diſtinct from the albumen. Harvey calls it the oculus.

COLLIQUATION, in chemiſtry, is applied to animal, vegetable, and mineral ſubſtances, tending towards fuſion. See Fusion.

Colliquation, in phyſic, a term applied to the blood, when it loſes its craſis or balſamic texture; and to the ſolid parts, when they waſte away, by means of the animal fluids flowing off through the ſeveral glands, and particularly thoſe of the ſkin, faſter than they ought: which occaſions fluxes of many kinds, but moſtly profuſe, greaſy, and clammy ſweats.

COLLIQUATIVE *fever*, in phyſic, a fever attended with a diarrhœa, or profuſe ſweats.

COLLISION, the ſtriking of one hard body againſt another; or the friction or percuſſion of bodies moving violently with different directions, and daſhing againſt each other. See Mechanics.

COLLURIO, in ornithology. See Lanius.

COLLUSION, in law, a ſecret underſtanding between two parties, who plead or proceed fradulently againſt each, to the prejudice of a third perſon.

COLLUM, the ſame with neck. See Neck, and Cervix.

COLLYRIUM, in pharmacy, a topical remedy for a diſorder of the eyes; deſigned to cool and repel hot, ſharp humours.

They are generally of two kinds, the one liquid, and the other dry: liquid collyrias are compoſed of ophthalmic powders in waters, as roſe-water, plantain-water, or that of fennel, eye-bright, &c. wherein tutty, white vitriol, or ſome other proper powder, is diſſolved.

The dry collyrium is troches of rhaſis, ſugar-candy, tutty prepared, &c. blown into the eye.

COLOCASIA, in botany. See Arum.

COLOCYNTHIS, in botany. See Cucumis.

COLOGNE, the capital of the circle of the Lower Rhine, in Germany, ſituated on the Rhine, about forty-five miles eaſt of Mæſtricht; E. long. 6° 40′, N. lat. 50° 50′. It is one of the largeſt and moſt elegant cities of Germany, being the ſee of an archbiſhop, who is one of the electors of the empire, and has a yearly revenue of 130,000 *l.*

Cologne-*earth*, a kind of very light baſtard ochre, of a deep brown colour.

COLON, in anatomy. See Vol. I. p. 261.

Colon, in grammar, a point or character marked thus, (:), ſhewing the preceding ſentence to be perfect or entire; only that ſome remark, farther illuſtration, or other matter connected therewith, is ſubjoined.

COLONEL, in military matters, the commander in chief of a regiment, whether horſe, foot, or dragoons.

A colonel may lay any officer of his regiment in arreſt, but muſt acquaint the general with it; he is not allowed a guard, only a centry from the quarter-guard.

Colonel-*lieutenant*, he who commands a regiment of guards, whereof the king, prince, or other perſon of the firſt eminence, is colonel. Theſe colonel-lieutenants have always a colonel's commiſſion, and are uſually general officers.

Lieutenant-**Colonel**, the ſecond officer in a regiment, who is at the head of the captains, and commands in the abſence of the colonel.

COLONNA, a town of Italy, in the Campagna of Rome, eighteen miles eaſtward of that city: E. long. 13° 15′, N. lat. 42°.

COLONNADE, in architecture, a periſtyle of a circular figure; or a ſeries of columns diſpoſed in a circle, and inſulated within ſide.

A polyſtile **Colonnade**, is that whoſe numbers of columns is too great to be taken in by the eye at a ſingle view. Such is the colonnade of the palace of St Peter's at Rome, conſiſting of 284 columns of the Doric order, each above four foot and an half diameter, all in Tiburtine marble.

COLONY, a company of people tranſplanted into a remote province, in order to cultivate and inhabit it.

Colonies are of three ſorts: the firſt are thoſe that ſerve to eaſe and diſcharge the inhabitants of a country, where the people are become too numerous; the ſecond are thoſe eſtabliſhed by victorious princes in the middle of vanquiſhed nations, to keep them in awe and obedience; and the third ſort are thoſe eſtabliſhed for the promotion of trade, called colonies of commerce; ſuch are thoſe eſtabliſhed by European nations in ſeveral parts of Aſia, Africa, and America.

COLOPHONY, in pharmacy, black reſin, or turpentine, boiled in water, and afterwards dried; or, which is ſtill better, the caput mortuum remaining after the diſtillation of the etherial oil, being further urged by a more intenſe and long continued fire.

COLOQUINTIDA, in botany. See Cucumis.

COLORATURA, in muſic, denotes all manner of variations, trillos, diminutions, *&c.* ſerving to make a ſong agreeable.

COLOSSUS, a ſtatue of a gigantic, or enormous ſize.

The moſt famous of this kind was the coloſſus of Rhodes, made, in honour of Apollo, by Chares the diſciple of Lyſippus. It was eighty-ſix feet high, and its thumb ſo large, that few people could fathom it. This ſtatue was placed acroſs the mouth of the harbour at Rhodes, and the ſhips with full ſails paſſed betwixt its legs.

COLOSTRUM, the firſt milk of any animal after bringing forth young, called beeſtings. It is remarkable that this milk is generally cathartic, and purges off the meconium; thus ſerving both as an aliment and medicine.

An emulſion prepared with turpentine, diſſolved with the yolk of an egg, is ſometimes called by this name.

COLOUR. See Optics.

Colour, in painting, is applied both to the drugs, and to the tints produced by thoſe drugs variouſly mixed and applied.

The principal colours uſed by painters are red and white lead, or ceruſs; yellow and red ochres; ſeveral kinds of earth, umbre, orpiment, lamp-black, burnt ivory, black lead, cinnabar or vermillion, gumboge, lacca, blue and green aſhes, verdigris, biſtre, bicce, ſmalt, carmine, ultra marine: each of which, with their uſes, *&c.* are to be found under their proper articles.

Of theſe colours ſome are uſed tempered with gum-water, ſome ground with oil, others only in freſco, and others for miniature.

Painters reduce all the colours they uſe under theſe two claſſes, of dark and light colours: dark colours are black, and all others that are obſcure and earthy, as umbre, biſtre, *&c.*

Under light colours are comprehended white, and all that approach neareſt to it.

Painters alſo diſtinguiſh colours into ſimple and mineral.

Under ſimple colours they rank all thoſe which are extracted from vegetables, and which will not bear the fire; as the yellow, made of ſaffron, French berries, lacca, and other tinctures extracted from flowers, uſed by limners, illuminers, *&c.*

The mineral colours are thoſe which being drawn from metals, *&c.* are able to bear the fire, and therefore uſed by enamellers. Changeable and permanent colours is another diviſion, which, by ſome, is made of colours.

Changeable colours are ſuch as depend on the ſituation of the objects with reſpect to the eye, as that of a pigeon's neck, taffeties, *&c.* the firſt however being attentively viewed by the microſcope, each fibre of the feathers appears compoſed of ſeveral little ſquares, alternately red and green, ſo that they are fixed colours.

Local **Colours**. See **Local**.

Water **Colours**. See **Water**.

Colour, in dying. There are, in the art of dying, five colours, called ſimple, primary, or mother colours, from the mixture of which all other colours are formed; theſe are blue, yellow, brown, red, and black. Of theſe colours, variouſly mixed and combined, they form the following colours, panſy, blue, and red; from the mixture of blue and ſcarlet are formed amaranth, violet, and panſy; from the ſame mixture of blue, crimſon, and red, are formed the columbine, or dove-colour, purple-crimſon, amaranth, panſy, and crimſon-violet. See Botany, Vol. I. p. 633.

Here it is to be obſerved, that they give the name crimſon to all colours made with cochineal.

Colour, in heraldry. The colours generally uſed in heraldry are red, blue, black, green, and purple, which the heralds call gules, azure, ſable, vert or ſinople, and purpure; tenne or tawny, and ſanguine, are not ſo common: as to yellow and white, called *or* and *argent*, they are metals, not colours.

The metals and colours are ſometimes expreſſed in blazon by the names of precious ſtones, and ſometimes by thoſe of planets or ſtars. See Blazoning.

Oenomaus is ſaid to have firſt invented the diſtinction of colours, to diſtinguiſh the gundillæ of combatants of the Circenſian games; the green for thoſe who repreſented the earth, and blue for thoſe who repreſented the ſea.

Colours, in the military art, include the banners, flags, enſigns, &c. of all kinds, borne in the army or fleet. See Flag, and Standard.

Field-Colour. See Field.

Colours, in the Latin and Greek churches, are uſed to diſtinguiſh ſeveral myſteries and feaſts, celebrated therein.

Five colours only are regularly admitted into the Latin church; theſe are white, green, red, violet, and black: the white is for the myſteries of our Saviour, the feaſts of the virgin, thoſe of the angels, ſaints, and confeſſors; the red is for the myſteries and ſolemnities of the holy ſacrament, the feaſts of the apoſtles and martyrs; the green for the time between pentecoſt and advent, and from epiphany to ſeptuageſima; the violet in advent and Chriſtmas, in vigils, rogations, &c. and in votive maſſes in time of war; laſtly, the black is for the dead, and the ceremonies thereto belonging.

In the Greek church, the uſe of colours is almoſt aboliſhed, as well as among us: red was, in the Greek church, the colour for Chriſtmas, and the dead, as black among us.

To Colour *ſtrangers goods*, is when a freeman allows a foreigner to enter goods at the cuſtom-houſe in his name.

COLOURING, among painters, the manner of applying and conducting the colours of a picture; or the mixtures of light and ſhadows, formed by the various colours employed in painting. See Painting.

Colouring *of glaſs*. See Glass.

Colouring *of porcelain*. See Porcelain.

COLT, in zoology. See Equus.

Colt-evil, among farriers, a ſwelling of the yard and ſcrotum, incident both to ſtoned horſes and geldings; for which, after waſhing the part with lukewarm vinegar, it is uſual to anoint them with juice of rue, mixed with honey, and boiled in hog's greaſe, adding bay-leaves and the powder of fenugreek.

Colt's-foot, in botany. See Tussilago.

COLTIE, a term uſed by timber-merchants for a defect, or blemiſh, in ſome of the annular circles of a tree, whereby its value is much diminiſhed.

COLUBER, in zoology, a genus of ſerpents belonging to the claſs of amphibia. The characters are theſe: They have a number of ſcuta, or hard cruſts, on the belly; and ſcutellæ, or ſcales, on the tail. Linnæus enumerates no leſs than 97 ſpecies under this genus, diſtinguiſhed ſolely by the number of ſcuta and ſcutellæ. For the ſake of brevity, we ſhall give the numbers in figures, the firſt denoting the number of ſcuta, and the ſecond the number of ſcutellæ, thus, 140-22.

The firſt ſpecies is the vipera, 118-22. This is the viper of the ſhops, the fleſh of which has been much recommended in ſcrophulous, leprous, and other obſtinate chronical diſorders: but its virtues in theſe caſes have been too much exaggerated: the fleſh of the viper is however highly nutritive, and is therefore properly eſteemed to be a good reſtorative: but, to anſwer any good purpoſe, even when given with this intention, it ought to be uſed liberally, and for a conſiderable time, as food. This animal is a native of Egypt. The body is very ſhort, and of a pale colour, with browniſh ſpots; and the head is gibbous, and covered with ſmall ſcales. 2. The atropos, 131-22, is a native of America; the body is white, and the eyes are brown, with a white iris. 3. The leberis, 110-50, is a native of Canada, and has many linear black rings. 4. The ammodites, 142-32, is about ſix inches long, and has an erect fleſhy protuberance on its noſe. It is a native of the Eaſt. 5. The berus, 146-39, or common Britiſh viper, is found in moſt countries in Europe: It is of a duſky blackiſh colour. 6. The cherſea, 150-34, is a native of Sweden, and rather leſs than the aſp. 7. The preſter, 152-32, is found in the northern parts of Europe, and the whole body is black. 8. The aſpis, 146-46, is a native of France, and is of a reddiſh colour, with duſky ſpots on the back. 9. Lebetinus, 155-46, is a native of Aſia, and is of a cloudy colour, with red ſpots on the belly. 10. The ſeverus, 170-42, is likewiſe a native of Aſia, and is aſh-coloured, with white belts. 11. The ſtolatus, 143-76, is a native of Aſia, and is of a greyiſh colour, with two white fillets. 12. The lacteus, 203-32, is a native of the Indies; the colour is white, with black ſpots. 13. The naja, 193-60, is a native of the Eaſt Indies; and is the moſt poiſonous of all ſerpents; they are eat by the ichneumon. 14. The atrox, 196-69, is a native of Aſia; it is of a hoary colour; and the head is compreſſed and covered with ſmall ſcales. 15. The niveus, 209-62, is white, without any ſpots. It is a native of Africa. 16. The corallinus, 193-82, is a native of Aſia: It is greyiſh, with three brown fillets. 17. The dipſas, 152-135, is a native of America: it is of a blueiſh colour, with the margins of the ſcales white. 18. The mycterizans, 192-167, is a native of America; the ſnout is ſtretched out, and triangular. Although this genus comprehends 97 ſpecies, the above 18 are all whoſe bite is ſuppoſed to be poiſonous. The poiſon is contained in a little bag at the baſe of their long fangs. See Natural History.

The 19th ſpecies is the lutrix, 134-27; the back and belly are yellow; and the ſides are blueiſh. It is a native of the Indies. 20, The calamarius, 140-22, is of a livid colour interſperſed with duſky ſpots and lines, and is found in America. 21. The ſimus, 124-46, is a native of Carolina; the head is roundiſh, flat, and gibbous; the body is interſperſed above with black and white; and the belly is black. 22. The ſtriatulus, 126-45, is likewiſe a native of Carolina: the back is duſky and ſtriated; and the belly is pale. 23. The ceraſtes, 150-25, is a native of Aſia; the ſcales of the head are round and ſmall: this is the horned viper of Haſſelquiſt; but the horns are a mere impoſition; the Arabians fix the ſpurs of a cock or other bird upon the head of the viper, in order to raiſe the admiration of travellers. 24. The plicatilis, 131-46, is of a livid colour, with duſky ſides. 25. The domicella, 118-60, is a native of Aſia; it is white, with black belts. 26. The alidras, 121-58, is a native of India, and is all white. 27. The punctatus, 136-43, is a native Carolina: It is aſh-coloured, variegated with yellow ſpots. 28. The buccatus, 107-72, is duſky-coloured, with white belts, and is a native of Aſia. 29. The angulatus, 117-70, is a native of Aſia, and of a greyiſh colour, with black fillets. 30. The cæruleus, 165-24, is blueiſh, with white ſcales on one ſide: It is a native of America. 31. The albus, 170-20, is entirely white, and is a native of Aſia. 32. The typhlus, 140-53, is a native of the Indies, and of a blueiſh colour. 33. The faſciatus, 128-67, is a native of Carolina; the ſcales are carinated, and the colour is blackiſh. 34. The melanocephalus, 140 62, is a native of America; the body is very ſmooth; the colour is duſky, and the head is black. 35. The cobella, 150-54, is very frequent in America: it is aſh-coloured, interſperſed with white lines. 36. The reginæ, 137-70, is a native of the Indies; the body is duſky, and the belly is black and white. 37. The dollatus, 164-43, is a native of Carolina; this is a ſmall ſerpent, of a whitiſh colour, with black rings. 38. The ordinatus, 138-72, is likewiſe found in Carolina: It is blueiſh, and clouded with black ſpots. 39. The Mexicanus, 134-77, is a native of America. 40. The aurora, 179-37, is a native of America: it is livid, with a yellow back. 41. The ſipedon, 144-73, is yellowiſh, and a native of North America. 42. The maurus, 152-66, is a native of Algiers: the body is yellowiſh above, and the belly is red. 43. The vittatus, 142-78, is a native of America; the edges of the ſcales are yellowiſh, and there is a white dentated fillet under the anus. 44. The miliaris, 162-59, is a native of the Indies: the body is yellow, with a white ſpot in each ſcale; and the belly is white. 45. The æſculapii, 180-43, is a native of the Indies: it has white and black belts. 46. The rhombeatus, 157-70, is a native of the Indies: the colour is blueiſh, with black ſpots. 47. The cyaneus, 119-110, is a native of America: it is of an azure colour, and the belly is green. 48. The natrix, 170 60, is a native of Europe: it is black, with a white ſpot on each ſide of the neck. 49. The agilis, 184-50, is a native of the Indies: it has yellow and white belts. 50. The jaculatrix, 163-77, is a native of Surinam. 51. The aulicus, 184-60, is a native of America, and is of a greyiſh colour, with white belts. 52. The monilis, 164-82, is a native America; the body is annulated, with three white ſpots on the collar. 53. The fulvius, 218-31, is a native of Carolina: it has 22 black rings, and as many yellow, placed alternately. 54. The pallidus, 156-96, is a native of the Indies, and is of a pale colour, with grey and yellow ſpots. 55. The lineatus, 169-84, is a native of Aſia: it is blueiſh, with four linear fillets. 56. The padera, 198-56, is a native of the Indies: it is white, with yellowiſh ſpots. 57. The canus, 188-70, is a native of the Indies: it is of a hoary colour, with yellowiſh belts. 58. The getulus, 215 44, is a native of Carolina: it is of a blackiſh blue colour, with yellow linear belts. 59. The ſibilans, 160-100, is a native of Aſia; and is blue, with black fillets, and a white belly. 60. The laticaudatus, 220-42, is a native of the Indies: it is aſh-coloured, with yellow belts; and the tail is obtuſe and compreſſed. 61. The ſirtalis, 150 114, is a native of Canada: the body is of a dirty yellow colour, with three blueiſh green fillets. 62. The ſibon, 180-85, is a native of Africa: it is of a yellowiſh iron-colour, interſperſed with white; and the belly is white, with yellow ſpots. 68. The nebulatus, 185-81, is a native of America: it is clouded with yellow and an aſh colour, and the belly is variegated with yellow and white. 64. The fuſcus, 149-117, is a native of Aſia; it is yellow and aſh-coloured, and there are yellow ſpots behind the eyes. 65. The ſaturninus, 147-120, is a native of the Indies: it is livid and coloured with an aſh-colour, and the eyes are very large. 66. The candidus, 220-50, is a native of the Indies: it is white, with yellow belts. 67. The ſcaber, 228-44, is a native of the Indies: it is clouded with black and yellow, and the ſcales are carinated. 68. The carinatus, 157-115, is a native of the Indies: it is of a lead colour, and the edges of the ſcales are tipped with white; the belly is white, and the back is carinated. 69. The ovivorus, 203 73, is a native of America. 70. The ſaurita, 156-121, is a native of Carolina: it is of a greeniſh colour. 71 The conſtrictor, 186 92, is a native of North America: it is black and ſmooth; the belly is of a paliſh green; and the nape of the neck is white. This ſpecies is ſo bold, that it even attacks men, twiſting about their legs, and breaking their bones: it runs very quickly; but its bite is not poiſonous. 72. The exoletus, 147-132, is a native of the Indies. It is blueiſh and aſh-coloured. 73. The ſitula, 236-45, is a native of Egypt: It is greyiſh. 74. The triſcalis, 195-86, is a native of the Indies: It is of an azure colour. 75. The guttatus, 227-60, is a native of Carolina: It is of a livid colour, with red and black ſpots on the back. 76. The lemniſcatus, 250-35, is a native of Aſia: The body is very ſmooth, and variegated with white and black rings. 77. The annulatus, 190-96, is a native of America: It is white, with round yellow ſpots. 78. The pelias, 187-103, is a native of the Indies: It is yellow behind the eyes, and the reſt is blackiſh. 79. The tyria, 210-83, is a native of Egypt: It is whitiſh, with yellow ſpots. 80. The jugularis, 195-102, is a native of Egypt: It is black, with a red neck. 81. The pethola, 209-90, is a native of Africa: It is of a leaden colour. 82. The æſtivus, 155-144, is a native of Carolina: It is blue, and very ſmooth; and the belly is of a paliſh green. 83. The molurus, 248-59, is a native of the Indies: This ſpecies is very like the boa; but the ſcuta and ſcales are larger. 84. The ahætulla, 163-150, is a native of Aſia and America: It is of a yellowiſh green colour, and the tops of the ſcales are black; it has likewiſe a black belt acroſs the eyes. 85. The petalarius, 212-102, is a native of the Indies: It is yellow, with white belts. 86. The haje, 207-109, is a native of Egypt. This is a large ſerpent, with oblique red belts, and about one half of each ſcale white. 87. The filiformis, 165-158, is a native of the Indies: It is black, with a white belly; and the head is thicker than the body. 88. The pullatus, 217-108, is a native of Aſia: It has red belts, with white ſpots. 89. The hippocrepis, 282-94, is a native of America: It is of a livid colour, with yellow ſpots. 90. The minervæ, 238-90, is a native of the Indies: It is of an azure colour, with a yellow fillet on the back. 91. The cinereus, 200-137, is a native of the Indies: It is of an aſh-colour, with a white belly. 92. The viridiſſimus, 217-122, is a native of Surinam: It is of a fine green colour. 93. The mucoſus, 200-140, is a native of the Indies: the head is blueiſh. 94. The domeſticus, 245-94, frequents the dwelling-houſes of Barbary: It greatly reſembles the hippocrepis. 95. The cenchoa, 220-124, is a native of America: It is yellowiſh, with pale ſpots and white belts: The head is globular. 96. The cæruleſcens, 215-170, is a native of the Indies, and is of an azure colour. 97. The argus, is a native of Africa; but hitherto we have had no juſt deſcription of it.—For the inſtincts, manner of living, *&c.* of ſerpents in general, ſee Natural History.

COLUBRINUM lignum, or Snake-wood. See Strychnos.

COLUMBA, pigeon, in ornithology, a genus belonging to the order of paſſeres. The characters of this genus are theſe: The bill is ſtrait, and deſcends towards the point; the noſtrils are oblong, and half covered with a ſoft tumid membrane; and the tongue is entire, *i. e.* not cloven. There are 40 ſpecies, *viz.* 1. The œnas, or domeſtic pigeon, is blueiſh, with a greeniſh ſhining neck; on the back, towards the tail, it is white, with a blackiſh ſtreak on the point of the wings and tail. It is the ſtock-dove or wood-pigeon of Ray, and is a bird of Europe. The pigeon lays two eggs, and hatches them every month, for eight or nine months in the year, which, in the ſpace of four years, amounts to about 18000 deſcendants. They always bill before copulation: Their method of feeding their young is curious; they firſt macerate peaſe or other grain for ſome time in their crop, and then vomit it up into the mouths of the young ones. The male and female ſit upon their eggs by turns. 2. The hiſpanica, with white mealy wax on the bill. It is about double the ſize of the common pigeon. 3. The daſypus, with rough feathered legs. 4. The gutturoſa, or cropper, has a power of inflating its crop till it be as large as the animal's body. It is a native of Arabia Felix. 5. The cucullata has the feathers on the back-part of the head erect and reflected; and the bill is ſhort. 6. The hiſpida, or rough pigeon, with the ſmall feathers of the back and wings erected. It is a native of the Eaſt Indies. 7. The turbita, with the feathers on the breaſt bent backward, a ſhort bill, and a plain vertex. 8. The laticauda, or broad-tailed pigeon, has an erect open tail conſiſting of many feathers. 9. The gyratrix turns itſelf round when flying: it is a little leſs than the common pigeon. 10. The galeata, with the head and prime feathers of the wings and tail of the ſame colour, and always different from the reſt of the body. 11. The turcica, with red papillous wax. It is a bird of Arabia. 12. The tabellaria has naked eye-brows, and broad, white, fleſhy wax on the bill. Although this bird be carried to a very great diſtance from home, it returns with vaſt ſpeed; and hence the ancients employed it for the purpoſe of conveying back letters. 13. The montana has naked red orbits, a reddiſh body, and a yellow belly; the bill and feet are red. It is the mountain-partridge of Ray, and is a native of Jamaica. 14. The leucocephala, with the top of the head and the orbits red, and a blueiſh body. It is a native of North America. 15. The leucoptera, with naked blue orbits, and the prime wing-feathers white at the points, and the intermediate ones yellowiſh. It is the Indian turtle of Edwards, and is a native of Aſia. 16. The guinea, with naked red orbits, a yellowiſh bill, triangular white ſpots on the wings, and the prime wing-feathers black at the points. It is a native of Africa. 17. The coronata has black orbits, a large erect creſt on the head, and a blueiſh body. It is almoſt as large as a peacock, and is a native of Banda. 18. The ſtriata, with hoary orbits, and the body variegated with black and aſh-coloured belts. It is a native of the Eaſt Indies. 19. The palumbus, with the prime tail-feathers red behind, the prime wing-feathers edged with white, a white neck, and feathered legs. It is a native of Europe and Aſia. 20. The cyanocephala, with a blue head, and a white belt below the eye. It is a native of America. 21. The madagaſcarenſis, with feathered legs, a violet tail, a greeniſh blue body, and the beak and feet red. It is found in Madagaſcar. 22. The aenea, with feathered legs, greeniſh legs and bill, and a braſs-coloured body. It is a native of the Molucca Iſles. 23. The viridis, with a braſs-coloured body, a violet belly, and red legs half covered with feathers. It is found at Amboina. 24. The martinica, with a violet body, a yellowiſh belly, and the prime wing-feathers red on the inſide. It is found in Martinico. 25. The jamaicenſis, with blueiſh prime tail-feathers terminated by a white line. It is found in Jamaica. 26. The Senegalenſis, with the three outmoſt prime tail-feathers white, and the neck ſpotted with black. It is found in Senegal. 27. The nicobarica has a white tail, a black body, blue prime wing-feathers, a greeniſh

iſh ſhining back, and long feathers on the neck. It is found in the iſland of Nicombar near Pegu. 28. The ſinica is yellowiſh, and belted with black; the belly is reddiſh, the wings yellow, the prime wing-feathers black, and a black bill. It is a native of China. 29. The indica, with a purple body, green ſhoulders, and the top of the head blueiſh. It is a native of the Eaſt Indies. 30. The canadenſis, with the prime wing-feathers yellow at the points, and the prime tail-feathers aſh-coloured. It is a native of Canada. 31. The afra, with the exterior prime tail-feathers white at the points, and violet ſpots on the wing-feathers. It is a native of Senegal. 32. The turtur, with the prime tail-feathers white, a greyiſh back, and a fleſh-coloured breaſt. It is a native of India. 33. The riſoria is clay-coloured above, and has a black creſcent on the neck. It is a native of India 34. The poſſyrina, with a purple body, and a yellow bill and legs. It inhabits America within the tropics. 35. The minuta is the ſmalleſt of all pigeons, is of a duſky colour, with five ſteel-coloured ſpots on the wings, and the outmoſt prime tail-feathers white. It is a native of America. 36. The migratoria has a wedge ſhaped tail, red naked orbits, and a reddiſh breaſt. This ſpecies is very frequent in North America: They live upon the ſeeds of the elm, oak, wheat, *&c.* and they winter in Carolina. 37. The carolinenſis has a wedge-ſhaped tail, blue orbits, and a reddiſh belly. It is a native of America. 38. The amboinenſis has a wedge-ſhaped tail, a reddiſh body, and a greeniſh neck. It is found at Amboina. 39. The capenſis has a wedge-ſhaped tail, and the prime wing-feathers red on the interior ſide. It is found at the Cape of Good Hope. 40. The marginata has a wedge-ſhaped tail, a red breaſt, and the points of the prime tail-feathers black and edged with white.

COLUMBINE, in botany. See Aquilegia.

Feathered Columbine. See Thalictrum.

COLUMBUS, or *Congregation of St* Columbus, a ſociety of regular canons, who formerly had an hundred abbeys or monaſteries in the Britiſh iſlands.

COLUMELLA, in botany. See Vol. I. p. 637.

COLUMN, in architecture, a round pillar, made to ſupport and adorn a building, and compoſed of a baſe, a ſhaft, and a capital. See Architecture.

Column, in the military art, a long deep file of troops or baggage.

The firſt and ſecond lines of the army as they are encamped, make generally two columns on a march, filing off either from the right or left: ſometimes the army marches in four, ſix, or eight columns, according as the ground will allow; and each column is led by a general officer.

COLUMNEA, in botany, a genus of the didynamia angioſpermia claſs. The calix is divided into five ſegments; the upper labium of the corolla is vaulted and entire, and gibbous at the baſe; the antheræ are connected; and the capſule is bilocular. There is but one ſpecies, *viz.* the ſcandens, a native of Martinico.

COLURES, in aſtronomy and geography, two great circles ſuppoſed to interſect each other at right angles in the poles of the world, and to paſs through the ſolſtitial and equinoctial points of the ecliptic. See Geography, and Astronomy.

COLURI, a little iſland in the gulph of Engia, in the Archipelago, about ſeven miles ſouth of Athens: of this iſland Ajax was ſovereign: E. long. 24°, N. lat. 38°.

COLUTEA, Bastard-sena, in botany, a genus of the diadelphia decandria claſs. The pod is inflated, and opens at the top; and the calix is bilabiated. The ſpecies are three, none of them natives of Britain.

COLYMBUS, the Diver, in ornithology, a genus belonging to the order of anſeres. The bill has no teeth, is ſubulated, ſtrait, and ſharp-pointed; the teeth are in the faux or throat; the noſtrils are linear, and at the baſe of the bill; and the legs are unfit for walking. There are eleven ſpecies, *viz.* 1. The grylle, with palmated and three-toed feet, a red body, and the covering feathers of the wings white. It flies very low, and is a native of Greenland. 2. The troile, with palmated three-toed feet, a black body, a white breaſt and belly, and the ſecondary prime feathers of the wings white at the points. It is found within the arctic circle. 3. The ſeptentrionalis, with palmated four-toed feet, and an iron-coloured ſpot under the neck. It is a native of the northern lakes of Europe. They build their neſts upon the ſhore without art, and lay a couple eggs: they run with great quickneſs upon the water; and preſage ſtorms by flying and crying with a miſerable tone of voice. 4. The arcticus, with palmated four-toed feet, a hoary head, and a violet neck. It frequents the northern ſeas and lakes. 5. The glacialis, with palmated four-toed feet, and a violet head and neck. It inhabits the northern ſeas. 6. The immer, with palmated four-toed feet, the upper part of the body black and undulated with white, and a white belly. It inhabits the frozen ſeas. 7. The cryſtalus, with lobated feet, a red head, a black collar, and white ſecondary prime wing-feathers. It is a native of Europe. 8. The auritus, with lobated feet, a black head, and the ears are creſted and of an iron colour. It frequents the lakes of Europe and America. 9. The urinator, with lobated feet, a ſmooth head, and white ſpots on the wings. It is a native of the ſouthern parts of Europe. 10. The dominicus, with lobated feet, a ſmooth head, and the belly very much ſpotted. 11. The padiceps, with lobated feet and a yellowiſh body. It is a native of North America.

COLYTEA, in botany. See Cercis.

COMA, or Coma-vigil, a preternatural propenſity to ſleep, when nevertheleſs the patient does not ſleep, or, if he does, awakes immediately without any relief. See Medicine.

Coma somnolentum, is when the patient continues in a profound ſleep, and, when awaked, immediately relapſes, without being able to keep open his eyes. See Medicine.

COMARUM, in botany, a genus of plants of the icoſandria polygynia claſs. The calix is divided into ten ſegments; the petals are five, and leſs than the calix, and the ſeeds are ovated, ſpongy, and perſiſtent. There is but one ſpecies, *viz.* the paluſtre, a native of Europe.

COMB, an inſtrument to clean, untangle, and dreſs flax, wool, hair, *&c.*

Combs for wool are prohibited to be imported into Britain.

COMB is alſo the creſt or red fleſhy tuft growing upon a cock's head.

Lady's **COMB**, in botany. See SCANDIX.

COMB-FISH, in the hiſtory of ſhell-fiſh. See OSTREA.

COMBAT, in a general ſenſe, denotes an engagement, or a difference decided by arms. See BATTLE.

COMBAT, in our ancient law, was a formal trial of ſome doubtful cauſe or quarrel by the ſwords or baſtons of two champions. This form of proceeding was very frequent not only in criminal but in civil cauſes; being built on a preſumption, that God would never grant the victory but to him who had the beſt right. The laſt trial of this kind in England, was between Donald lord Ray, appellant, and David Ramſay, eſq; defendant; when, after many formalities, the matter was referred to the king's pleaſure.

COMBATANT, in heraldry, a term for two beaſts, as lions, *&c.* borne in a coat of arms in a fighting poſture, with their faces to each other.

COMBINATION, properly denotes an aſſemblage of ſeveral things two by two.

COMBINATION, in mathematics, is the variation or alteration of any number of quantities, letters, or the like, in all the different manners poſſible.

COMEDY. See EPIC and DRAMATIC COMPOSITIONS.

COMET, an opake, ſpherical, and ſolid body like a planet, performing revolutions about the ſun in elliptical orbits, which have the ſun in one of the foci. See ASTRONOMY, p. 444.

COMETARIUM, a curious machine exhibiting an idea of the revolution of a comet about the ſun. See Plate XLVIII. fig. 2.

COMFREY, in botany. See SYMPHYTUM.

COMITIA, in Roman antiquity, an aſſembly of the people, either in the comitium or campus martius, for the election of magiſtrates, or conſulting on the important affairs of the republic.

There were certain days fixed for theſe aſſemblies, called *dies comitiales*, marked with a C in Julius Cæſar's calendar,

There were three kinds of comitia, *viz.* curiata, centuriata, and tributa, ſo diſtinguiſhed from the manner wherein the people voted, and gave their ſuffrages, *viz.* by curiæ, or pariſhes, tribes, or centuries. The comitia curiata, owe their original to the diviſion which Romulus made of the people into thirty curiæ, which anſwer in moſt reſpects to our pariſhes. The comitia centuriata were inſtituted by Servius Tullius. Comitial aſſemblies held for the election of conſuls, were called conſular comitia. In like manner the other comitia were named from the officer to be created, whether a tribune, pontif, ædile, or the like. The power of calling theſe aſſemblies, belonged at firſt only to the kings: but on the eſtabliſhment of the democracy, the ſame privilege was allowed to moſt of the chief magiſtrates, and ſometimes to the pontiff.

COMITIALIS MORBUS, an appellation given to the epilepſy, by reaſon the comitia of ancient Rome were diſſolved, if any perſon in the aſſembly happened to be taken with this diſtemper.

COMITIUM, in Roman antiquity, a large hall in the forum, where the comitia were ordinarily held.

COMMA, among grammarians, a point or character marked thus (,) ſerving to denote a ſhort ſtop, and to divide the members of a period.

COMMA, in muſic, an interval equal to the difference of the tone major or minor, and expreſſed by the ratio 81 : 80.

COMMELINA, in botany, a genus of the triandria monogynia claſs. The corolla is divided into ſix ſegments; it has three croſs-like nectaria inſerted by their proper filaments. The ſpecies are ten, none of them natives of Britain.

COMMEMORATION, in a general ſenſe, the remembrance of any perſon or thing; or the doing any thing in honour of a perſon's memory, or in remembrance of any paſt event. Thus the euchariſt is a commemoration of the ſufferings of Jeſus Chriſt.

COMMENDAM, in the eccleſiaſtical law, the truſt or adminiſtration of the revenues of a benefice, given either to a layman, to hold, by way of *depoſitum*, for ſix months, in order to repairs, *&c.* or to an eccleſiaſtic, or beneficed perſon, to perform the paſtoral duties thereof, till once the benefice is provided with a regular incumbent.

COMMENSURABLE, among geometricians, an appellation given to ſuch quantities as are meaſured by one and the ſame common meaſure.

COMMENSURABLE NUMBERS, whether integers or fractions, are ſuch as can be meaſured or divided by ſome other number, without any remainder: ſuch are 12 and 18, as being meaſured by 6 or 3.

COMMENSURABLE in POWER, is ſaid of right lines, when their ſquares are meaſured by one and the ſame ſpace or ſuperficies.

COMMENSURABLE SURDS, thoſe that being reduced to their leaſt terms, become true figurative quantities of their kind; and are therefore as a rational quantity to a rational one.

COMMENTARY, or **COMMENT**, in matters of literature, an illuſtration of the difficult or obſcure paſſages of an author.

COMMENTARY, or **COMMENTARIES**, likewiſe denotes a kind of hiſtory, or memoirs of certain tranſactions, wherein the author had a conſiderable hand: ſuch are the commentaries of Cæſar.

COMMERCE.

COMMERCE is an operation, by which the wealth, or work, either of individuals, or of ſocieties, may be exchanged, by a ſet of men called merchants, for an equivalent, proper for ſupplying every want, without any interruption to induſtry, or any check upon conſumption.

We ſhall begin by tracing commerce to its ſource, in order to reduce it to its firſt principles.

The moſt ſimple of all trade, is that which is carried on by bartering the neceſſary articles of ſubſiſtence. If we ſuppoſe the earth free to the firſt poſſeſſor, this perſon who cultivates it will firſt draw from it his food, and the ſurplus will be the object of barter: he will give this in exchange to any one who will ſupply his other wants. This naturally ſuppoſes both a ſurplus quantity of food produced by labour, and alſo free hands; for he who makes a trade of agriculture cannot ſupply himſelf with all other neceſſaries, as well as food; and he who makes a trade of ſupplying the farmers with ſuch neceſſaries, in exchange for his ſurplus of food, cannot be employed in producing that food. The more the neceſſities of man increaſe, the more free hands are required to ſupply them; and the more free hands are required, the more ſurplus food muſt be produced by additional labour, to ſupply their demand.

This is the leaſt complex kind of trade, and may be carried on to a greater or leſs extent, in different countries, according to the different degrees of the wants to be ſupplied. In a country where there is no money, nor any thing equivalent to it, the wants of mankind will be confined to few objects; to wit, the removing the inconveniencies of hunger, thirſt, cold, heat, danger, and the like. A free man, who, by his induſtry, can procure all the comforts of a ſimple life, will enjoy his reſt, and work no more: and, in general, all increaſe of work will ceaſe, ſo ſoon as the demand for the purpoſes mentioned comes to be ſatisfied. There is a plain reaſon for this. When the free hands have procured, by their labour, wherewithal to ſupply their wants, their ambition is ſatisfied: ſo ſoon as the huſbandmen have produced the neceſſary ſurplus for relieving theirs, they work no more. Here then is a natural ſtop put to induſtry, conſequently to bartering.

The next thing to be examined is, how bartering grows into trade, properly ſo called and underſtood, according to the definition given of it above; how trade comes to be extended among men; how manufactures, more ornamental than uſeful, come to be eſtabliſhed; and how men come to ſubmit to labour, in order to acquire what is not abſolutely neceſſary for them.

This, in a free ſociety, is chiefly owing to the introduction of money, and a taſte for ſuperfluities in thoſe who poſſeſs it.

In ancient times, money was not wanting; but the taſte for ſuperfluities not being in proportion to it, the ſpecie was locked up. This was the caſe in Europe four hundred years ago. A new taſte for ſuperfluity has drawn, perhaps, more money into circulation, from our own treaſures, than from the mines of the new world. The poor opinion we entertain of the riches of our forefathers, is founded upon the modern way of eſtimating wealth, by the quantity of coin in circulation, from which we conclude, that the greateſt part of the ſpecie now in our hands muſt have come from America.

It is more, therefore, through the taſte of ſuperfluity, than in conſequence of the quantity of coin, that trade comes to be eſtabliſhed; and it is only in conſequence of trade that we ſee induſtry carry things in our days to ſo high a pitch of refinement and delicacy. Let us illuſtrate this, by comparing together the different operations of barter, ſale, and commerce.

When reciprocal wants are ſupplied by barter, there is not the ſmalleſt occaſion for money: this is the moſt ſimple of all combinations.

When wants are multiplied, bartering becomes more difficult; upon this money is introduced. This is the common price of all things: it is a proper equivalent in the hands of thoſe who want, perfectly calculated to ſupply the occaſions of thoſe who, by induſtry, can relieve them. This operation of buying and ſelling is a little more complex than the former; but ſtill we have here no idea of trade, becauſe we have not introduced the merchant, by whoſe induſtry it is carried on.

Let this third perſon be brought into play, and the whole operation becomes clear. What before we called wants, is here repreſented by the conſumer; what we called induſtry, by the manufacturer; what we called money, by the merchant. The merchant here repreſents the money, by ſubſtituting credit in its place; and as the money was invented to facilitate barter, ſo the merchant, with his credit, is a new refinement upon the uſe of money. This renders it ſtill more effectual in performing the operations of buying and ſelling. This operation is trade: it relieves both parties of the whole trouble of tranſportation, and adjuſting wants to wants, or wants to money; the merchant repreſents by turns both the conſumer, the manufacturer, and the money. To the conſumer he appears as the whole body of manufacturers; to the manufacturers as the whole body of conſumers; and to the one and the other claſs his credit ſupplies the uſe of money. This is ſufficient at preſent for an illuſtration. We now return to the ſimple operations of money in the hands of the two contracting parties, the buyer and the ſeller, in order to ſhow how men come to ſubmit to labour in order to acquire ſuperfluities.

So ſoon as money is introduced into a country, it becomes an univerſal object of want to all the inhabitants. The conſequence is, that the free hands of the ſtate, who before ſtopt working, becauſe all their wants were provided for, having this new object of ambition before their eyes, endeavour, by refinements upon their labour, to remove the ſmaller inconveniences which reſult from a ſimplicity of manners. People, who formerly knew but one ſort of clothing for all ſeaſons, willingly part with a little money to procure for themſelves different ſorts of apparel properly adapted to ſummer and winter, which the ingenuity of manufacturers, and their deſire of getting money, may have ſuggeſted to their invention.

Indeed theſe refinements ſeem more generally owing to the induſtry and invention of the manufacturers, (who by their ingenuity daily contrive means of ſoftening or relieving inconveniencies, which mankind ſeldom perceive to be ſuch, till the way of removing them is contrived), than to the taſte of luxury in the rich, who, to indulge their eaſe, engage the poor to become induſtrious.

Let any man make an experiment of this nature upon himſelf, by entering into the firſt ſhop. He will no where ſo quickly diſcover his wants as there. Every thing he ſees appears either neceſſary, or at leaſt highly convenient; and he begins to wonder how he could have been ſo long without that which the ingenuity of the workman alone had invented, in order that from the novelty it might excite his deſire; for perhaps when it is bought, he will never once think of it more, nor ever apply it to the uſe for which it at firſt appeared ſo neceſſary.

Here then is a reaſon why mankind labour though not in want. They become deſirous of poſſeſſing the very inſtruments of luxury, which their avarice or ambition prompted them to invent for the uſe of others.

What has been ſaid repreſents trade in its infancy, or rather the materials with which that great fabrick is built.

We have formed an idea of the wants of mankind multiplied even to luxury, and abundantly ſupplied by the employment of all the free hands ſet apart for that purpoſe. But if we ſuppoſe the workman himſelf diſpoſing of his work, and purchaſing with it food from the farmer, cloaths from the clothier; and, in general, ſeeking for the ſupply of every want from the hands of the perſon directly employed for the purpoſe of relieving it; this will not convey an idea of trade, according to our definition.

Trade and commerce are an abbreviation of this long proceſs; a ſcheme invented and ſet on foot by merchants, from a principle of gain, ſupported and extended among men, from a principle of general utility to every individual, rich or poor, to every ſociety, great or ſmall.

Inſtead of a pin-maker exchanging his pins with fifty different perſons, for whoſe labour he has occaſion, he ſells all to the merchant for money or for credit; and, as occaſion offers, he purchaſes all his wants, either directly from thoſe who ſupply them, or from other merchants who deal with manufacturers in the ſame way his merchant dealt with him.

Another advantage of trade is, that induſtrious people in one part of the country, may ſupply cuſtomers in another, though diſtant. They may eſtabliſh themſelves in the moſt commodious places for their reſpective buſineſs, and help one another reciprocally, without making the diſtant parts of the country ſuffer for want of their labour. They are likewiſe expoſed to no avocation from their work, by ſeeking for cuſtomers.

Trade produces many excellent advantages; it marks out to the manufacturers when their branch is under or over ſtocked with hands. If it is underſtocked, they will find more demand than they can anſwer: if it is overſtocked, the ſale will be ſlow.

Intelligent men, in every profeſſion, will eaſily diſcover when theſe appearances are accidental, and when they proceed from the real principles of trade.

Poſts, and correſpondence by letters, are a conſequence of trade; by the means of which merchants are regularly informed of every augmentation or diminution of induſtry in every branch, in every part of the country. From this knowldge they regulate the prices they offer; and as they are many, they ſerve as a check upon one another, from the principles of competition.

From the current prices the manufacturers are as well informed as if they kept the correſpondence themſelves: the ſtateſman feels perfectly where hands are wanting, and young people deſtined to induſtry, obey, in a manner, the call of the public, and fall naturally in to ſupply the demand.

Two great aſſiſtances to merchants, eſpecially in the infancy of trade, are public markets for collecting the work of ſmall dealers, and large undertakings in the manufacturing way by private hands. By theſe means the merchants come at the knowledge of the quantity of work in the market, as on the other hand the manufacturers learn, by the ſale of the goods, the extent of the demand for them. Theſe two things being juſtly known, the price of goods is eaſily fixed.

Public ſales ſerve to correct the ſmall inconveniencies which proceed from the operations of trade. A ſet of manufacturers got all together into one town, and entirely taken up with their induſtry, are thereby as well informed of the rate of the market as if every one of them carried thither his work, and upon the arrival of the merchant, who readily takes it off their hands, he has not the leaſt advantage over them from his knowledge of the ſtate of demand. This man both buys and ſells in what is called wholeſale; and from him retailers purchaſe, who diſtribute the goods to every conſumer throughout the country. Theſe laſt buy from wholeſale merchants in every branch, that proportion of every kind of merchandize which is ſuitable to the demand of their borough, city, or province.

Thus all inconveniencies are prevented, at ſome additional coſt to the conſumer, who muſt naturally reimburſe the whole expence. The diſtance of the manufacturer, the obſcurity of his dwelling, the caprice in ſelling his work, are quite removed; the retailer has all in his ſhop, and the public buys at a current price.

How the Prices of Goods are determined by Trade.

In the price of goods, two things muſt be conſidered as really exiſting, and quite different from one another;

to wit, the real value of the commodity, and the profit upon alienation.

I. The firſt thing to be known of any manufacture, when it comes to be ſold, is, how much of it a perſon can perform in a day, a week, a month, according to the nature of the work, which may require more or leſs time to bring it to perfection. In making ſuch eſtimates, regard is to be had only to what, upon an average, a workman of the country in general may perform, without ſuppoſing him the beſt or the worſt in his profeſſion, or having any peculiar advantage or diſadvantage as to the place where he works.

Hence the reaſon why ſome people thrive by their induſtry, and others not; why ſome manufactures flouriſh in one place, and not in another.

II. The ſecond thing to be known, is the value of the workman's ſubſiſtence, and neceſſary expence, both for ſupplying his perſonal wants, and providing the inſtruments belonging to his profeſſion, which muſt be taken upon an average as above; except when the nature of the work requires the preſence of the workman in the place of conſumption: for although ſome trades, and almoſt every manufacture, may be carried on in places at a diſtance, and therefore may fall under one general regulation as to prices; yet others there are which, by their nature, require the preſence of the workman in the place of conſumption; and in that caſe the prices muſt be regulated by circumſtances relative to every particular place.

III. The third and laſt thing to be known, is the value of the materials, that is, the firſt matter employed by the workman; and if the object of his induſtry be the manufacture of another, the ſame proceſs of inquiry muſt be gone through with regard to the firſt, as with regard to the ſecond: and thus the moſt complex manufactures may be at laſt reduced to the greateſt ſimplicity.

Theſe three articles being known, the price of manufacture is determined. It cannot be lower than the amount of all the three, that is, than the real value; whatever it is higher, is the manufacturer's profit. This will ever be in proportion to demand, and therefore will fluctuate according to circumſtances.

Hence appears the neceſſity of a great demand, in order to promote flouriſhing manufactures.

By the extenſive dealings of merchants, and their conſtant application to the ſtudy of the balance of work and demand, all the above circumſtances are known to them, and are made known to the induſtrious, who regulate their living and expence according to their certain profit.

Employ a workman in a country where there is little trade or induſtry, he proportions his price always to the urgency of your want, or your capacity to pay; but ſeldom to his own labour. Employ another in a country of trade, he will not impoſe upon you, unleſs perhaps you be a ſtranger, which ſuppoſes your being ignorant of the value; but employ the ſame workman in a work not uſual in the country, conſequently not demanded, conſequently not regulated as to the value, he will proportion his price as in the firſt ſuppoſition.

We may therefore conclude from what has been ſaid, that in a country where trade has been eſtabliſhed, manufactures muſt flouriſh, from the ready ſale, the regulated price of work, and the certain profit reſulting from induſtry. Let us next inquire into the conſequences of ſuch a ſituation.

How foreign Trade opens to an induſtrious People, and the Conſequences of it to the Merchants who ſet it on foot.

The firſt conſequence of the ſituation deſcribed in the preceding ſection is, that wants are eaſily ſupplied, for the adequate value of the thing wanted.

The next conſequence is, the opening of foreign trade under its two denominations of paſſive and active. Strangers and people of diſtant countries, finding the difficulty of having their wants ſupplied at home, and the eaſe of having them ſupplied from this country, immediately have recourſe to it. This is paſſive trade. The active is when merchants, who have executed this plan at home with ſucceſs, begin to tranſport the labour of their countrymen into other regions, which either produce, or are capable of producing ſuch articles of conſumption, proper to be manufactured, as are moſt demanded at home; and conſequently will meet with the readieſt ſale, and fetch the largeſt profits.

Here then is the opening of foreign trade, under its two denominations of active and paſſive.

What then are the conſequences of this new commerce to our merchants, who have left their homes in queſt of gain aboard?

The firſt is, that, arriving in any new country, they find themſelves in the ſame ſituation, with regard to the inhabitants, as the workman in the country of no trade, with regard to thoſe who employed him; that is, they proportion the price of their goods to the eagerneſs of acquiring, or the capacity of paying, in the inhabitants, but never to their real value.

The firſt profits then, upon this trade, muſt be very conſiderable; and the demand from ſuch a country will be *high* or *low*, *great* or *ſmall*, according to the ſpirit, not the real wants of the people: for theſe in all countries muſt firſt be ſupplied by the inhabitants themſelves, before they ceaſe to labour.

If the people of this not-trading country be abundantly furniſhed with commodities uſeful to the traders, they will eaſily part with them, at firſt, for the inſtruments of luxury and eaſe; but the great profit of the traders will inſenſibly increaſe the demand for the productions of their new correſpondents; this will have the effect of producing a competition between themſelves, and thereby of throwing the demand on their ſide. This is perpetually a diſadvantage in traffic: the moſt unpoliſhed nations in the world quickly perceive the effects of it; and are taught to profit by the diſcovery, in ſpite of the addreſs of thoſe who are the moſt expert in commerce.

The traders will therefore be very fond of falling upon every method and contrivance to inſpire this people with a taſte of refinement and delicacy. Abundance of fine preſents, conſiſting of every inſtrument of luxury and ſuperfluity, the beſt adapted to the genius of the people, will be given to the prince and leading men among them. Workmen will even be employed at home to ſtudy the taſte of the ſtrangers, and to captivate their deſires by every poſſible means. The more eager they are of preſents, the more laviſh the traders will be in beſtowing and diverſifying them. It is an animal put up to fatten, the more he eats the ſooner he is fit for ſlaughter. When their taſte for ſuperfluity is fully formed, when the reliſh for their former ſimplicity is ſophiſticated, poiſoned, and obliterated, then they are ſurely in the fetters of the traders, and the deeper they go, the leſs poſſibility there is of their getting out. The preſents then will die away, having ſerved their purpoſe; and if afterwards they are found to be continued, it will probably be to ſupport the competition againſt other nations, who will incline to ſhare of the profits.

If, on the contrary, this not-trading nation does not abound with commodities uſeful to the traders, theſe will make little account of trading with them, whatever their turn may be; but, if we ſuppoſe this country inhabited by a laborious people, who, having taken a taſte for refinement from the traders, apply themſelves to agriculture, in order to produce articles of ſubſiſtence, they will ſolicit the merchants to give them part of their manufactures in exchange for thoſe; and this trade will undoubtedly have the effect of multiplying numbers in the trading nation. But if food cannot be furniſhed, nor any other branch of production found out to ſupport the correſpondence, the taſte for refinement will ſoon die away, and trade will ſtop in this quarter.

Had it not been for the furs in thoſe countries adjacent to Hudſon's Bay, and in Canada, the Europeans never would have thought of ſupplying inſtruments of luxury to thoſe nations; and if the inhabitants of thoſe regions had not taken a taſte for the inſtruments of luxury, furniſhed to them by the Europeans, they never would have become ſo indefatigable nor ſo dextrous hunters. At the ſame time we are not to ſuppoſe, that ever theſe Americans would have come to Europe in queſt of our manufactures. It is therefore owing to our merchants, that theſe nations are become in any degree fond of refinement; and this taſte, in all probability, will not ſoon exceed the proportion of the productions of their country. From theſe beginnings of foreign trade it is eaſy to trace its increaſe.

One ſtep towards this, is the eſtabliſhing correſpondences in foreign countries; and theſe are more or leſs neceſſary in proportion as the country where they are eſtabliſhed is more or leſs poliſhed or acquainted with trade. They ſupply the want of poſts, and point out to the merchants what proportion the productions of the country bear to the demand of the inhabitants for manufactures. This communicates an idea of commerce to the not-trading nation, and they inſenſibly begin to fix a determined value upon their own productions, which perhaps bore no determined value at all before.

Let us trace a little the progreſs of this refinement in the ſavages, in order to ſhew how it has the effect of throwing the demand upon the traders, and of creating a competition among them, for the productions of the new country.

Experience ſhews, that, in a new diſcovered country, merchants conſtantly find ſome article or other of its productions, which turns out to a great account in commerce; and we ſee that the longer ſuch a trade ſubſiſts, and the more the inhabitants take a taſte far European manufactures, the more their own productions riſe in their value, and the leſs profit is made by trading with them, even in caſes where the trade is carried on by companies; which is a very wiſe inſtitution for one reaſon, that it cuts off a competition between our merchants.

This is the beſt means of keeping prices low in favour of the nation; however it may work a contrary effect with reſpect to individuals who muſt buy from theſe monopolies.

When companies are not eſtabliſhed, and when trade is open, our merchants, by their eagerneſs to profit by the new trade, betray the ſecrets of it, they enter into competition for the purchaſe of the foreign produce, and this raiſes prices, and favours the commerce of the moſt ignorant ſavages.

Conſequences of the Introduction of a paſſive foreign Trade among a People who live in Simplicity and Idleneſs.

We now ſuppoſe the arrival of traders, all in one intereſt, with inſtruments of luxury and refinement, at a port in a country of great ſimplicity of manners, abundantly provided by nature with great advantages for commerce, and peopled by a nation capable of adopting a taſte for ſuperfluities.

The firſt thing the merchants do is, to expoſe their goods, and point out the advantages of many things, either agreeable or uſeful to mankind in general, ſuch as wines, ſpirits, inſtruments of agriculture, arms, and ammunition for hunting, nets for fiſhing, manufactures for clothing, and the like. The advantages of theſe are preſently perceived, and ſuch commodities are eagerly ſought after.

The natives on their ſide produce what they moſt eſteem, generally ſomething ſuperfluous or ornamental. The traders, after examining all circumſtances, determine the object of their demand, giving the leaſt quantity poſſible in return for this ſuperfluity, in order to impreſs the inhabitants with a high notion of the value of their own commodities; but as this parſimony may do more hurt than good to their intereſt, they are very generous in making preſents, from the principles mentioned above.

When the exchange is completed, and the traders depart, regret is commonly mutual; the one and the other are ſorry that the ſuperfluities of the country fall ſhort. A return is promiſed by the traders, and aſſurances are given by the natives of a better proviſion another time.

What are the firſt conſequences of this revolution?

It is evident, that, in order to ſupply an equivalent for this new want, more hands muſt be ſet to work than formerly. And it is evident alſo, that this augmeptation of induſtry will not eſſentially increaſe numbers: Why? Becauſe the produce of the induſtry is, in this caſe, intended to be exported. But, if we can find out any additional conſumption at home, even implied by this new trade, it will have the effect of augmenting numbers. An example will make this plain.

Let us ſuppoſe the ſuperfluity of this country to be the ſkins of wild beaſts, not proper for food; the manufacture ſought for, brandy. The brandy is ſold for furs. He who has furs, or he who can ſpare time to hunt for them, will drink brandy in proportion: but there is no reaſon to conclude from this ſimple operation, that one man more in the country muſt neceſſarily be fed, or that any augmentation of agriculture muſt of conſequence enſue from this new traffic.

But let us throw in a circumſtance which may apply an additional conſumption at home, and then examine the conſequences.

A poor creature who has no equivalent to offer for food, who is miſerable, and ready to periſh for want of ſubſiſtence, goes a hunting, and kills a wolf; he comes to a farmer with the ſkin, and ſays, You are well fed, but you have no brandy; if you will give me a loaf, I will give you this ſkin, which the ſtrangers are ſo fond of, and they will give you brandy. But, ſays the farmer, I have no more bread than what is ſufficient for my own family. As for that, replies the other, I will come and dig in your ground, and you and I will ſettle our account as to the ſmall quantity I deſire of you. The bargain is made; the poor fellow gets his loaf, and lives at leaſt; perhaps he marries, and the farmer gets a dram. But had it not been for this dram, that is, this new want, which was purchaſed by the induſtry of this poor fellow, by what argument could he have induced the farmer to part with a loaf?

Here the ſentiment of chartiy is excluded. This alone is a principle of multiplication; but as true it is, on the other hand, that conld the poor fellow have got bread by begging, he would not probably have gone ahunting.

Here then it appears, that the very dawning of trade, in the moſt unpoliſhed countries, implies a multiplication. This is enough to point out the firſt ſtep, and to connect the ſubject of our preſent inquiries with what has been already diſcuſſed in relation to other circumſtances.

So ſoon as all the furs are diſpoſed of, and a taſte for ſuperfluity is introduced, both the traders and the natives will be equally intereſted in the advancement of induſtry in this country. Many new objects of profit for the firſt will be diſcovered, which the proper employment of the inhabitants, in reaping the natural advantages of their ſoil and climate, will make effectual. The traders will therefore endeavour to ſet on foot many branches of induſtry among the ſavages, and the allurements of brandy, arms, and clothing, will animate theſe in the purſuit of them.

When once this revolution is brought about; when thoſe who formerly lived in ſimplicity become induſtrious; manners put one a new face.

That is to ſay, we now find two trading nations inſtead of one, with this difference, however, that as hitherto we have ſuppoſed the merchants all in one intereſt, the compound demand, that is, the competition of the buyers, has been, and muſt ſtill continue on the ſide of the natives. This is a great prejudice to their intereſt; but as it is not ſuppoſed ſufficient to check their induſtry, nor to reſtrain their conſumption of the manufactures, let us here examine a little more particularly the conſequences of the principle of demand in ſuch a ſituation; for although we allow, that it can never change ſides, yet it may admit of different modifications, and produce different effects, as we ſhall preſently perceive.

The merchants we ſuppoſe all in one intereſt, conſequently there can be no competition among them; conſequently no check can be put upon their raiſing their prices, as long as the prices they demand are complied with. So ſoon as they are raiſed to the full extent of the abilities of the natives, or of their inclination to buy, the merchants have the choice of three things, which are all perfectly in their option; and the preference to be given to the one or the other, depends entirely upon themſelves, and upon the circumſtances we are going to point out.

Firſt, they may ſupport they *high* demand; that is, not lower their price; which will preſerve a high eſtimation of the manufactures in the opinion of the inhabitants, and render the profits upon their trade the greateſt poſſible. This part they may poſſibly take, if they perceive the natives doubling their diligence, in order to become able, in time, to purchaſe conſiderable cargoes at a high value; from which ſuppoſition is implied a ſtrong diſpoſition in the people to become luxurious, ſince nothing but want of ability prevents them from complying with the higheſt demand: but ſtill another circumſtance muſt concur, to engage the merchants not to lower their price. The great proportion of the goods they ſeek for in return, muſt be found in the hands of a few. This will be the caſe if ſlavery be eſtabliſhed; for then there muſt be many poor, and few rich: and they are commonly the rich conſumers who proportion the price they offer, rather to their deſires, than to the value of the thing.

The ſecond thing which may be done is, to open the door to a *great* demand; that is, to lower their prices. This will ſink the value of the manufactures in the opinion of the inhabitants, and render profits leſs in proportion, although indeed, upon the voyage, the profits may be greater.

This part they will take, if they perceive the inhabitants do not incline to conſume great quantities of the merchandize at a high value, either for want of abilities or inclination; and alſo, if the profits upon the trade depend upon a large conſumption, as is the caſe in merchandize of a low value, and ſuited chiefly to the occaſions of the lower ſort. Such motives of expediency will be ſufficient to make them neglect a *high* demand, and prefer a *great* one; and the more, when there is a likelihood that the conſumption of low-priced goods in the beginning may beget a taſte for others of a higher value, and thus extend in general the taſte of ſuperfluity.

A third part to be taken, is the leaſt politic, and perhaps the moſt familiar. It is to profit by the competition between the buyers, and encourage the riſing of demand as long as poſſible; when this comes to a ſtop, to make a kind of auction, by firſt bringing down the prices to the level of the higheſt bidders, and ſo to deſcend by degrees, in proportion as demand ſinks. Thus we may ſay with propriety, that demand commonly becomes *great*, in proportion as prices ſink. By this operation, the traders will profit as much as poſſible, and ſell off as much of their goods as the profits will permit.

But this plan, in a new diſcovered country, is not politic, as it both diſcovers a covetouſneſs and a want of faith in the merchants, and alſo throws open the ſecrets of their trade to thoſe who ought to be kept ignorant of them.

Let us next ſuppoſe, that the large profits of our merchants ſhall be diſcovered by others, who arrive at the ſame ports in a ſeparate intereſt, and who enter into no combination which might prevent the natural effects of competition.

Let the ſtate of demand among the natives be ſuppoſed the ſame as formerly, both as to *height* and *greatneſs*, in conſequence of the operation of the different principles, which might have induced our merchants to follow one or other of the plans we have been deſcribing; we muſt however ſtill ſuppoſe, that they have been careful to preſerve conſiderable profits upon every branch.

If we ſuppoſe the inhabitants to have increaſed in numbers, wealth, and taſte for ſuperfluity, ſince the laſt voyage, demand will be found rather on the riſing hand. Upon the arrival of the merchants in competition with the former, both will offer to ſale: but if both ſtand to the ſame prices, it is very natural to ſuppoſe, that the former dealers will obtain a preference; as, *cæteris paribus*, it is always an advantage to know and to be known. The laſt comers, therefore, have no other way left to counter-balance this advantage, but to lower their prices.

This is a new phenomenon: here the fall of prices is not voluntary as formerly; nor conſented to from expediency; not owing to a failure of demand, but to the influence of a new principle of commerce, to wit, a double competition, which we ſhall now examine.

Of Double Competition.

WHEN *competition* is much ſtronger on one ſide of the contract than on the other, it is called *ſimple*. This is the ſpecies of competition which is implied in the term *high demand*, or when it is ſaid that *demand raiſes prices*.

Double competition is, when, in a certain degree, it takes place on both ſides of the contract at once, or vibrates alternately from one to the other. This is what reſtrains prices to the adequate value of merchandize.

The great difficulty is to diſtinguiſh clearly between the principles of *demand*, and thoſe of *competition*: here then follows the principal differences between the two, relatively to the effects they produce ſeverally in the mercantile contract of buying and ſelling, which we here expreſs ſhortly by the word *contract*.

Simple demand is what brings the quantity of a commodity to market. Many demand, who do not buy; many offer, who do not ſell. This demand is called *great* or *ſmall*; it is ſaid to *increaſe*, to *augment*, to *ſwell*; and is expreſſed by theſe and other ſynonimous terms, which mark an augmentation or diminution of quantity. In this ſpecies, two people never demand the ſame thing, but a part of the ſame thing, or things quite alike.

Compound demand is the principle which raiſes prices, and never can make them ſink; becauſe in this caſe more than one demands the very ſame thing. It is ſolely applicable to the buyers, in relation to the price they offer. This demand is called *high* or *low*, and is ſaid to *riſe*, to *fall*, to *mount*, to *ſink*, and is expreſſed by theſe and other ſynonimous terms.

Simple competition, when between buyers, is the ſame as *compound* or *high demand*; but differs from it in ſo far, as this may equally take place among ſellers, which *compound demand* cannot; and then it works a contrary effect: it makes prices *ſink*, and is ſynonimous with *low demand*: it is this competition which overturns the balance of work and demand.

Double competition is what is underſtood to take place in almoſt every operation of trade; it is this which prevents their exceſſive riſe of prices; it is this which prevents their exceſſive fall. While *double competition* prevails, the balance is perfect, trade and induſtry flouriſh.

The capital diſtinction, therefore, between the terms *demand* and *competition* is, that *demand* is conſtantly relative to the buyers; and when money is not the price, as in barter, then it is relative to that ſide upon which the greateſt *competition* is found.

We therefore ſay, with regard to *prices*, demand is *high* or *low*. With regard *to the quantity of merchandize*, demand is *great* or *ſmall*. With regard *to competition*, it is always called *great* or *ſmall*, *ſtrong* or *weak*.

Competition is, with equal propriety, applicable to both parties in the contract. A *competition* among buyers is a proper expreſſion; a *competition* among ſellers, who have the merchandize, is fully as eaſily underſtood, tho' it be not quite ſo ſtriking, for reaſons which an example will make plain.

You come to a fair, where you find a great variety of every kind of merchandize, in the poſſeſſion of different merchants. Theſe, by offering their goods to ſale, conſtitute a tacit competition; every one of them wiſhes to ſell in preference to another, and at the ſame time with the beſt advantage to himſelf.

The buyers begin, by cheapning at every ſhop. The firſt price aſked marks the covetouſneſs of the ſeller; the firſt price offered, the avarice of the buyer. From this operation competition begins to work its effects on both ſides, and ſo becomes double. The principles which influence this operation are now to be deduced.

It is impoſſible to ſuppoſe the ſame degree of eagerneſs, either to buy or to ſell, among ſeveral merchants; becauſe the degree of eagerneſs is exactly in proportion to their view of profit; and as theſe muſt neceſſarily be influenced and regulated by different circumſtances, that buyer, who has the beſt proſpect of ſelling again with profit, obliges him, whoſe proſpect is not ſo good, to content himſelf with leſs; and that ſeller, who has bought to the beſt advantage, obliges him, who has paid dearer for the merchandize, to moderate his deſire of gain.

It is from theſe principles, that competition among buyers and ſellers muſt take place. This is what confines the fluctuation of prices within limits which are compatible with the reaſonable profits of both buyers and ſellers; for we muſt conſtantly ſuppoſe the whole operation of buying and ſelling to be performed by merchants; the buyer cannot be ſuppoſed to give ſo high a price as that which he expects to receive, when he diſtributes to the conſumers, nor can the ſeller be ſuppoſed to accept of a lower than that which he paid to the manufacturer. This competition is properly called double, becauſe of the difficulty to determine upon which ſide it ſtands; the ſame merchant may have it in his favour upon certain articles, and againſt him upon others; it is continually in vibration, and the arrival of every poſt may leſs or more pull down the heavy ſcale.

In every tranſaction between merchants, the profit reſulting from the ſale muſt be exactly diſtinguiſhed from the value of the merchandize. The firſt *may* vary, the laſt never *can*. It is this profit alone which can be influenced by competition; and it is for that reaſon we find ſuch uniformity every where in the prices of goods of the ſame quality.

The competition between ſellers does not appear ſo ſtriking, as that between buyers; becauſe he who offers to ſale, appears only paſſive in the firſt operation; whereas the buyers preſent themſelves one after another; they make a demand when the merchandize is refuſed to one at a certain price, a ſecond either offers more, or does not offer all: but ſo ſoon as another ſeller finds his account in accepting the price the firſt had refuſed, then the firſt enters into competition, providing his profits will admit his lowering the firſt price, and thus competition takes place among the ſellers, until the profits upon their trade prevent prices from falling lower.

In all markets this competition is varying, though inſenſibly, on many occaſions; but in others, the vibrations are very perceptible. Sometimes it is found ſtrongeſt on the ſide of the buyers; and in proportion as this grows, the competition between the ſellers diminiſhes. When the competition between the former has raiſed prices to a certain ſtandard, it comes to a ſtop; then the competition changes ſides, and takes place among the ſellers, eager to profit of the higheſt price. This makes prices fall, and according as they fall, the competition among the buyers diminiſhes. They ſtill wait for the loweſt period. At laſt it comes; and then perhaps ſome new circumſtance, by giving the balance a kick, diſappoints their hopes. If therefore it ever happens, that there is but one intereſt upon one ſide of the contract, as in the example in the former ſection, where we ſuppoſed the ſellers united, you perceive, that the riſe of the price, occaſioned by the competition of the buyers, and even its coming to a ſtop, could not poſſibly have the effect of producing any competition on the other ſide; and therefore, if prices come afterwards to ſink, the fall muſt have proceeded from the prudential conſiderations of adapting the price to the faculties of thoſe who, from the height of it, had withdrawn their demand.

From theſe principles of competition, the foreſtalling of markets is made a crime, becauſe it diminiſhes the competition which ought to take place between different people, who have the ſame merchandize to offer to ſale. The foreſtaller buys all up, with an intention to ſell with more profit, as he has by that means taken other competitors out of the way, and appears with a ſingle intereſt on one ſide of the contract, in the face of many competitors on the other. This perſon is puniſhed by the ſtate, becauſe he has prevented the price of the merchandice from becoming juſtly proportioned to the real value; he has robbed the public, and enriched himſelf; and in the puniſhment he makes reſtitution. Here occur two queſtions to be reſolved, for the ſake of illuſtration.

Can competition among buyers poſſibly take place, when the proviſion made is more than ſufficient to ſupply the quantity demanded? On the other hand, can competition take place among the ſellers, when the quantity demanded exceeds the total proviſion made for it?

We think it may in both caſes; becauſe in the one and the other, there is a competition implied on one ſide of the contract, and the very nature of this competition implies a poſſibility of its coming on the other, provided ſeparate intereſts be found upon both ſides. But to be more particular:

1. Experience ſhews, that however juſtly the proportion between the demand and the ſupply may be determined in fact, it is ſtill next to impoſſible to diſcover it exactly, and therefore the buyers can only regulate the prices they offer, by what they may reaſonably expect to ſell for again. The ſellers, on the other hand, can only regulate the prices they expect, by what the merchandize has coſt them when brought to market. We have already ſhewn, how, under ſuch circumſtances, the ſeveral intereſts of individuals affect each other, and make the balance vibrate.

2. The proportion between the ſupply and the demand is ſeldom other than *relative* among merchants, who are ſuppoſed to buy and ſell, not from neceſſity, but from a view to profit. What we mean by *relative* is, that their demand is *great* or *ſmall*, according to prices; there may be a great demand for grain at 35 s. *per* quarter, and no demand at all for it at 40s.; that is, among merchants.

It is eſſential to attend to the ſmalleſt circumſtance in matters of this kind. The circumſtance we mean, is the difference we find in the effect of competition, when it takes place purely among merchants on both ſides of the contract, and when it happens, that either the conſumers mingle themſelves with the merchant-buyers, or the manufacturers, that is, the furniſhers, mingle themſelves with the merchant-ſellers. This combination we ſhall illuſtrate, by the ſolution of another queſtion, and then conclude with a few reflections upon the whole.

Can there be no caſe formed, where the competition upon one ſide may ſubſiſt, without a poſſibility of its taking place on the other, although there ſhould be ſeparate intereſts upon both?

The caſe is hardly ſuppoſable among merchants, who buy and ſell with a view to profit; but it is abſolutely ſuppoſable, and that is all, when the direct conſumers are the buyers; when the circumſtances of one of the parties is perfectly known; and when the competition is ſo ſtrong upon one ſide, as to prevent a poſſibility of its becoming double, before the whole proviſion is ſold off, or the demand ſatisfied. Let us have recourſe to examples.

Grain arriving in a ſmall quantity, at a port where the inhabitants are ſtarving, produces ſo great a competition among the conſumers, who are the buyers, that their neceſſity becomes evident; all the grain is generally bought up before prices can riſe ſo high as to come to a ſtop; becauſe nothing but want of money, that is, an impoſſibility of complying with the prices demanded by the merchants, can reſtrain them: but if you ſuppoſe, even here, that prices come naturally to a ſtop; or that, after ſome time, they fall lower, from prudential conſiderations; then there is a poſſibility of a competition taking place among the ſellers, from the principles above deduced. If, on the contrary, the ſtop is not natural, but occaſioned by the interpoſition of the magiſtrate, from humanity, or the like, there will be no competition, becauſe then the principles of commerce are ſuſpended; the ſellers are reſtrained on one ſide, and they reſtrain the buyers on the other. Or rather, indeed, it is the magiſtrate, or compaſſion, who in a manner fixes the price, and performs the office of both buyer and ſeller.

A better example ſtill may be found, in a competition among ſellers; where it may be ſo ſtrong, as to render a commodity in a manner of no value at all, as in the caſe of an uncommon and unexpected draught of fiſh, in a place of ſmall conſumption, when no preparations have been made for ſalting them. There can be then no competition among the buyers; becauſe the market cannot laſt, and they find themſelves entirely maſters, to give what price they pleaſe, being ſure the ſellers muſt accept of it, or loſe their merchandize. In the firſt example, humanity commonly ſtops the activity of the principle of competition; in the other it is ſtopt by a certain degree of fair-dealing, which forbids the accepting of a merchandize for nothing.

In proportion therefore as the riſing of prices can ſtop demand, or the ſinking of prices can increaſe it, in the ſame proportion will competition prevent either the riſe or the fall from being carried beyond a certain length: and if ſuch a caſe can be put, where the riſing of prices cannot ſtop demand, nor the lowering of prices augment it, in ſuch caſes double competition has no effect; becauſe theſe circumſtances unite the moſt ſeparate intereſts of buyers and ſellers in the mercantile contract; and when upon one ſide there is no ſeparate intereſt, there can then be no competition.

From what has been ſaid, we may form a judgment of the various degrees of competition. A book not worth a ſhilling, a fiſh of a few pounds weight, are often ſold for conſiderable ſums. The buyers here are not merchants. When an ambaſſador leaves a court in a hurry, things are ſold for leſs than the half of their value: he is no merchant, and his ſituation is known. When, at a public market, there are found conſumers, who make their proviſion; or manufacturers, who diſpoſe of their goods for preſent ſubſiſtence; the merchants, who are reſpectively upon the oppoſite ſide of the contract to theſe, profit of their competition; and thoſe who are reſpectively upon the ſame ſide with them, ſtand by with patience, until they have finiſhed their buſineſs. Then matters come to be carried on between merchant and merchant, and then profits may riſe and fall, in the proportion of quantity to demand; that is to ſay, if the proviſion is leſs than the demand, the competition among the demanders, or the riſe of the price, will be in the compound proportion of the falling ſhort of the commodity, and of the proſpect of ſelling again with profit. It is this combination which regulates the competition, and keeps it within bounds. It can affect but the profits upon the tranſaction; the intrinſic value of the commodity ſtands immoveable: nothing is ever ſold below the real value; nothing is ever bought for more than it may probably bring. We mean in general. Whereas, ſo ſoon as conſumers and needy manufacturers mingle in the operation, all proportion is loſt. The competition between them is too ſtrong for the merchants; the balance vibrates by jerks. In ſuch markets merchants ſeldom appear: the principal objects there, are the fruits and productions of the earth, and articles of the firſt neceſſity for life, not manufactures ſtrictly ſo called. A poor fellow often ſells, to purchaſe bread to eat; not to pay what he did eat while he was employed in the work he diſpoſes of. The conſumer often meaſures the value of what he is about to purchaſe, by the weight of his purſe, and his deſire to conſume.

Of what is called Expence, Profit, and Loſs.

The term *expence*, when ſimply expreſſed, without any particular relation, is always underſtood to be relative to money. This kind is diſtinguiſhed under the three heads of *private*, *public*, and *national*.

1. *Private* expence is, what a private perſon, or private ſociety, lays out, either to provide articles of conſumption, or ſomething more permanent, which may be conducive to their eaſe, convenience, or advantage. Thus we ſay, *a large domeſtic expence*, relative to one who ſpends a great income. We ſay, a merchant has been at *great expence* for magazines, for living, for clerks, *&c.* but never that he has been at any in buying goods. In the ſame way a manufacturer may expend for building, machines, horſes, and carriages, but never for the matter he manufactures. When a thing is bought, in order to be ſold again, the ſum employed is called money *advanced*; when it is bought not to be ſold, it may be ſaid to be *expended*.

2. *Public expence* is, the employment of that money, which has been contributed by individuals, for the current ſervice of the ſtate. The contribution, or gathering it together, repreſents the effects of many articles of *private expence*; the laying it out when collected, is *public expence*.

3. *National expence*, is what is expended out of the country: this is what diminiſhes national wealth. The principal diſtinction to be here attended to, is between *public expence*, or the laying out of public money, and *national expence*, which is the alienating the nation's wealth in favour of ſtrangers. Thus the greateſt *public expence* imaginable. may be no national expence; becauſe the money may remain at home. On the other hand, the ſmalleſt *public*, or even *private expence*, may be a national expence; becauſe the money may go abroad.

Profit and *loſs* is divided into *poſitive*, *relative*, and *compound*. *Poſitive profit*, implies no loſs to any body; it reſults from an augmentation of labour, induſtry, or ingenuity, and has the effect of ſwelling or augmenting the public good.

Poſitive loſs, implies no profit to any body; it is what reſults from the ceſſation of the former, or of the effects reſulting from it, and may be ſaid to diminiſh the public good.

Relative profit, is what implies a loſs to ſome body; it marks a vibration of the balance of wealth between parties, but implies no addition to the general ſtock.

Relative loſs, is what, on the contrary, implies a profit to ſome body; it alſo marks a vibration of the balance, but takes nothing from the general ſtock.

The *compound* is eaſily underſtood; it is that ſpecies of profit and loſs which is partly *relative*, and partly *poſitive*.

The general Conſequences reſulting to a trading Nation, upon the opening of an active foreign Commerce.

A NATION which remains paſſive in her commerce, is at the mercy of thoſe who are active, and muſt be greatly favoured, indeed, by natural advantages, or by a conſtant flux of gold and ſilver from her mines, to be able to ſupport a correſpondence, not entirely hurtful to the augmentation of her wealth.

When we look upon the wide field which here opens to our view, we are perplexed with too great a variety of objects. In one part, we ſee a decent and comely beginning of induſtry; wealth flowing gently in, to recompence ingenuity; numbers both augmenting, and every one becoming daily more uſeful to another; agriculture proportionally extending itſelf; no violent revolutions; no exorbitant profits; no inſolence among the rich; no exceſſive miſery among the poor; multitudes employed in producing; great oeconomy upon conſumption; and all the inſtruments of luxury, daily produced by the hands of the diligent, going out of the country for the ſervice of ſtrangers; not remaining at home for the gratification of ſenſuality. At laſt the augmentations come inſenſibly to a ſtop. Then theſe rivers of wealth, which were in briſk circulation through the whole world, and which returned to this trading nation as blood returns to the heart, only to be thrown out again by new pulſations, begin to be obſtructed in their courſe; and flowing abroad more ſlowly than before, come to form ſtagnations at home. Theſe, impatient of reſtraint, ſoon burſt out into domeſtic circulation. Upon this cities ſwell in magnificence of buildings; the face of the country is adorned with palaces, and becomes covered with groves; luxury ſhines triumphant in every part; inequality becomes more ſtriking to the eye; and want and miſery appear more deformed, from the contraſt: even fortune grows more whimſical in her inconſtancy; the beggar of the other day, now rides in his coach; and he who was born in a bed of ſtate, is ſeen to die in a goal, or in an alms-houſe. Such are the effects of great domeſtic circulation.

The ſtateſman looks about with amazement; he, who was wont to conſider himſelf as the firſt man in the ſociety in every reſpect, perceives himſelf, perhaps, eclipſed by the luſtre of private wealth, which avoids his graſp when he attempts to ſeize it. This makes his government more complex and more difficult to be carried on; he muſt now avail himſelf of art and addreſs, as well as of power and force. By the help of cajoling and intrigues, he gets a little into debt; this lays a foundation for public credit, which, growing by degrees, and in its progreſs aſſuming many new forms, becomes, from the moſt tender beginnings, a moſt formidable monſter, ſtriking terror into thoſe who cheriſhed it in its infancy. Upon this, as upon a triumphant war-horſe, the ſtateſman gets a-ſtride; he then appears formidable a-new; his head turns giddy; he is choaked with the duſt he has raiſed; and at the moment he is ready to fall, to his utter aſtoniſhment and ſurprize, he finds a ſtrong monied intereſt, of his own creating, which, inſtead of ſwallowing him up as he apprehended, flies to his ſupport. Through this he gets the better of all oppoſition, he eſtabliſhes taxes, multiplies them, mortgages his fund of ſubſiſtence; either becomes a bankrupt, and riſes again from his aſhes; or if he be leſs audacious, he ſtands trembling and tottering for a while on the brink of the political precipice. From one or the other of theſe perilous ſituations, he begins to diſcover an endleſs path, which, after a multitude of windings, ſtill returns into itſelf, and continues an equal courſe through this vaſt labyrinth.

It is now full time to leave off rhapſody, and return to reaſoning and cool inquiry, concerning the more immediate and more general effects and revolutions produced by the opening of a foreign trade in a nation of induſtry.

The firſt and moſt ſenſible alteration will be an increaſe of demand for manufacturers, becauſe by ſupplying the wants of ſtrangers, the number of conſumers will now be conſiderably augmented. What again will follow upon this, muſt depend upon circumſtances.

If this revolution in the ſtate of demand ſhould prove too violent, the conſequence of it will be to *raiſe* demand; if it ſhould prove gradual, it will *increaſe* it. This diſtinction is well underſtood, and the conſequence appears juſt: for, if the ſupply do not increaſe in proportion to the demand, a competition will enſue among the demanders; which is the common effect of ſuch ſudden revolutions. If, on the other hand, a gentle increaſe of demand ſhould be accompanied with a proportional ſupply, the whole induſtrious ſociety will grow in vigour, and in wholſome ſtature, without being ſenſible of any great advantage or inconveniency; the change of their circumſtances will even be imperceptible.

The immediate effects of the violent revolution will, in this example, be flattering to ſome, and diſagreeable to others. Wealth will be found daily to augment, from the riſing of prices, in many branches of induſtry. This will encourage the induſtrious claſſes, and the idle conſumers at home will complain. We have already dwelt abundantly long upon the effects reſulting from this to the lower claſſes of the people, in providing them with a certain means of ſubſiſtence. Let us now examine in what reſpect even the higher claſſes will be made likewiſe to feel the good effects of this general change, although at firſt they may ſuffer a temporary inconveniency from it.

Farmers, as has been obſerved, will have a greater difficulty in finding ſervants, who, inſtead of labouring the ground, will chuſe to turn themſelves to manufactures. This we have conſidered in the light of purging the lands of ſuperfluous mouths; but every conſequence in this great chain of politics draws other conſequences after it, and as they follow one another, things put on different faces, which affect claſſes differently. The purging of the land is but one of the firſt; here follows another.

The deſertion of the lands employed in a trifling agriculture will at firſt, no doubt, embarraſs the farmers; but in a little time every thing becomes balanced in a trading nation, becauſe *here* every *induſtrious* man muſt advance in proſperity, in ſpite of all general combinations of circumſtances.

In the caſe before us, the relative profits upon farming muſt ſoon become greater than formerly, becauſe of this additional expence which muſt affect the whole claſs of farmers; conſequently, this additional expence, inſtead of turning out to be a loſs to either landlord or farmer, will, after ſome little time, turn out to the advantage of both: becauſe the produce of the ground, being indiſpenſably neceſſary to every body, muſt in every article increaſe in its value. Thus in a ſhort time accounts will be nearly balanced on all hands; that is to ſay, the ſame proportion of wealth will, *cæteris paribus*, continue the ſame among the induſtrious. We ſay among the induſtrious; for thoſe who are either idle, or even negligent, will be great loſers.

A proprietor of land, inattentive to the cauſes of his farmer's additional expence, may very imprudently ſuffer his rents to fall, inſtead of aſſiſting him on a proper occaſion, in order to make them afterwards riſe the higher.

Thoſe who live upon a determined income in money, and who are nowiſe employed in traffic, nor in any ſcheme of induſtry, will, by the augmentation of prices, be found in worſe circumſtances than before.

In a trading nation every man muſt turn his talents to account, or he will undoubtedly be left behind in this univerſal emulation, in which the moſt induſtrious, the moſt ingenious, and the moſt frugal will conſtantly carry off the prize.

This conſideration ought to be a ſpur to every body. The richeſt men in a trading nation have no ſecurity againſt poverty; we mean proportional poverty; for though they diminiſh nothing of their income, yet, by not increaſing it in proportion to others, they loſe their rank in wealth, and from the firſt claſs in which they ſtood they will ſlide inſenſibly down to a lower.

There is one conſequence of an additional beneficial trade, which raiſes demand and increaſes wealth; but if we ſuppoſe no proportional augmentation of ſupply, it will prove at beſt but an airy dream which laſts for a moment, and when the gilded ſcene is paſſed away, numberleſs are the inconveniencies which are ſeen to follow.

We ſhall now point out the natural conſequences of this augmentation of wealth drawn from foreign nations, when the ſtateſman remains inattentive to increaſe the ſupply both of food and manufactures, in proportion to the augmentation of mouths, and of the demand for the produce of induſtry.

In ſuch a ſituation profits will daily ſwell, and every ſcheme for reducing them within the bounds of moderation, will be looked upon as a hurtful and unpopular meaſure: be it ſo; but let us examine the conſequences.

We have ſaid, that the riſe of demand for manufactures naturally increaſes the value of work: now we muſt add, that under ſuch circumſtances, the augmentation of riches, *in a country, either not capable of improvement as to the ſoil, or where precautions have not been taken for facilitating a multiplication of inhabitants, by the importation of ſubſiſtence*, will be productive of the moſt calamitous conſequences.

On one ſide, this wealth will effectually diminiſh the maſs of the food before produced; and on the other, will increaſe the number of uſeleſs conſumers. The firſt of theſe circumſtances will raiſe the demand for food; and the ſecond will diminiſh the number of uſeful free hands, and conſequently raiſe the price of manufactures: here are ſhortly the outlines of this progreſs.

The more rich and luxurious a people are, the more delicate they become in their manner of living; if they fed on bread formerly, they will now feed on meat; if they fed on meat, they will now feed on fowl. The ſame ground which feeds a hundred with bread, and a proportional quantity of animal food, will not maintain an equal number of delicate livers. Food muſt then become more ſcarce; demand for it riſes; the rich are always the ſtrongeſt in the market; they conſume the food, and the poor are forced to ſtarve. Here the wide door to modern diſtreſs opens; to wit, a hurtful competition for ſubſiſtence. Farther, when a people become rich, they think leſs of œconomy; a number of uſeleſs ſervants are hired, to become an additional dead weight on conſumption; and when their ſtarving countrymen cannot ſupply the extravagance of the rich ſo cheaply as other nations, they either import inſtruments of foreign luxury, or ſeek to enjoy them out of their own country, and thereby make reſtitution of their gains.

Is it not therefore evident, that if, before things come to this paſs, additional ſubſiſtence be not provided by one method or other, the number of inhabitants muſt diminiſh; although riches may daily increaſe by a balance of additional matter, ſuppoſed to be brought into the country in conſequence of the hitherto beneficial foreign trade. This is not all. We ſay farther, that the beneficial trade will laſt for a time only. For the infallible conſequence of the riſe of prices at home will be, that thoſe nations which at firſt conſumed your manufactures, perceiving the gradual increaſe of their price, will begin to work for themſelves; or finding out your rivals who can ſupply them cheaper, will open their doors to them. Theſe again, perceiving the great advantages gained by your traders, will begin to ſupply the market; and ſince every thing muſt be cheaper in countries where we do not ſuppoſe the concurrence of all the circumſtances mentioned above, theſe nations will ſupplant you, and be enriched in their turn.

Here comes a new revolution. Trade is come to a ſtop: what then becomes of all the hands which were formerly employed in ſupplying the foreign demands?

Were revolutions ſo ſudden as we are obliged to repreſent them, all would go to wreck; in proportion as they happen by quicker or ſlower degrees, the inconveniencies are greater or ſmaller.

Prices, we have ſaid, are made to riſe by competition. If the competition of the ſtrangers was what raiſed them, the diſtreſs upon the manufacturers will be in proportion to the ſuddenneſs of their deſerting the market. If the competition was divided between the ſtrangers and the home-conſumers, the inconveniencies which enſue will be leſs; becauſe the deſertion of the ſtrangers will be in ſome meaſure made up by an increaſe of home-conſumption which will follow upon the fall of prices. And if, in the third caſe, the natives have been ſo imprudent, as not only to ſupport a competition with the ſtrangers, and thereby diſguſt them from coming any more to market, but even to continue the competition between themſelves, the whole *loſs* ſuſtained by the revolution will be national. Wealth will ceaſe to augment; but the inconveniencies, in place of being felt by the manufacturers, will only affect the ſtate; thoſe will continue in affluence, extolling the generoſity of their countrymen, and deſpiſing the poverty of the ſtrangers who had enriched them.

Domeſtic luxury will here prove an expedient for preſerving from ruin the induſtrious part of a people, who in ſubſiſting themſelves had enriched their country. No change will follow in their condition; they will go on with a painful aſſiduity to labour, and if the conſequences of it become now hurtful to one part of the ſtate, they muſt at leaſt be allowed to be eſſentially neceſſary for the ſupport of the other.

But that luxury is no neceſſary concomitant of foreign trade, in a nation where the true principles of it are underſtood, will appear very plain, from a contraſt we are now going to point out, in the example of a modern ſtate, renowned for its commerce and frugality. The country is Holland.

A ſet of induſtrious and frugal people were aſſembled in a country by nature ſubject to many inconveniencies, the moving of which neceſſarily employed abundance of hands. Their ſituation upon the continent, the power of their former maſters, and the ambition of their neighbours, obliged them to keep great bodies of troops. Theſe two articles added to the numbers of the community, without either enriching the ſtate by their labour exported, or producing food for themſelves or countrymen.

The ſcheme of a commonwealth was calculated to draw together the induſtrious; but it has been ſtill more uſeful in ſubſiſting them: the republican form of government being there greatly ſubdivided, veſts authority ſufficient in every part of it, to make ſuitable proviſion for their own ſubſiſtence; and the tie which unites them, regards only matters of public concern. Had the whole been governed by one ſovereign, or by one council, this important matter never could have been effectuated.

It would be impoſſible for the moſt able miniſter that ever lived, to provide nouriſhment for a country ſo extended as France, or even as England, ſuppoſing theſe as fully peopled as Holland is: even although it ſhould be admitted that a ſufficient quantity of food might be found in other countries for their ſubſiſtence. The enterpriſe would be too great, abuſes would multiply; the conſequence would be, that the inhabitants would die for want. But in Holland the caſe is different, every little town takes care of its own inhabitants; and this care being the object of application and profit to ſo many perſons, is accompliſhed with ſucceſs.

When once it is laid down as a maxim in a country, that food muſt of neceſſity be got from abroad in order to feed the inhabitants at home, the corn-trade becomes conſiderable, and at the ſame time certain, regular, and permanent. This was the caſe in Holland: as the inhabitants were induſtrious, the neceſſary conſequence has been, a very extraordinary multiplication; and at the ſame time ſuch an abundance of grain, that, inſtead of being in want themſelves, they often ſupply their neighbours. There are many examples of England's being ſupplied with grain from thence, and, which is ſtill more extraordinary, from the re-exportation of the very produce of its own fruitful ſoil.

It is therefore evident, that the only way to ſupport induſtry, is to provide a ſupply of ſubſiſtence, conſtantly proportional to the demand that may be made for it. This is a precaution indiſpenſably neceſſary for preventing hurtful competition. This is the particular care of the Dutch: ſo long as it can be effectual, their ſtate can fear no decline; but whenever they come to be diſtreſſed in the markets, upon which they depend for ſubſiſtence, they will ſink into ruin. It is by mere dint of frugality, cheap and parſimonious living, that the navigation of this induſtrious people is ſupported. Conſtant employment, and an accumulation of almoſt imperceptible gains, fills their coffers with wealth, in ſpite of the large outgoings to which their own proper nouriſhment yearly forces them. The large profits upon induſtry in other countries, which are no proof of generoſity, but a fatal effect of a ſcanty ſubſiſtence, is far from dazzling their eyes. They ſeldom are found in the liſt of competitors at any foreign port; if they have their cargo to diſpoſe of, they wait with pleaſure in their own veſſels, conſuming their own proviſions, and at laſt accept of what others have left. It may be ſaid, that many other circumſtances concur in favour of the Dutch, beſides the article of ſubſiſtence.

Without diſputing this matter, it may be obſerved, that if a computation be made of the hands employed in providing ſubſiſtence, and of thoſe who are ſeverally taken up in ſupplying every other want, their numbers will be found nearly to balance one another in the moſt luxurious countries. From this we may conclude, that the article of food, among the lower claſſes, muſt bear a very high proportion to all the other articles of their conſumption; and therefore a diminution upon the price of ſubſiſtence, muſt be of infinite conſequence to manufacturers, who are obliged to buy it. From this conſideration, let us judge of the conſequence of ſuch augmentations upon the price of grain as are familiar to us; 30 or 40 *per cent.* ſeems nothing. Now this augmentation operates upon two thirds, at leaſt, of the whole expence of a labouring man: let any one who lives in tolerable affluence make the application of this to himſelf, and examine how he would manage his affairs if, by accidents of rains or winds, his expences were to riſe 30 *per cent.* without a poſſibility of reſtraining them; for this is unfortunately the caſe with all the lower claſſes. From whence it may be concluded, that the keeping food cheap, and ſtill more the preſerving it at all times at an equal ſtandard, is the fountain of the wealth of Holland; and that any hurtful competition in this article muſt beget a diſorder which will affect the whole of the manufacturers of a ſtate.

COMMINATORY, an appellation given to whatever threatens puniſhment, or ſome penalty.

COMMINUTION, denotes the breaking, or rather grinding, a body to very ſmall particles.

COMMISSARY, in the eccleſiaſtical law, an officer of the biſhop, who exerciſes ſpiritual juriſdiction in places of a dioceſe ſo far from the epiſcopal ſee, that the chancellor cannot call the people to the biſhop's principal conſiſtory court, without giving them too much inconveniency.

COMMISSARY-*court*, in Scots law, a court originally conſtituted by the biſhops for executing in their name an uſurped juriſdiction, and was anciently called the *biſhops court, curia Chriſtianitatis*, or *conſiſtorial court*. This court was new-modelled by Queen Mary at the Reformation, and continues till this day. See SCOTS LAW, title, *Eccleſiaſtical perſons*.

COMMISSARY, in a military ſenſe, is of three ſorts.

COMMISSARY-*general of the muſters*, an officer appointed to muſter the army, as often as the general thinks proper, in order to know the ſtrength of each regiment and company, to receive and inſpect the muſter-rolls, and to keep an exact ſtate of the ſtrength of the army.

COMMISSARY-*general of ſtores*, an officer in the artillery, who has the charge of all the ſtores, for which he is accountable to the office of ordnance.

COMMISSARY-*general of proviſions*, an officer who has the inſpection of the bread and proviſions of the army.

COMMISSION, in common-law, the warrant or letters patent which all perſons exerciſing juriſdiction have to empower them to hear or determine any cauſe or ſuit: as, the commiſſion of the judges, &c.

COMMISSION *of bankruptcy*, is the commiſſion that iſſues from the lord chancellor, on a perſon's becoming a bankrupt within any of the ſtatutes, directed to certain commiſſioners appointed to examine into it, and to ſecure the bankrupt's lands and effects for the ſatisfaction of his creditors.

COMMISSION *of lunacy* iſſues out of the court of chancery, to inquire whether a perſon repreſented to be a lunatic be ſo or not.

COMMISSION, in commerce. See FACTORAGE.

COMMISSIONER, a perſon authoriſed by commiſſion, letters-patent, or other lawful warrant, to examine any matters, or execute any public office, &c.

Beſides thoſe relating to judicial proceedings, there are

COMMISSIONERS *of the cuſtoms*. See CUSTOMS.

COMMISSIONERS *of exciſe*. See EXCISE.

COMMISSIONERS *of the navy*. See NAVY.

Lords COMMISSIONERS *of the treaſury*. See TREASURY and EXCHEQUER.

COMMITTEE, one or more perſons, to whom the conſideration or ordering of a matter is referred, either by ſome court, or by the conſent of parties, to whom it belongs.

COMMITTEE *of parliament*, a certain number of members appointed by the houſe, for the examination of a bill, making a report of an inquiry, proceſs of the houſe, &c.

When a parliament is called, and the ſpeaker and members have taken the oaths, there are committees appointed to ſit on certain days, *viz.* the committee of privileges and elections, of religion, of trade, &c. which are ſtanding committees.

Sometimes the whole houſe reſolves itſelf into a committee; on which occaſion each perſon has a right to ſpeak and reply as often as he pleaſes, which is not the caſe when a houſe is not in a committee.

COMMIXTION, in Scots law, is a method of acquiring property, by mixing or blending together different ſubſtances belonging to different proprietors. If this commixtion was made without the conſent of the different proprietors, and the materials cannot again be disjoined, it draws after it the property of the materials. See SCOTS LAW, title, *Diviſion of rights.*

COMMODATE, in Scots law, is a gratuitous loan, wherein the property of the thing but continues with the lender, and only the uſe of it given to the borrower, who muſt reſtore the individual thing borrowed. See SCOTS LAW, title, *Obligations and contracts in general.*

COMMODITY, in a general ſenſe, denotes all ſorts of wares and merchandizes whatſoever that a perſon deals or trades in.

Staple COMMODITIES, ſuch wares and merchandizes as are commonly and readily ſold in a market, or exported abroad: being, for the moſt part, the proper produce or manufacture of the country.

COMMODORE, in maritime affairs, an officer of the Britiſh navy, commiſſioned by the lords of the admiralty, or by an admiral, to command a ſquadron of men of war in chief.

COMMON, ſomething that belongs to all alike, in contradiſtinction to proper, peculiar, *&c.*

COMMON COUNCIL. COUNCIL.

COMMON LAW, that body of rules received as law in England, before any ſtatute was enacted in parliament to alter the ſame. See LAW.

COMMON-PLACE BOOK, is a regiſter of what things occur, worthy to be noted, in the courſe of a man's thinking or ſtudy, ſo diſpoſed, as that, among a number of ſubjects, any one may be eaſily found. The advantages of making a common-place book are many: it not only makes a man read with accuracy and attention, but induces him inſenſibly to think for himſelf, provided he conſiders it not ſo much as a regiſter of ſentiments that ſtrike him in the courſe of reading, but as a regiſter of his own thoughts upon various ſubjects. Many valuable thoughts occur even to men of no extraordinary genius. Theſe, without the aſſiſtance of a common place-book, are generally loſt both to himſelf and others. There are various methods of arranging common-place books; that of Mr Locke is as good as any that have hitherto been contrived.

The firſt page of the book you intend to take down their *common-place* in, is to ſerve as a kind of index to the whole; and to contain references to every place or matter therein: in the commodious contrivance of which index, ſo as it may admit of a ſufficient copia or variety of materials, without any confuſion, all the ſecret of the method conſiſts.

In order to this, the firſt page, as already mentioned, or, for more room, the two firſt pages that front each other, are to be divided, by parallel lines, into 25 equal parts; whereof, every fifth line to be diſtinguiſhed, by its colour or other circumſtance. Theſe lines are to be cut perpendicularly by others, drawn from top to bottom; and in the ſeveral ſpaces thereof, the ſeveral letters of the alphabet, both capital and minuſcule, are to be duly wrote.

The form of the lines and diviſions, both horizontal and perpendicular, with the manner of writing the letters therein, will be conceived from the following ſpecimen; wherein, what is to be done in the book for all the letters of the alphabet, is here ſhewn in the firſt four, *A*, *B*, *C*, and *D*.

	a			*a*	
	e			*e*	
A	*i*		*C*	*i*	
	o			*o*	
	u			*u*	
	a			*a*	
	e 2. 3			*e*	
B	*i*		*D*	*i*	
	o			*o*	
	u			*u*	

The index of the *common-place* book thus formed, matters are ready for the taking down any thing therein.

In order to this, conſider to what head the thing you would enter is moſt naturally referred; and under which one would be led to look for ſuch a thing: in this head, or word, regard is had to the initial letter, and the firſt vowel that follows it; which are the characteriſtic letters whereon all the uſe of the index depends.

Suppoſe, (*e. gr.*) I would enter down a paſſage that refers to the head *Beauty*; *B*, I conſider, is the initial letter, and *e* the firſt vowel: then, looking upon the index for the partition *B*, and therein the line *e*, (which is the place for all words whoſe firſt letter is *B*, and firſt vowel *e*; as *Beauty*, *Beneficence*, *Bread*, *Breeding*, *Blemiſhes*,) and finding no numbers already down to direct me to any page of the the book where words of this characteriſtic have been entered, I turn forward to the firſt blank page I find, which, in a freſh book, as this is ſuppoſed to be, will be page 2, and here write what I have occaſion for on the head *Beauty*; beginning the head in the margin, and indenting all the other ſubſervient lines, that the head may ſtand out and ſhew itſelf: this done, I enter the page where it is wrote, *viz.* 2, in the index, in the ſpace, *B e*; from which time, the claſs *B e* becomes wholly in poſſeſſion of the 2d and 3d pages, which are conſigned to letters of this characteriſtic.

Had I found any page or number already entered in the ſpace *B e*, I muſt have turned to the page, and have wrote my matter in what room was left therein: ſo, if after entering the paſſage on beauty, I ſhould have occaſion for *benevolence*, or the like, finding the number 2 already poſſeſſed of the ſpace of this characteriſtic, I begin the paſſage on benevolence in the remainder of the page, which not containing the whole, I carry it on to page 3, which is alſo for *B e*; and add the number 3 in the index.

COMMON PLEAS is one of the king's courts now held conſtantly in Weſtminſter hall, but in former times was moveable.

All civil cauſes, as well real as perſonal, are, or were formerly, tried in this court, according to the ſtrict law of the land. In perſonal and mixed actions it has a concurrent juriſdiction with the king's bench, but has no cognizance of pleas of the crown. The actions belonging to the court of common pleas come thither by original, as arreſts and outlawries; or by privilege, or attachment for or againſt privileged perſons; or out of inferior courts, not of record, by *pone*, *recordari*, *accedas ad curiam*, writ of falſe judgment, *&c.* The chief judge of this court is called lord chief juſtice of the common pleas, who is aſſiſted by three other judges: the other officers of the court are the *cuſtos brevium*, who is the chief clerk; three prothonotaries, and their ſecondaries; the clerk of the warrants, clerk of the eſſoins, fourteen filazers, four exigentors, a clerk of the juries, the chirographer, the clerk of the king's ſilver, clerk of the treaſury, clerk of the ſeal, clerk of the outlawries, clerk of the inrolment of fines and recoveries, and clerk of the errors.

Common, in law, that ſoil, the uſe of which is common to this or that town or lordſhip. There is common of paſture for cattle, and alſo common of fiſhing, common of eſtovers, common of turbary, *&c.*

Common prayer is the liturgy in the church of England. Clergymen are to uſe the public form of prayers preſcribed by the Book of Common Prayer; and refuſing to do ſo, or uſing any other public prayers, are puniſhable by 1 Eliz. c. ii.

Common, in grammar, denotes the gender of nouns, which are equally applicable to both ſexes: thus *parens*, a parent, is of the common gender.

Common, in geometry, is applied to an angle, line, or the like, which belongs equally to two figures.

Common divisor, a quantity or number which exactly divides two or more other quantities or numbers, without leaving any remainder.

COMMONER, or **Gentleman Commoner**, in the univerſities, a ſtudent entered in a certain rank.

COMMONS, or **House of commons** a denomination given to the lower houſe of parliament. See Parliament.

Commons, or **Commonalty**, likewiſe ſignifies the whole body of the people under the degree of a baron, whether knights, gentlemen, burgeſſes, yeomen, *&c.*

Doctors **Commons**, See College *of civilians*.

Proctor of the **Commons**. See Proctor.

COMMONTY, in Scots law, ſometimes ſignifies lands belonging to two or more common proprietors; ſometimes a heath or muir though it ſhould belong in property to one, if there has been a promiſcuous poſſeſſion upon it by paſturage; and the act 1695 mentions *commonties* belonging in property to the king and to royal borroughs. See title, *Obligations ariſing from conſent*.

COMMONWEALTH. See Republic.

COMMUNICATION, in a general ſenſe, the act of imparting ſomething to another.

Communication is alſo uſed for the connection of one thing with another, or the paſſage from one place to another: thus a gallery is a communication between two apartments.

Communication *of idioms*, in theology, the act of imparting the attributes of one of the natures in Jeſus Chriſt to the other.

Communication *of motion*, the act whereby a body at reſt is put into motion by a moving body; or, it is the acceleration of motion in a body already moving. See Mechanics,

Lines of **Communication**, in military matters, trenches made to continue and preſerve a ſafe correſpondence between two forts or poſts; or at a ſiege, between two approaches, that they may relieve one another.

COMMUNION, in matters of religion, the being united in doctrine and diſcipline; in which ſenſe of the word, different churches are ſaid to hold communion with each other.

In the primitive chriſtian church, every biſhop was obliged, after his ordination, to ſend circular letters to foreign churches, to ſignify that he was in communion with them. The three grand communions into which the Chriſtian church is at preſent divided, is that of the church of Rome, the Greek church, and the Proteſtant church: but originally all Chriſtians were in communion with each other, having one common faith and diſcipline.

Communion is alſo uſed for the act of communicating in the ſacrament of the euchariſt, or the Lord's ſupper. See Religion.

Communion service, in the liturgy of the church of England, the office for the adminiſtration of the holy ſacrament, extracted from ſeveral ancient liturgies, as thoſe of St Baſil, St Ambroſe, *&c.*

By the laſt rubric, part of this ſervice is appointed to be read every ſunday and holyday, after the morning prayer, even though there be no communicants.

COMMUNITY, a ſociety of men living in the ſame place, under the ſame laws, the ſame regulations, and the ſame cuſtoms.

Commutation, in law, the change of a penalty or puniſhment from a greater to a leſs; as when death is commuted for baniſhment, *&c.*

COMORIN, or **Cape Comorin**, the moſt ſoutherly promontary of the hither India, lying north-weſt of the iſland of Ceylon.

COMPACT, in phyſiology, is ſaid of bodies which are of a cloſe, denſe, and heavy texture, with few pores, and very ſmall.

Company, in a commercial ſenſe, is a ſociety of merchants, mechanics, or other traders, joined together in one common intereſt.

When there are only two or three joined in this manner, it is called a partnerſhip; the term *company* being reſtrained to ſocieties conſiſting of a conſiderable number of members, aſſociated together by a charter obtained from the prince.

The mechanics of all corporations, or towns incorporated, are thus erected into companies, which have charters of privileges and large immunities.

We ſhall here give ſome account of the principal companies of merchants, ſome of which trade with joint ſtocks, and all of them enjoy by charter many excluſive privileges: for however injurious theſe companies may, at this time of day, be reckoned to the nation in general, yet it is certain, that they were the original parents of all our foreign commerce: private traders upon their own bottom being diſcouraged from hazarding their fortunes in foreign countries, till the methods of traffic had been ſettled by joint-ſtock companies: and from this very principle it is, that we find ſeveral nations at preſent endeavouring to extend their trade by the ſame means. The moſt ancient trading company, in Britain, is the Hamburgh company, originally called merchants of the ſtaple, and afterwards merchant-adventurers: they were incorporated by king Edward IV. from which time they traded with ſucceſs till the reign of queen Elizabeth, who, for a farther encouragement of their induſtry, not only confirmed, but inlarged their privileges. However, it ought to be obſerved, that this trade is now open to private merchants, upon paying a very ſmall ſum to the company. The company of this kind, next incorporated, was that of the Ruſſia-merchants; who having improved their trade and commerce in thoſe remote parts, were incorporated by Edward VI. greatly encouraged by queen Mary, and had their confirmation, with an enlargement of their privileges, from Elizabeth. This company is not very conſiderable at preſent; the trade of thoſe parts being moſtly carried on by private merchants, on paying the ſum of 5 l. to the company.

The Eaſtland-company, formerly called merchants of Elbin, were encorporated by queen Elizabeth, and by her greatly encouraged; but, like the former company, it is now become inconſiderable, the trade of Norway and Sweden being laid open by act of parliament.

The Turkey, or Levant-company, was likewiſe incorporated by the ſame princeſs, and its charter confirmed and enlarged by king James I. who impowered them to trade to the Levant, or eaſtern parts of the Mediterranean; particularly to Smyrna, Aleppo, Alexandria, Grand-Cairo, and the other parts of the Turkiſh dominions. But this trade is now alſo laid open to private merchants, upon paying a ſmall conſideration.

The next in order is the Eaſt-India company, firſt incorporated in the year 1600, and impowered to trade to all countries lying eaſtward of the cape of Good Hope. Towards the end of king William's reign, an act of parliament paſſed, granting all private merchants, who ſhould raiſe a certain ſum for the ſupply of the government, the privilege of trading to theſe parts. Accordingly, a great many ſubſcribed, and were called the new Eaſt-India-company; which ſoon found it neceſſary to unite with the old one, and trade with one joint ſtock: ſince which time, they have been ſtyled the united Eaſt-India-company; and are at preſent in a flouriſhing condition, and in poſſeſſion of many conſiderable forts and factories on the coaſt of Malabar, the Coromandel-coaſt, the bay of Bengal, *&c.*

The royal African-company was firſt erected in the year 1661, with an excluſive privilege to trade from cape Blanc, on the coaſt of Africa, in 20° N. lat. as far as the cape of Good Hope. But this trade is now laid open by act of parliament.

The Eaſtland-company, the Greenland-company, the Hudſon's-bay company, the South-ſea-company, have likewiſe their ſeveral charters and privileges for trading to the places from which they take their denominations.

Theſe are the principal trading company's belonging to the crown of Great Britain; and of a ſimilar nature are the Dutch Eaſt and Weſt India companies, the French Eaſt and Weſt India companies, *&c.*

Concerning theſe companies, it may be proper to remark, that however neceſſary they might be in the infancy of trade, they are now looked upon by moſt men in the light of monopolies: hence it is, that their privileges have from time to time been leſſened, in order to eſtabliſh an abſolutely free and general trade; and experience hath ſhewn, that the trade of the nation has advanced in proportion as monopolies have beed laid aſide. Indeed, to carry on trade with diſtant countries, where forces and forts are to be maintained, a company with a joint ſtock ſeems neceſſary; or, at leaſt, certain duties ought to be paid by all who trade thither, towards defraying the ſaid expences: for not to ſpeak of the Eaſt-India, Hudſon's bay, *&c.* companies, the expence of maintaining whoſe forts muſt be very conſiderable, even the Turkey, Hamburgh, Muſcovy, and Eaſtland companies, which do not trade with a joint ſtock, are nevertheleſs obliged to be at conſiderable charges, in making preſents to the grand ſeignior and his miniſters, maintaining conſuls, *&c.* It would therefore be injuſtice that any ſhould trade to the places within their charters, without paying the ſame duties towards the company's charge, as the preſent adventurers pay; but then there appears to be no reaſon why any of the king's ſubjects ſhould be barred from trading to thoſe places, or forced to pay a great fine for admiſſion, that are willing to pay the company's duties, and ſubmit to their regulations and orders in other reſpects.

On the whole, as all reſtrictions of trade are found to be hurtful, nothing can be more evident than that no company whatſoever, whether they trade in a joint ſtock, or only under regulation, can be for the public good, except it may be eaſy for all or any of his majeſty's ſubjects to be admitted into all or any of the ſaid companies, at any time, and for a very inconſiderable fine.

Company, in military affairs, a ſmall body of foot, commanded by a captain, who has under him a lieutenant and enſign.

The number of centinels or private ſoldiers in a company, may be from 50 to 80; and a battalion conſiſts of thirteen ſuch companies, one of which is always grenadiers, and poſted on the right: next them ſtand the eldeſt company, and on the left the ſecond company;

the youngeſt one being always poſted in the centre.

Companies not incorporated into regiments are called irregulars, or independent companies.

Artillery COMPANY. See ARTILLERY.

COMPANY *of ſhips*, a fleet of merchantmen, who make a charter party among themſelves; the principal conditions whereof uſually are, that certain veſſels ſhall be acknowledged admiral, vice admiral, and rear-admiral; that ſuch and ſuch ſignals ſhall be obſerved; that thoſe which bear no guns, ſhall pay ſo much *per cent.* of their cargo; and in caſe they be attacked, that what damages are ſuſtained, ſhall be reimburſed by the company in general. In the Mediterranean, ſuch companies are called conſerves.

COMPARATIVE ANATOMY, is that branch of anatomy which conſiders the ſecondary objects, or the bodies of other animals; ſerving for the more accurate diſtinctions of ſeveral parts, and ſupplying the defect of human ſubjects.

It is otherwiſe called the anatomy of beaſts, and ſometimes zootomy; and ſtands in contradiſtinction to human anatomy, or that branch of the art which conſiders the human body, the primary object of anatomy. See ANATOMY.

COMPARATIVE DEGREE, among grammarians, that between the poſitive and ſuperlative degrees, expreſſing any particular quality above or beneath the level of another.

COMPARISON, in a general ſenſe, the conſideration of the relation between two perſons or things, when oppoſed and ſet againſt each other, by which we judge of their agreement or difference.

Inſtruction is the principal, but not the only end of compariſon. It may be employed with ſucceſs in putting a ſubject in a ſtrong point of view. A lively idea is formed of a man's courage by likening it to that of a lion; and eloquence is exalted in our imagination by comparing it to a river overflowing its bank, and involving all in its impetuous courſe. The ſame effect is produced by contraſt: A man in proſperity becomes more ſenſible of his happpineſs, by comparing his condition with that of a perſon in want of bread. Thus compariſon is ſubſervient to poetry as well as to philoſophy.

Compariſons ſerve two purpoſes: when addreſſed to the underſtanding, their purpoſe is to inſtruct; when to the heart, their purpoſe is to pleaſe. Various means contribute to the latter: firſt, the ſuggeſting ſome unuſual reſemblance or contraſt; ſecond, the ſetting an object in the ſtrongeſt light; third, the aſſociating an object with others that are agreeable; fourth, the elevating an object; and, fifth, the depreſſing it. And that compariſons may give pleaſure by theſe various means, will be made evident by examples, which ſhall be given, after premiſing ſome general obſervations.

Objects of different ſenſes cannot be compared together; for ſuch objects are totally ſeparated from each other, and have no circumſtance in common to admit either reſemblance or contraſt. Objects of hearing may be compared together, as alſo of taſte, of ſmell, and of touch: but the chief fund of compariſon are objects of ſight; becauſe, in writing or ſpeaking, things can only be compared in idea, and the ideas of ſight are more diſtinct and lively than thoſe of any other ſenſe.

When a nation emerging out of barbarity begins to think of the fine arts, the beauties of language cannot long lie concealed; and when diſcovered, they are generally, by the force of novelty, carried beyond all bounds of moderation. Thus, in the earlieſt poems of every nation, we find metaphors and ſimiles founded on the ſlighteſt and moſt diſtant reſemblances, which, loſing their grace with their novelty, wear gradually out of repute; and now, by the improvement of taſte, no metaphor nor ſimile is admitted into any polite compoſition but of the moſt ſtriking kind. To illuſtrate this obſervation, a ſpecimen ſhall be given afterward of ſuch metaphors as we have been deſcribing: with reſpect to ſimiles take the following ſpecimen.

“Behold, thou art fair, my love: thy hair is as a flock of goats that appear from Mount Gilead: thy teeth are like a flock of ſheep from the waſhing, every one bearing twins: thy lips are like a thread of ſcarlet: thy neck like the tower of David built for an armoury, whereon hang a thouſand ſhields of mighty men: thy two breaſts like two young roes that are twins, which feed among the lilies: thy eyes like the fiſh-pools in Heſbon, by the gate of Bath-rabbin: thy noſe like the tower of Lebanon, looking toward Damaſcus.” *Song of Solomon.*

“Thou art like ſnow on the heath; thy hair like the miſt of Cromla, when it curls on the rocks and ſhines to the beam of the weſt: thy breaſts are like two ſmooth rocks ſeen from Branno of the ſtreams: thy arms like two white pillars in the hall of the mighty Fingal.” *Fingal.*

It has no good effect to compare things by way of ſimile that are of the ſame kind; nor to contraſt things of different kinds.

A numerous brigade haſten'd: as when bands
Of pioneers with ſpade and pick-ax arm'd,
Forerun the royal camp to trench a field
Or caſt a rampart. *Milton.*

The following is of things contraſted that are of different kinds.

Queen. What, is my Richard both in ſhape and mind
Transform'd and weak? Hath Bolingbroke depos'd
Thine intellect? Hath he been in thy heart?
The lion, dying, thruſteth forth his paw,
And wounds the earth, if nothing elſe, with rage
To be o'erpower'd: and wilt thou, pupil like,
Take thy correction mildly, kiſs the rod,
And fawn on rage with baſe humility?
Richard II. *act* 5. *ſc.* 1.

This compariſon has ſcarce any force: a man and a lion are of different ſpecies, and therefore are proper ſubjects for a ſimile; but there is no ſuch reſemblance between them in general, as to produce any ſtrong effect by contraſting particular attributes or circumſtances.

A third general obſervation is, That abſtract terms can never be the ſubject of compariſon, otherwiſe than by being perſonified. Shakeſpear compares adverſity to a toad, and ſlander to the bite of a crocodile; but in ſuch compariſons theſe abſtract terms muſt be imagined ſenſible beings.

To have a juſt notion of compariſons, they muſt be diſtinguiſhed into two kinds; one common and familiar, as where a man is compared to a lion in courage, or to a horſe in ſpeed; the other more diſtant and refined, where two things that have in themſelves no reſemblance or oppoſition, are compared with reſpect to their effects. There is no reſemblance between a flower-plot and a chearful ſong; and yet they may be compared with reſpect to their effects, the emotions they produce in the mind being extremely ſimilar There is as little reſemblance between fraternal concord and precious ointment; and yet obſerve how ſucceſsfully they are compared with reſpect to the impreſſions they make.

“ Behold, how good and how pleaſant it is for
“ brethren to dwell together in unity. It is like the
“ precious ointment upon the head, that ran down
“ upon Aaron's beard, and deſcended to the ſkirts of
“ his garment.” *Pſalm* 133.

For illuſtrating this ſort of compariſon, we ſhall add ſome more examples:

“ Delightful is thy preſence, O Fingal! it is like
“ the ſun on Cromla, when the hunter mourns his
“ abſence for a ſeaſon, and ſees him between the
“ clouds.

“ Did not Oſſian hear a voice? or is it the ſound
“ of days that are no more? Often, like the even-
“ ing-ſun, comes the memory of former times on my
“ ſoul.

“ His countenance is ſettled from war; and is calm
“ as the evening-beam, that from the cloud of the
“ weſt looks on Cona's ſilent vale.” *Fingal.*

We now proceed to illuſtrate by particular inſtances the different means by which compariſons, whether of the one ſort or the other, can afford pleaſure; and, in the order above eſtabliſhed, we ſhall begin with ſuch inſtances as are agreeable by ſuggeſting ſome unuſual reſemblance or contraſt.

Sweet are the uſes of Adverſity,
Which, like the toad, ugly and venomous,
Wears yet a precious jewel in her head.
As you like it, act 2. *ſc.* 1.

See, how the Morning opes her golden gates,
And takes her farewel of the glorious ſun;
How well reſembles it the prime of youth,
Trimm'd like a yonker prancing to his love.
Second Part Henry VI. *act.* 2. *ſc.* 1.

Thus they their doubtful conſultations dark
Ended, rejoicing in their matchleſs chief:
As when from mountain tops, the duſky clouds
Aſcending, while the North-wind ſleeps, o'erſpread
Heav'n's chearful face, the lowring element
Scowls o'er the darken'd landſcape, ſnow, and ſhower;
If chance the radiant ſun with farewel ſweet
Extends his ev'ning-beam, the fields revive,
The birds their notes renew, and bleating herds
Atteſt their joy, that hill and valley rings.
Paradiſe Loſt, book 2.

None of the foregoing ſimiles tend to illuſtrate the principal ſubject: and therefore the chief pleaſure they afford muſt ariſe from ſuggeſting reſemblances that are not obvious: for undoubtedly a beautiful ſubject introduced to form the ſimile affords a ſeparate pleaſure, which is felt in the ſimiles mentioned, particularly in that cited from Milton.

The next effect of a compariſon in the order mentioned, is to place an object in a ſtrong point of view; which effect is remarkable in the following ſimiles.

As when two ſcales are charg'd with doubtful loads,
From ſide to ſide the trembling balance nods,
(While ſome laborious matron, juſt and poor,
With nice exactneſs weighs her woolly ſtore),
Till pois'd aloft, the reſting beam ſuſpends
Each equal weight; nor this nor that deſcends:
So ſtood the war, till Hector's matchleſs might,
With fates prevailing, turn'd the ſcale of fight.
Fierce as a whirlwind up the wall he flies,
And fires his hoſt with loud repeated cries.
Iliad, b. xii. 521.

——— Out, out, brief candle!
Life's but a walking ſhadow, a poor player,
That ſtruts and frets his hour upon the ſtage,
And then is heard no more.
Macbeath, act 5. *ſc.* 5.

O thou Goddeſs,
Thou divine nature! how thyſelf thou blazon'ſt
In theſe two princely boys! they are as gentle
As zephyrs blowing below the violet,
Not wagging his ſweet head; and yet as rough,
(Their royal blood inchaf'd) as the rud'ſt wind,
That by the top doth take the mountain-pine,
And make him ſtoop to th' vale.
Cymbeline, act 4. *ſc.* 4.

“ Why did not I paſs away in ſecret, like the
“ flower of the rock that lifts its fair head unſeen,
“ and ſtrows its withered leaves on the blaſt?”
Fingal.

As words convey but a faint and obſcure notion of great numbers, a poet, to give a lively notion of the object he deſcribes with regard to number, does well to compare it to what is familiar and commonly known. Thus Homer compares the Grecian army in point of number to a ſwarm of bees: in another paſſage he compares it to that profuſion of leaves and flowers which appear in the ſpring, or of inſects in a ſummer's evening: and Milton,

——————— As when the potent rod
Of Amram's ſon in Egypt's evil day
Wav'd round the coaſt, up call'd a pitchy cloud
Of locuſts, warping on the eaſtern wind,
That o'er the realm of impious Pharaoh hung
Like night, and darken'd all the land of Nile:
So numberleſs were thoſe bad angels ſeen,
Hov'ring on wing under the cope of hell,
'Twixt upper, nether, and ſurrounding fires.
Paradiſe Loſt, book 1.

Such compariſons have, by ſome writers, been condemned for the lowneſs of the images introduced: but ſurely without reaſon; for, with regard to numbers, they put the principal ſubject in a ſtrong light.

Milton has a peculiar talent in embelliſhing the principal ſubject by aſſociating it with others that are agreeable; which is the third end of a compariſon. Similes of this kind have, beſide, a ſeparate effect: they diverſify the narration by new images that are not ſtrictly neceſſary to the compariſon: they are ſhort epiſodes, which, without drawing us from the principal ſubject, afford great delight by their beauty and variety.

He ſcarce had ceas'd, when the ſuperior fiend
Was moving toward the ſhore; his pond'rous ſhield,
Ethereal temper, maſſy, large, and round,
Behind him caſt; the broad circumference
Hung on his ſhoulders like the moon, whoſe orb
Through optic glaſs the Tuſcan artiſt views
At ev'ning from the top of Feſole,
Or in Valdarno, to deſcry new lands,
Rivers, or mountains, in her ſpotty globe.

Milton, *b*. 1.

As when a vulture on Imaus bred,
Whoſe ſnowy ridge the roving Tartar bounds,
Diſlodging from a region ſcarce of prey
To gorge the fleſh of lambs, or yeanling kids,
On hills where flocks are fed, flies toward the ſprings
Of Ganges or Hydaſpes, Indian ſtreams,
But in his way lights on the barren plains
Of Sericana, where Chineſes drive
With ſails and wind their cany waggons light:
So on this windy ſea of land, the fiend
Walk'd up and down alone, bent on his prey.

Milton, *b*. 3.

Next of compariſons that aggrandiſe or elevate. Theſe affect us more than any other ſort: the reaſon of which will be evident from the following inſtances.

As when a flame the winding valley fills,
And runs on crackling ſhrubs between the hills,
Then o'er the ſtubble up the mountain flies,
Fires the high woods, and blazes to the ſkies,
This way and that, the ſpreading torrent roars;
So ſweeps the hero through the waſted ſhores.
Around him wide, immenſe deſtruction pours,
And earth is delug'd with the ſanguine ſhow'rs.

Iliad xx. 569.

Methinks, King Richard and myſelf ſhould meet
With no leſs terror than the elements
Of fire and water, when their thund'ring ſhock,
At meeting tears the cloudy cheeks of heaven.

Richard II. *act* 3. *ſc*. 5.

"As ruſheth a foamy ſtream from the dark ſhady
" ſteep of Cromla, when thunder is rolling above,
" and dark brown night reſts on the hill: ſo fierce,
" ſo vaſt, ſo terrible, ruſh forward the ſons of Erin.
" The chief, like a whale of Ocean followed by all
" its billows, pours valour forth as a ſtream, rolling
" its might along the ſhore." *Fingal*, *b*. 1.

The laſt article mentioned, is that of leſſening or depreſſing a hated or diſagreeable object; which is effectually done by reſembling it to any thing low or deſpicable. Thus Milton, in his deſcription of the rout of the rebel angels, happily expreſſes their terror and diſmay in the following ſimile:

———————————— As a herd
Of goats or timorous flock together throng'd,
Drove them before him thunder-ſtruck, purſu'd
With terrors and with furies to the bounds
And cryſtal wall of heav'n, which op'ning wide,
Rowl'd inward, and a ſpacious gap diſclos'd
Into the waſteful deep; the monſtrous ſight
Strook them with horror backward, but far worſe
Urg'd them behind; headlong themſelves they threw
Down from the verge of Heav'n.

Milton, *b*. 6.

By this time the different purpoſes of compariſon, and the various impreſſions it makes on the mind, are ſufficiently illuſtrated by proper examples. This was an eaſy work. It is more difficult to lay down rules about the propriety or impropriety of compariſons; in what circumſtances they may be introduced, and in what circumſtances they are out of place. It is evident, that a compariſon is not proper upon every occaſion: a man in his cool and ſedate moments, is not diſpoſed to poetical flights, nor to ſacrifice truth and reality to the deluſive operations of the imagination: far leſs is he ſo diſpoſed, when oppreſſed with care, or intereſted in ſome important tranſaction that occupies him totally. On the other hand, it is obſervable, that a man, when elevated or animated by any paſſion, is diſpoſed to elevate or animate all his ſubjects: he avoids familiar names, exalts objects by circumlocution and metaphor, and gives even life and voluntary action to inanimate beings. In this warmth of mind, the higheſt poetical flights are indulged, and the boldeſt ſimiles and metaphors reliſhed. But without ſoaring ſo high, the mind is frequently in a tone to reliſh chaſte and moderate ornament; ſuch as compariſons that ſet the principal object in a ſtrong point of view, or that embelliſh and diverſify the narration. In general, when by any animating paſſion, whether pleaſant or painful, an impulſe is given to the imagination; we are in that condition diſpoſed to every ſort of figurative expreſſion, and in particular to compariſons. This in a great meaſure is evident from the compariſons already mentioned; and ſhall be further illuſtrated by other inſtances. Love, for example, in its infancy, rouſing the imagination, promps the heart to diſplay itſelf in figurative language, and in ſimiles:

Troilus. Tell me, Apollo, for thy Daphne's love,
What Creſſid is, what Pandar, and what we?
Her bed is India, there ſhe lies, a pearl:
Between our Ilium, and where ſhe reſides,
Let it be call'd the wild and wandering flood;
Ourſelf the merchant, and this ſailing Pandar
Our doubtful hope, our convoy, and our bark.

Troilus and Creſſida, *act* 1. *ſc*. 1.

Again:

Come, gentle Night; come, loving black-brow'd
Night!
Give me my Romeo; and, when he ſhall die,
Take him, and cut him out in little ſtars,
And he will make the face of heav'n ſo fine,

That all the world ſhall be in love with Night,
And pay no worſhip to the gariſh ſun.
Romeo and Juliet, act 3. *ſc.* 4.

But it will be a better illuſtration of the preſent head, to give examples where compariſons are improperly introduced. Similes are not the language of a man in his ordinary ſtate of mind, diſpatching his daily and uſual work: for that reaſon, the following ſpeech of a gardener to his ſervant, is extremely improper:

Go bind thou up yon dangling apricocks,
Which, like unruly children, make their ſire
Stoop with oppreſſion of their prodigal weight:
Give ſome ſupportance to the bending twigs.
Go thou, and, like an executioner,
Cut off the heads of too-faſt-growing ſprays,
That look too lofty in our commonwealth:
All muſt be even in our government.
Richard II. *act* 3. *ſc.* 7.

The fertility of Shakeſpear's vein betrays him frequently into this error.

Rooted grief, deep anguiſh, terror, remorſe, deſpair, and all the ſevere diſpiriting paſſions, are declared enemies, perhaps not to figurative language in general, but undoubtedly to the pomp and ſolemnity of compariſon. Upon this account, the ſimile pronounced by young Rutland, under terror of death from an inveterate enemy, and praying mercy, is unnatural:

So looks the pent-up lion o'er the wretch
That trembles under his devouring paws;
And ſo he walks inſulting o'er his prey,
And ſo he comes to rend his limbs aſunder.
Ah, gentle Clifford, kill me with thy ſword,
And not with ſuch a cruel threat'ning look.
Third part Henry VI. *act* 1. *ſc.* 5.

A man ſpent and diſpirited after loſing a battle, is not diſpoſed to heighten or illuſtrate his diſcourſe by ſimiles.

York. With this we charg'd again; but out! alas,
We bodg'd again; as I have ſeen a ſwan
With bootleſs labour ſwim againſt the tide,
And ſpend her ſtrength with over-matching waves.
Ah! hark, the fatal followers do purſue;
And I am faint and cannot fly their fury.
The ſands are number'd that make up my life;
Here muſt I ſtay, and here my life muſt end.
Third part Henry VI. *act* 1. *ſc.* 6.

Similes thus unſeaſonably introduced, are finely ridiculed in the *Rehearſal*.

" *Bayes.* Now here ſhe muſt make a ſimile.
" *Smith.* Where's the neceſſity of that, Mr Bayes?
" *Bayes.* Becauſe ſhe's ſurprized; that's a general
" rule; you muſt ever make a ſimile when you are
" ſurprized; 'tis a new way of writing."

A compariſon is not always faultleſs even where it is properly introduced. A compariſon, like other human productions, may fall ſhort of its end; of which defect inſtances are not rare even among good writers: and to complete the preſent ſubject, it will be neceſſary to make ſome obſervations upon ſuch faulty compariſons. Nothing can be more erroneous than to inſtitute a compariſon too faint: a diſtant reſemblance or contraſt fatigues the mind with its obſcurity, inſtead of amuſing it; and tends not to fulfil any one end of a compariſon. The following ſimiles ſeem to labour under this defect.

K. Rich. Give me the crown.—Here, couſin, ſeize the crown,
Here, on this ſide, my hand; on that ſide, thine.
Now is this golden crown like a deep well,
That owes two buckets, filling one another;
The emptier ever dancing in the air,
The other down, unſeen and full of water;
That bucket down, and full of tears, am I,
Drinking my griefs, whilſt you mount up on high.
Richard II. *act* 4. *ſc.* 3.

K. John. Oh! couſin, thou art come to ſet mine eye;
The tackle of my heart is crack'd and burnt;
And all the ſhrouds wherewith my life ſhould ſail,
Are turned to one thread, one little hair:
My heart hath one poor ſtring to ſtay it by,
Which holds but till thy news be uttered.
King John, act 5. *ſc.* 10.

York. My uncles both are ſlain in reſcuing me:
And all my followers to the eager foe
Turn back, and fly like ſhips before the wind,
Or lambs purſu'd by hunger-ſtarved wolves.
Third part Henry VI. *act* 1. *ſc.* 6.

The latter of the two ſimilies is good: the former, becauſe of the faintneſs of the reſemblance, produces no good effect, and crouds the narration with an uſeleſs image.

In an epic poem, or in any elevated ſubject, a writer ought to avoid raiſing a ſimile upon a low image, which never fails to bring down the principal ſubject. In general, it is a rule, that a grand object ought never to be reſembled to one that is diminutive, however delicate the reſemblance may be: for it is the peculiar character of a grand object to fix the attention, and ſwell the mind; in which ſtate, it is diſagreeable to contract the mind to a minute object, however elegant. The reſembling an object to one that is greater, has, on the contrary, a good effect, by raiſing or ſwelling the mind: for one paſſes with ſatisfaction from a ſmall to a great object; but cannot be drawn down, without reluctance, from great to ſmall. Hence the following ſimiles are faulty:

Meanwhile the troops beneath Patroclus' care,
Invade the Trojans, and commence the war.
As waſps, provok'd by children in their play,
Pour from their manſions by the broad highway,
In ſwarms the guiltleſs traveller engage,
Whet all their ſtings, and call forth all their rage;
All riſe in arms, and with a general cry
Aſſert their waxen domes and buzzing progeny:
Thus from the tents the fervent legion ſwarms,
So loud their clamours, and ſo keen their arms.
Iliad, xvi. 312.

So burns the vengeful hornet (ſoul all o'er)
Repuls'd in vain, and thirſty ſtill of gore;
(Bold ſon of air and heat) on angry wings
Untam'd, untir'd, he turns, attacks, and ſtings.

Fir'd with like ardour, fierce Atrides flew,
And ſent his ſoul with ev'ry lance he threw.
Iliad, xvii. 642.

An error oppoſite to the former, is the introducing a reſembling image, ſo elevated or great as to bear no proportion to the principal ſubject. Their remarkable diſparity, being the moſt ſtriking circumſtance, ſeizes the mind, and never fails to depreſs the principal ſubject by contraſt, inſtead of raiſing it by reſemblance: and if the diſparity be exceeding great, the ſimile takes on an air of burleſque; nothing being more ridiculous than to force an object out of its proper rank in nature, by equalling it with one greatly ſuperior or greatly inferior. This will be evident from the following compariſon.

Loud as a bull makes hill and valley ring,
So roar'd the lock when it releas'd the ſpring.
Odyſſey, xxi. 51.

Such a ſimile upon the ſimpleſt of all actions, that of opening a lock, is pure burleſque.

A writer of delicacy will avoid drawing his compariſons from any image that is nauſeous, ugly, or remarkably diſagreeable; for however ſtrong the reſemblance may be, more will be loſt than gained by ſuch compariſon. Therefore we cannot help condemning, though with ſome reluctancy, the following ſimile, or rather metaphor.

O thou fond many! with what loud applauſe
Did'ſt thou beat heav'n with bleſſing Bolingbroke
Before he was what thou would'ſt have him be?
And now being trimm'd up in thine own deſires,
Thou, beaſtly feeder, art ſo full of him,
That thou provok'ſt thyſelf to caſt him up.
And ſo, thou common dog, didſt thou diſgorge
Thy glutton boſom of the royal Richard,
And now thou would'ſt eat thy dead vomit up,
And howl'ſt to find it.
Second part Henry IV. *act* 1. *ſc.* 6.

The ſtrongeſt objection that can lie againſt a compariſon is, that it conſiſts in words only, not in ſenſe. Such falſe coin, or baſtard wit, does extremely well in burleſque; but is far below the dignity of the epic, or of any ſerious compoſition:

The noble ſiſter of Poplicola,
The moon of Rome; chaſte as the icicle
That's curdled by the froſt from pureſt ſnow,
And hangs on Dian's temple.
Coriolanus, *act* 5. *ſc.* 3.

There is evidently no reſemblance between an icicle, and a woman, chaſte or unchaſte: but chaſtity is cold in a metaphorical ſenſe, and an icicle is cold in a proper ſenſe; and this verbal reſemblance, in the hurry and glow of compoſing, has been thought a ſufficient foundation for the ſimile. Such phantom ſimiles are mere witticiſms, which ought to have no quarter, except where purpoſely introduced to provoke laughter. Lucian, in his diſſertation upon hiſtory, talking of a certain author, makes the following compariſon, which is verbal merely.

"This author's deſcriptions are ſo cold, that they "ſurpaſs the Caſpian ſnow, and all the ice of the "north."

——But for their ſpirits and ſouls
This word *rebellion* had froze them up
As fiſh are in a pond.
Second part Henry IV. *act* 1. *ſc.* 3.

Pope has ſeveral ſimiles of the ſame ſtamp.

And hence one maſter paſſion in the breaſt,
Like Aaron's ſerpent ſwallows up the reſt.
Epiſt. 2. *l.* 131.

And again, talking of this ſame ruling or maſter paſſion:

Nature its mother, Habit is its nurſe;
Wit, ſpirit, faculties, but make it worſe;
Reaſon itſelf but gives it edge and pow'r;
As heav'n's bleſs'd beam turns vinegar more ſowr.
Ibid, *l.* 145.

Where the ſubject is burleſque or ludicrous, ſuch ſimiles are far from being improper. Horace ſays pleaſantly,

Quamquam tu levior cortice. *L.* 3. *od.* 9.

And Shakeſpear,

In breaking oaths he's ſtronger than Hercules.

And this leads to obſerve, that beſides the foregoing compariſons, which are all ſerious, there is a ſpecies, the end and purpoſe of which is to excite gaiety or mirth. Take the following examples.

Falſtaff, ſpeaking to his page:

"I do here walk before thee, like a ſow that hath "overwhelmed all her litter but one."
Second part Henry IV. *act* 1. *ſc.* 10.

"I think he is not a pick-purſe, nor a horſe-ſtealer; but for his verity in love, I do think him as "concave as a cover'd goblet, or a worm-eaten nut."
As you like it, *act* 3. *ſc.* 10.

This ſword a dagger had his page,
That was but little for his age;
And therefore waited on him ſo,
As dwarfs upon knights-errant do.
Hudibras, *canto* 1.

"Books, like men, their authors, have but one "way of coming into the world; but there are ten "thouſand to go out of it, and return no more."
Tale of a Tub.

"The moſt accompliſhed way of uſing books at "preſent is, to ſerve them as ſome do lords, learn "their *titles*, and then brag of their acquaintance."
Ibid.

"He does not conſider, that ſincerity in love is as "much out of faſhion as ſweet ſnuff; no body takes "it now."
Careleſs Huſband.

Comparison *of ideas*, that operation of the mind whereby it compares its ideas one with another, in regard of extent, degree, time, place, or any other circumſtance, and is the ground of relations.

Comparison, in grammar, the inflection of the comparative degree.

COMPARTITION, in architecture, denotes the uſeful and graceful diſpoſition of the whole ground-plot of an edifice, into rooms of office, and of reception or entertainment.

COMPARTMENT, in general, is a deſign compoſed of ſeveral different figures, diſpoſed with ſymmetry, to adorn a parterre, a ceiling, *&c.*

A compartment of tiles, or bricks, is an arrangement of them, of different colours, and varniſhed, for the decoration of a building. Compartments, in gardening, are an aſſemblage of beds, plats, borders, walks, *&c.* diſpoſed in the moſt advantageous manner that the ground will admit of. Compartments, in heraldry, are otherwiſe called partitions.

COMPASS, or *mariner's* Compass, an inſtrument whereby the ſhip's courſe is determined. See Navigation.

Azimuth Compass. See Navigation.

Compass *dials*, are ſmall horizontal dials, fitted in braſs or ſilver boxes, for the pocket, to ſhew the hour of the day, by the direction of a needle, that indicates how to place them right, by turning the dial about, till the cock or ſtyle ſtand directly over the needle, and point to the northward: but theſe can never be very exact, becauſe of the variations of the needle itſelf. See Dialing.

COMPASSES, or *pair of* Compasses, a mathematical inſtrument for deſcribing circles, meaſuring figures, *&c.*

The common compaſſes conſiſt of two ſharp-pointed branches, or legs, of iron, ſteel, braſs, or other metal, joined at top by a rivet, whereon they move as on a centre.

The principal perfection of this, as of all other compaſſes, conſiſts in the eaſy and uniform opening and ſhutting of their legs; one of which may be taken out, in order to make room for others.

There are now uſed compaſſes of various kinds and contrivances, accommodated to the various uſes they are intend d for.

COMPEIGN, a city of France, ſituated on the river Oyſe, about forty-five miles north-eaſt of Paris: E. long. 3°, N. lat. 49° 30′.

COMPENDIUM, in matters of literature, denotes much the ſame with epitome or abridgment. See Abridgment.

COMPENSATION, in a general ſenſe, an action whereby any thing is admitted as an equivalent to another.

Compensation. Where the ſame perſon is debtor and creditor to another, the mutual obligations, if they are for equal ſums, are extinguiſhed by compenſation; if for unequal, the leſſer obligation is extinguiſhed, and the greater diminiſhed, as far as the concourſe of debt and credit goes. See Scots Law, title, *Extinction of obligations.*

COMPETENCE, or Competency, in law, the right or authority of a judge, for taking cognizance of any matter.

COMPETITION, in Scots law: In eſcheats, ſee title, *Caſualties due to the ſuperior:* In confirmations by the ſuperior, in reſignations, and in perſonal rights of lands, ſee title, *Of tranſmiſſion of rights by confirmation:* In inhibitions, in adjudications, amongſt aſſignees, arreſters, and poinders, ſee title, *Inhibitions, adjudications, aſſignations, arreſtments, and poindings:* Amongſt creditors of a defunct, ſee title, *Succeſſion in moveables.*

COMPITALIA, or Compitalitia, in Roman antiquity, feaſts inſtituted by Servius Tullius in honour of the Lares. See Lares.

Theſe feaſts were obſerved on the 12th of January, and 6th of March.

COMPLEMENT, in geometry, is what remains of a quadrant of a circle, or of 90°, after any certain arch has been taken away from it. Thus, if the arch taken away be 40°, its complement is 50: becauſe $50+40=90$. The ſine of the complement of an arch is called the co-ſine, and that of the tangent the co-tangent, *&c.*

COMPLEX, in a more general ſenſe, a term ſynonymous with compound; though, in ſtrictneſs of ſpeech, there is ſome difference. See Compound.

Complex *terms*, or *ideas*, in logic, are ſuch as are compounded of ſeveral ſimple ones. See Term, and Idea.

COMPLEXION, among phyſicians, the temperament, habitude, and natural dipoſition of the body, but more often the colour of the face and ſkin.

COMPLEXUS, in anatomy. See Vol. I. p. 216.

Complexus *minor*, in anatomy. See Vol. I. p. 216.

COMPLICATION, in general, denotes the blending, or rather interweaving, of ſeveral different things together: thus a perſon afflicted with ſeveral diſorders at the ſame time, is ſaid to labour under a complication of diſeaſes.

COMPOUND, Compone, or Gobony, in heraldry, is ſaid of a bordure made up of angular parts, or chequers, of two different colours. See Plate LXV. fig. 13.

COMPOSITE, in general, denotes ſomething compounded, or made up of ſeveral others united together. Thus,

Composite *numbers*, are ſuch as can be meaſured exactly by a number exceeding unity; as 6 by 2 or 3, or 10 by 5, *&c.* ſo that 4 is the loweſt compoſite number.

Composite *order*, in architecture. See Vol. I. p. 352.

COMPOSITION, in a general ſenſe, the uniting or putting together ſeveral things, ſo as to form one whole, called a compound.

Composition *of ideas*, an act of the mind, whereby it unites ſeveral ſimple ideas into one conception or complex idea.

When we are provided with a ſufficient ſtock of ſimple ideas, and have by habit and uſe rendered them familiar to our minds, they become the component parts of other ideas ſtill more complicated, and form what we may call a ſecond order of compound notions. This proceſs may be continued to any degree of compoſition we pleaſe, mounting from one ſtage to another, and enlarging the number of combinations.

Composition, in grammar, the joining of two words together; or prefixing a particle to another word, to augment, diminiſh, or change its ſignification.

Composition, in logic, a method of reaſoning, whereby we proceed from ſome general ſelf-evident truth, to other particular and ſingular ones.

In diſpoſing and putting together our thoughts, there are two ways of proceeding, equally within our choice: for we may ſo propoſe the truths, relating to any part of knowledge, as they preſented themſelves to the mind, in the manner of inveſtigation; carrying on the ſeries of proofs in a reverſe order, till they, at laſt, terminate in firſt principles: or beginning with theſe principles, we may take the contrary way, and from them deduce, by a direct train of reaſoning, all the ſeveral propoſitions we want to eſtabliſh.

This diverſity, in the manner of arranging our thoughts, gives riſe to the twofold diviſion of method eſtabliſhed among logicians; the one called analytic method, or the method of reſolution, inaſmuch as it traces things back to their ſource, and reſolves knowledge into its firſt and original principles. This method ſtands in contradiſtinction to the method of compoſition; or, as it is otherwiſe called, the ſynthetic method: for here we proceed by gathering together the ſeveral ſcattered parts of knowledge, and combining them into one ſyſtem, in ſuch a manner, as that the underſtanding is enabled diſtinctly to follow truth through all the different ſtages of gradation.

Composition, in muſic, the art of diſpoſing muſical ſounds into airs, ſongs, *&c.* either in one or more parts, to be ſung by a voice, or played on inſtruments. See Music, and Song.

Under compoſition are comprehended the rules, 1. Of melody, or the art of making a ſingle part; that is, contriving and diſpoſing the ſimple ſounds, ſo as that their ſucceſſion and progreſſion may be agreeable to the ear. See Melody.

2. Of harmony, or the art of diſpoſing and concerting ſeveral ſingle parts together, ſo as that they make one agreeable whole. See Harmony.

COMPOSITION, in literature, the art of forming and arranging ſentiments, and cloathing them with language ſuitable to the nature of the ſubject or diſcourſe. We ſhall firſt give a few thoughts on original compoſition; and, 2dly, by way of example, unfold the nature of epic and dramatic compoſitions.

1. *On Original Compoſition.*

The mind of a man of genius is a fertile and pleaſant field; pleaſant as *Elyſium*, and fertile as *Tempe*; it enjoys a perpetual ſpring. Of that ſpring, *originals* are the faireſt flowers: *imitations* are of quicker growth, but fainter bloom. *Imitations* are of two kinds; one of nature, one of authors: the firſt we call *originals*, and confine the term *imitation* to the ſecond. We ſhall not enter into the curious inquiry of what is, or is not, ſtrictly ſpeaking, *original*, content with what all muſt allow, that ſome compoſitions are more ſo than others; and the more they are ſo, the better. *Originals* are, and ought to be, great favourites, for they are benefactors; they extend the republic of letters, and add a new province to its dominion: *imitators* only give us a ſort of duplicates of what we had, poſſibly much better, before; increaſing the mere drug of books, while all that makes them valuable, *knowledge* and *genius*, are at a ſtand. The pen of an *original* writer, like Armida's wand, out of a barren waſte calls a blooming ſpring: out of that blooming ſpring an *imitator* is a tranſplanter of laurels, which ſometimes die on removal, always languiſh in a foreign ſoil.

But ſuppoſe an *imitator* to be moſt excellent (and ſuch there are), yet ſtill he but nobly builds on another's foundation; his debt is, at leaſt, equal to his glory; which therefore, on the balance, cannot be very great. On the contrary, an *original*, though but indifferent (its *originality* being ſet aſide), yet has ſomething to boaſt; it is ſomething to ſay with him in Horace,

> Meo *ſum pauper in ære*;

and to ſhare ambition with no leſs than *Cæſar*, who declared he had rather be the firſt in a village, than the ſecond at Rome.

Still farther: an *imitator* ſhares his crown, if he has one, with the choſen object of his imitation; an *original* enjoys an undivided applauſe. An *original* may be ſaid to be of a *vegetable* nature; it riſes ſpontaneouſly from the vital root of genius; it *grows*, it is not *made*: *imitations* are often a ſort of *manufacture* wrought by thoſe *mechanics*, *art* and *labour*, out of pre-exiſtent materials not their own.

Again: we read *imitation* with ſomewhat of his languor who liſtens to a twice-told tale: our ſpirits rouſe at an *original*; that is a perfect ſtranger, and all throng to learn what news from a foreign land: and though it comes, like an Indian prince, adorned with feathers only, having little of weight; yet of our attention it will rob the more ſolid, if not equally new: thus every teleſcope is lifted at a new-diſcovered ſtar; it makes a hundred aſtronomers in a moment, and denies equal notice to the ſun. But if an *original*, by being as excellent, as new, adds admiration to ſurprize, then are we at the writer's mercy; on the ſtrong wing of his imagination, we are ſnatched from Britain to Italy, from climate to climate, from pleaſure to pleaſure; we have no home, no thought, of our own; till the magician drops his pen: and then falling down into ourſelves, we awake to flat realities, lamenting the change, like the beggar who dreamt himſelf a prince.

It is with thoughts, as it is with words; and with both, as with men; they may grow old and die. Words tarniſhed, by paſſing through the mouths of the vulgar, are laid aſide as inelegant and obſolete. So thoughts, when become too common, ſhould loſe their currency; and we ſhould ſend new metal to the mint, that is, new meaning to the preſs. The diviſion of tongues at Babel did not more effectually debar men from making themſelves a name (as the ſcripture ſpeaks) than the too great concurrence or union of tongues will do for ever. We may as well grow good by another's virtue, or fat by another's food, as famous by another's thought. The world will pay its debt of praiſe but once; and inſtead of applauding, explode a ſecond demand, as a cheat.

If it is ſaid, that moſt of the Latin claſſics, and all the Greek, except, perhaps, Homer, Pindar, and Anacreon,

creon, are in the number of ***imitators***, yet receive our higheſt applauſe; our anſwer is, that they, though not *real*, are ***accidental originals***; the works they imitated, few excepted, are loſt: they, on their father's deceaſe, enter as lawful heirs on their eſtates in fame: the fathers of our copyiſts are ſtill in poſſeſſion; and ſecured in it, in ſpite of Goths, and flames, by the perpetuating power of the preſs. Very late muſt a modern *imitator*'s fame arrive, if it waits for their deceaſe.

An *original* enters early on reputation: *fame*, fond of new glories, ſounds her trumpet in triumph at its birth; and yet how few are awakened by it into the noble ambition of like attempts? Ambition is ſometimes no vice in life; it is always a virtue in compoſition. High in the towering Alps is the fountain of the Po; high in fame, and in antiquity, is the fountain of an *imitator*'s undertaking; but the river, and the imitation, humbly creep along the vale. So few are our *originals*, that, if all other books were to be burnt, the lettered world would reſemble ſome metropolis in flames, where a few incombuſtible buildings, a fortreſs, temple, or tower, lift their heads, in melancholy grandeur, amid the mighty ruin. Compared with this conflagration, old Omar lighted up but a ſmall bonfire, when he heated the baths of the barbarians, for eight months together, with the famed Alexandrian library's ineſtimable ſpoils, that no prophane book might obſtruct the triumphant progreſs of his holy Alcoran round the globe.

But why are originals ſo few? not becauſe the writer's harveſt is over, the great reapers of antiquity having left nothing to be gleaned after them; nor becauſe the human mind's teeming time is paſt, or becauſe it is incapable of putting forth unprecedented births; but becauſe illuſtrious examples ***engroſs***, ***prejudice***, and ***intimidate***. They ***engroſs*** our attention, and ſo prevent a due inſpection of ourſelves; they ***prejudice*** our judgment in favour of their abilities, and ſo leſſen the ſenſe of our own; and they ***intimidate*** us with the ſplendor of their renown, and thus under diffidence bury our ſtrength. Nature's impoſſibilities, and thoſe of diffidence, lie wide aſunder.

After all, the firſt ancients had not merit in being *originals*: they could ***not*** be ***imitators***. Modern writers have a *choice* to make; and therefore have a merit in their power. They may ſoar in the regions of *liberty*, or move in the ſoft fetters of eaſy ***imitation***; and ***imitation*** has as many plauſible reaſons to urge, as *pleaſure* had to offer to Hercules. Hercules made the choice of an hero, and *ſo* became immortal.

Yet let not aſſertors of claſſic excellence imagine, that we deny the tribute it ſo well deſerves. He that admires not ancient authors, betrays a ſecret he would conceal, and tells the world, that he does not underſtand them. Let us be as far from neglecting, as from copying, their admirable compoſitions: ſacred be their rights, and inviolable their fame. Let our underſtanding feed on theirs; they afford the nobleſt nouriſhment: but let them nouriſh, and annihilate, our own. When we read, let our imagination kindle at their charms; when we write, let our judgment ſhut them out of our thoughts; treat even Homer himſelf, as his royal admirer was treated by the cynic; bid him ſtand aſide, nor ſhade our compoſition from the beams of our own genius; for nothing ***original*** can riſe, nothing immortal, can ripen, in any other ſun.

Muſt we, then, not imitate ancient authors? Imitate them, by all means; but imitate aright. He that imitates the divine Iliad, does not imitate Homer; but he who takes the ſame method, which Homer took, for arriving at a capacity of accompliſhing a work ſo great. Tread in his ſteps to the ſole fountain of immortality; drink where he drank, at the true *Helicon*, that is, at the breaſt of nature. Imitate; but imitate not the *compoſition*, but the ***man***. For may not this paradox paſs into a maxim? ***viz.*** "The leſs we copy the renowned ancients, we ſhall reſemble them the more."

But poſſibly it may be replied, that we muſt either imitate Homer, or depart from nature. Not ſo: for ſuppoſe you was to change place, in time, with Homer; then, if you write naturally, you might as well charge Homer with an imitation of you. Can you be ſaid to imitate Homer for writing *ſo*, as you would have written if Homer had never been? As far as a regard to nature, and ſound ſenſe, will permit a departure from your great predeceſſors; ſo far, ambitiouſly, depart from them; the farther from them in *ſimilitude*, the nearer are you to them in *excellence*; you riſe by it into an ***original***; become a noble collateral, not an humble deſcendant from them. Let us build our compoſitions with the ſpirit, and in the taſte of the ancients; but not with their materials: thus will they reſemble the ſtructures of Pericles at Athens, which Plutarch commends for having had an air of antiquity as ſoon as they were built. All eminence, and diſtinction, lies out of the beaten road; excurſion, and deviation, are neceſſary to find it; and the more remote your path from the highway, the more reputable; if, like poor Gulliver, you fall not into a ditch, in your way to glory.

What glory to come near, what glory to reach, what glory (preſumptuous thought!) to ſurpaſs our predeceſſors? And is that then in nature abſolutely impoſſible? or is it not rather contrary to nature to fail in it? Nature herſelf ſets the ladder, all wanting is our ambition to climb. For by the bounty of nature we are as ſtrong as our predeceſſors; and by the favour of time (which is but another round in nature's ſcale) we ſtand on higher ground. As to the *firſt*, were ***they*** more than men? or are ***we*** leſs? Are not our minds caſt in the ſame mould with thoſe before the flood? The flood affected matter: mind eſcaped. As to the ***ſecond***; though we are moderns, the world is an ancient; more ancient far, than when they, whom we moſt admire, filled it with their fame. Have we not their beauties, as ſtars, to guide; their defects, as rocks, to be ſhunned; the judgment of ages on both, as a chart to conduct, and a ſure helm to ſteer us in our paſſage to greater perfection than theirs? And ſhall we be ſtopt in our rival pretenſions to fame by this juſt reproof?

> *Stat contra, dicitque tibi tua pagina,* Fur *es.*
>
> Mart.

It is by a ſort of noble contagion, from a general familiarity with their writings, and not by any particular ſordid theft, that we can be the better for thoſe who went before us. Hope we, from plagiariſm, any dominion in literature; as that Rome roſe from a neſt of thieves?

Rome was a powerful ally to many ſtates; ancient authors are our powerful allies; but we muſt take heed, that they do not ſuccour till they inſlave, after the manner of Rome. Too formidable an idea of their ſuperiority, like a ſpectre, would fright us out of a proper uſe of our wits; and dwarf our underſtanding, by making a giant of theirs. Too great awe for them lays genius under reſtraint, and denies it that free ſcope, that full elbow-room, which is requiſite for ſtriking its moſt maſterly ſtrokes. Genius is a maſter-workman, learning is but an inſtrument, and an inſtrument, though moſt valuable, yet not always indiſpenſable. Heaven will not admit of a partner in the accompliſhment of ſome favourite ſpirits; but rejecting all human means, aſſumes the whole glory to itſelf. Have not ſome, though not famed for erudition, *ſo* written, as almoſt to perſuade us, that they ſhone brighter, and ſoared higher, for eſcaping the boaſted aid of that proud ally?

Nor is it ſtrange; for what, for the moſt part, mean we by genius, but the power of accompliſhing great things without the means generally reputed neceſſary to that end? A *genius* differs from a *good underſtanding*, as a magician from a good architect; *that* raiſes his ſtructure by means inviſible; *this* by the ſkilful uſe of common tools. Hence genius has ever been ſuppoſed to partake of ſomething divine.

Learning, deſtitute of this ſuperior aid, is fond, and proud of what has coſt it much pains; is a great lover of rules, and boaſter of famed examples. As beauties leſs perfect, who owe half their charms to cautious art, learning inveighs againſt natural unſtudied graces, and ſmall harmleſs inaccuracies, and ſets rigid bounds to that liberty to which genius often owes its ſupreme glory; but the no genius its frequent ruin. For unpreſcribed beauties, and unexampled excellence, which are characteriſtics of *genius*, lie without the pale of *learning*'s authorities, and laws; which pale, genius muſt leap to come at them: but by that leap, if genius is wanting, we break our necks; we loſe that little credit, which poſſibly we might have enjoyed before. For rules, like crutches, are a needful aid to the lame, though an impediment to the ſtrong. A Homer caſts them away; and, like his Achilles,

Jura negat ſibi nata, nihil non arrogat,

by native force of mind. There is ſomething in poetry beyond proſe-reaſon; there are myſteries in it not to be explained, but admired; which render mere proſe-men infidels to their divinity. And here may be offered a ſecond paradox: *viz.* “*Genius* often then deſerves moſt to be praiſed, when it is moſt ſure to be condemned; that is, when its excellence, from mounting high, to weak eyes is quite out of ſight.”

If we might ſpeak farther of learning and genius, we would compare genius to virtue, and learning to riches. As riches are moſt wanted where there is leaſt virtue; ſo learning where there is leaſt genius. As virtue without much riches can give happineſs; ſo genius without much learning can give renown. As it is ſaid in Terence, *pecuniam negligere interdum maximum eſt lucrum;* ſo to neglect of learning, genius ſometimes owes its greater glory. Genius, therefore, leaves but the ſecond place, among men of letters, to the learned. It is their merit, and ambition, to fling light on the works of genius, and point out its charms. We moſt juſtly reverence their informing radius for that favour; but we muſt much more admire the radiant ſtars pointed out by them.

A ſtar of the firſt magnitude among the moderns was Shakeſpeare; among the ancients, Pindar; who, (as Voſſius tells us) boaſted of his no-learning, calling himſelf the eagle, for his flight above it. And ſuch genii as theſe may, indeed, have much reliance on their own native powers. For genius may be compared to the natural ſtrength of the body; learning to the ſuperinduced accountrements of arms: if the firſt is equal to the propoſed exploit, the latter rather encumbers, than aſſiſts; rather retards, than promotes, the victory. *Sacer nobis ineſt Deus*, ſays Seneca. With regard to the moral world, *conſcience*, with regard to the intellectual, *genius*, is that god within. Genius can ſet us right in compoſition, without the rules of the learned; as conſcience ſets us right in life, without the laws of the land: *this*, ſingly, can make us good, as men: *that*, ſingly, as writers, can, ſometimes, make us great.

As too great admirers of the fathers of the church have ſometimes ſet up their authority againſt the true ſenſe of ſcripture; ſo too great admirers of the claſſical fathers have ſometimes ſet up their authority, or example, againſt reaſon.

Neve minor, neu ſit quinto productior actu fabula.

So ſays Horace, ſo ſays ancient example. But reaſon has not ſubſcribed. We know but one book that can juſtify our implicit acquieſcence in it: and (by the way) on that book a noble diſdain of undue deference to prior opinion has lately caſt, and is ſtill caſting, a new and ineſtimable light.

But, ſuperſtition for our predeceſſors ſet aſide, the claſſics are for ever our rightful and revered maſters in *compoſition*; and our underſtandings bow before them. But when? When a maſter is wanted; which ſometimes is not the caſe. Some are pupils of nature only, nor go farther to ſchool. From ſuch we reap often a double advantage; they not only rival the reputation of the great ancient authors, but alſo reduce the number of mean ones among the moderns. For when they enter on ſubjects which have been in former hands, ſuch is their ſuperiority, that, like a tenth wave, they overwhelm, and bury in oblivion all that went before: and thus not only enrich and adorn, but remove a load, and leſſen the labour, of the letter'd world.

“But, it may be ſaid, ſince *originals* can ariſe from genius only, and ſince genius is ſo very rare, it is ſcarce worth while to labour a point ſo much, from which we can reaſonably expect ſo little.” To ſhow that genius is not ſo very rare as you imagine, we ſhall point out ſtrong inſtances of it, in a far diſtant quarter from that mentioned above. The minds of the ſchoolmen were almoſt as much cloiſtered as their bodies; they had but little learning, and few books; yet may the moſt learned be ſtruck with ſome aſtoniſhment at their ſo ſingular natural ſagacity, and moſt exquiſite edge of thought. Who would expect to find Pindar and Scotus, Shakeſpeare and Aquinas, of the ſame party? Both equally ſhew an *original*, unindebted, energy: the *vigor igneus*, and *cæleſtis origo*, burns in both; and leaves us in doubt whether genius is more evident in the ſublime flights and beauteous flowers of poetry, or in the profound penetrations, and marvelouſly keen and minute diſtinctions, called the thorns of the ſchools. There might have been more able conſuls called from the plough, than ever arrived at that honour: many a genius, probably, there has been, which could neither write nor read. So that genius, that ſupreme luſtre of literature, is leſs rare than is generally conceived.

By the praiſe of genius we detract not from learning; we detract not from the value of gold, by ſaying that diamond has greater ſtill. He who diſregards learning, ſhows that he wants its aid; and he that overvalues it, ſhows that its aid has done him harm. Over-valued indeed it cannot be, if genius as to *compoſition*, is valued more. Learning, we thank; genius, we revere; that gives us pleaſure, this gives us rapture; that informs, this inſpires; and is itſelf inſpired; for genius is from heaven, learning from man: *this* ſets us above the low, and illiterate; *that*, above the learned, and polite. Learning is borrowed knowledge; genius is knowledge innate, and quite our own. Therefore, as Bacon obſerves, it may take a nobler name, and be called wiſdom; in which ſenſe of wiſdom, ſome are born wiſe.

Having put in a caveat againſt the moſt fatal of errors, from the too great indulgence of genius, return we now to that too great ſuppreſſion of it, which is detrimental to compoſition; and endeavour to reſcue the writer, as well as the man. We have ſaid, that ſome are born wiſe; but they, like thoſe that are born rich, by neglecting the cultivation and produce of their own poſſeſſions, and by running in debt, may be beggared at laſt; and loſe their reputations, as younger brothers eſtates, not by being born with leſs abilities than the rich heir, but at too late an hour.

Many a great man has been loſt to himſelf, and the public, purely becauſe great ones were born before him. Hermias, in his collections on Homer's blindneſs, ſays, that Homer requeſting the gods to grant him a ſight of Achilles, that hero roſe, but in armour ſo bright, that it ſtruck Homer blind with the blaze. Let not the blaze of even Homer's muſe darken us to the diſcernment of our own powers; which may poſſibly ſet us above the rank of *imitators*; who, though moſt excellent, and even immortal, (as ſome of them are), yet are ſtill but *dii minorum gentium*, nor can expect the largeſt ſhare of incenſe, the greateſt profuſion of praiſe, on their ſecondary altars.

But farther ſtill: a ſpirit of *imitation* hath many ill effects; we ſhall confine ourſelves to three. *Firſt*, It deprives the liberal and politer arts of an advantage which the mechanic enjoy: in theſe, men are ever endeavouring to go beyond their predeceſſors; in the former, to follow them. And ſince copies ſurpaſs not their *originals*, as ſtreams riſe not higher than their ſpring, rarely ſo high; hence, while arts mechanic are in perpetual progreſs and increaſe, the liberal are in retrogradation and decay. *Theſe* reſemble pyramids, are broad at bottom, but leſſen exceedingly as they riſe; *theſe* reſemble rivers, which, from a ſmall fountain head, are ſpreading ever wider and wider, as they run. Hence it is evident, that different portions of underſtanding are not (as ſome imagine) allotted to different periods of time; for we ſee, in the ſame period, underſtanding riſing in one ſet of artiſts, and declining in another. Therefore *nature* ſtands abſolved, and our inferiority in compoſition muſt be charged on ourſelves.

Nay, ſo far are we from complying with a neceſſity which nature lays us under, that, *ſecondly*, by a ſpirit of imitation we counteract nature, and thwart her deſign. She brings us into the world all *originals*. No two faces, no two minds, are juſt alike; but all bear nature's evident mark of ſeparation on them. Born *originals*, how comes it to paſs that we die *copies*? That meddling ape *imitation*, as ſoon as we come to years of *indiſcretion*, (if we may ſo ſpeak), ſnatches the pen, and blots out nature's mark of ſeparation, cancels her kind intention, deſtroys all mental individuality; the letter'd world no longer conſiſts of ſingulars, it is a medly, a maſs; and a hundred books, at bottom, are but one. Why are monkies ſuch maſters of mimickry? why receive they ſuch a talent at imitation? Is it not as the Spartan ſlaves received a licenſe for ebriety, that their betters might be aſhamed of it?

The *third* fault to be found with a ſpirit of *imitation* is, that with great incongruity it makes us poor and proud; makes us think little, and write much; gives us huge folios, which are little better than more reputable cuſhions to promote our repoſe. Have not ſome ſevenfold volumes put us in mind of Ovid's ſevenfold channels of the Nile at the conflagration?

Oſtia ſeptem
Pulverulenta vacant ſeptem ſine flumine valles.

Such leaden labours are like Lycurgus's iron money, which was ſo much leſs in value than in bulk, that it required barns for ſtrong boxes, and a yoke of oxen to draw five hundred pounds.

But notwithſtanding theſe diſadvantages of *imitation*, imitation muſt be the lot (and often an honourable lot it is) of moſt writers. If there is a famine of *invention* in the land, like Joſeph's brethren, we muſt travel far for food; we muſt viſit the remote and rich ancients: but an inventive genius may ſafely ſtay at home; that, like the widow's cruſe, is divinely repleniſhed from within, and affords us a miraculous delight. Whether our own genius be ſuch or not, we diligently ſhould inquire, that we may not go a-begging with gold in our purſe. For there is a mine in man, which muſt be deeply dug ere we can conjecture its contents. Another often ſees that in us, which we ſee not ourſelves; and may there not be that in us which is unſeen by both? That there may, chance often diſcovers, either by a luckily choſen theme, or a mighty premium, or an abſolute neceſſity of exertion, or a noble ſtroke of emulation from another's glory; as that on Thucydides from hearing Herodotus repeat part of his hiſtory at the Olympic games. Had there been no Herodotus, there might have been no Thucydides, and the world's admiration might have begun at Livy for excellence in that province of the pen. Demoſthenes had the ſame ſtimulation on hearing Calliſtratus; or Tully might have been the firſt of conſummate renown at the bar

Quite clear of the diſpute concerning ancient and modern learning, we ſpeak not of performance, but powers. The modern powers are equal to thoſe before them; modern performance in general is deplorably ſhort. How great are the names juſt mentioned? Yet who will daily affirm, that as great may not riſe up in ſome future, or even in the preſent age? Reaſons there are why talents may not *appear*, none why they may not *exiſt*, as much in one period as another. An evocation of vegetable fruits depends on rain, air, and ſun; an evocation of the fruits of genius no leſs depends on externals. What a marvellous crop bore it in Greece and Rome? And what a marvellous ſunſhine did it there enjoy? What encouragement from the nature of their governments, and the ſpirit of their people? Virgil and Horace owed their divine talents to Heaven; their immortal works to men; thank Mæcenas and Auguſtus for them. Had it not been for theſe, the genius of thoſe poets had lain buried in their aſhes. Athens expended on her theatre, painting, ſculpture, and architecture, a tax levied for the ſupport of a war. Cæſar dropt his papers when Tully ſpoke; and Philip trembled at the voice of Demoſthenes. And has there ariſen but one Tully, one Demoſthenes in ſo long a courſe of years? The powerful eloquence of them both in one ſtream, ſhould never bear us down into the melancholy perſuaſion, that ſeveral have not been born, though they have not emerged. The ſun as much exiſts in a cloudy day, as in a clear; it is outward, accidental circumſtances that with regard to genius either in nation, or age,

Collectas fugat nubes, ſolemque reducit. VIRG.

As great, perhaps greater than thoſe mentioned (preſumptuous as it may ſound) may, poſſibly, ariſe; for, who hath fathomed the mind of man? Its bounds are as unknown, as thoſe of the creation; ſince the birth of which, perhaps, not one has ſo far exerted, as not to leave his poſſibilities beyond his attainments, his powers beyond his exploits. Forming our judgments altogether by what *has* been done, without knowing, or at all inquiring, what poſſibly *might* have been done, we naturally enough fall into too mean an opinion of the human mind. If a ſketch of the divine Iliad before Homer wrote, had been given to mankind, by ſome ſuperior being, or otherwiſe, its execution would probably have appeared beyond the power of man. Now, to ſurpaſs it, we think impoſſible. As the firſt of theſe opinions would evidently have been a miſtake, why may not the ſecond be ſo too? Both are founded on the ſame bottom; on our ignorance of the poſſible dimenſions of the mind of man.

Nor are we only ignorant of the dimenſions of the human mind in general, but even of our own. That a man may be ſcarce leſs ignorant of his own powers, than an oyſter of its pearl, or a rock of its diamond; that he may poſſeſs dormant, unſuſpected abilities, till awakened by loud calls, or ſtung up by ſtriking emergencies; is evident from the ſudden eruption of ſome men out of perfect obſcurity, into public admiration, on the ſtrong impulſe of ſome animating occaſion; not more to the world's great ſurpriſe, than their own. Few authors of diſtinction but have experienced ſomething of this nature, at the firſt beamings of their yet unſuſpected genius on their hitherto dark compoſition. The writer ſtarts at it, as at a lucid meteor in the night; is much ſurpriſed; can ſcarce believe it true. During this happy confuſion, it may be ſaid to him, as to Eve at the lake,

What there thou ſeeſt, fair creature, is thyſelf. MILTON.

Genius, in this view, is like a dear friend in our company under diſguiſe; who, while we are lamenting his abſence, drops his maſk, ſtriking us at once with equal ſurpriſe and joy. This ſenſation, which we ſpeak of in a writer, might favour, and ſo promote, the fable of poetic inſpiration. A poet of a ſtrong imagination, and ſtronger vanity, on feeling it, might naturally enough realiſe the world's mere compliment, and think himſelf truly inſpired. Which is not improbable; for enthuſiaſm of all kinds do no leſs.

Since it is plain, that men may be ſtrangers to their own abilities; and by thinking meanly of them without juſt cauſe, may poſſibly loſe a name, perhaps a name immortal; we would find ſome means to prevent theſe evils. Whatever promotes virtue, promotes ſomething more, and carries its good influence beyond the *moral* man: to prevent theſe evils we borrow two golden rules from *ethics*, which are no leſs golden in *compoſition*, than in life. 1. *Know thyſelf*; 2. *Reverence thyſelf*.

1ſt, *Know thyſelf*. Of ourſelves it may be ſaid, as Martial ſays of a bad neighbour,

Nil tam prope, proculque nobis.

Therefore dive deep into thy boſom; learn the depth, extent, bias, and full ſort of thy mind; contract full intimacy with the ſtranger within thee; excite and cheriſh every ſpark of intellectual light and heat, however ſmothered under former negligence, or ſcattered through the dull, dark maſs of common thoughts; and collecting them into a body, let thy genius riſe (if a genius thou haſt) as the ſun from chaos; and if we ſhould then ſay, like an Indian, *Worſhip it*, (though too bold) yet ſhould we ſay little more than the ſecond rule enjoins, viz. *Reverence thyſelf*.

That is, let not great examples, or authorities, browbeat thy reaſon into too great a diffidence of thyſelf: thyſelf ſo reverence, as to prefer the native growth of thy own mind to the richeſt import from abroad; ſuch borrowed riches make us poor. The man who thus reverences himſelf, will ſoon find the world's reverence to follow his own. His works will ſtand diſtinguiſhed; his the ſole property of them; which property alone can confer the noble title of an *author*; that is, of one who, to ſpeak accurately, *thinks*, and *compoſes*; while other invaders of the preſs, how voluminous, and learned ſoever, with due reſpect be it ſpoken, only *read* and *write*.

This is the difference between thoſe two luminaries in literature, the well-accompliſhed ſcholar, and the divinely-inſpired enthuſiaſt; the firſt is, as the bright morning ſtar; the ſecond, as the riſing ſun. The writer who neglects thoſe two rules above will never ſtand alone; he makes ceſsfully in ſeveral of his pieces. One advantage it poſſeſſes above fiction, that of more readily engaging our belief, which tends above any other particular to raiſe our ſympathy. The ſcene of comedy is generally laid at home: familiarity is no objection; and we are peculiarly ſenſible of the ridicule of our own manners.

After a proper ſubject is choſen, the dividing it into parts requires ſome art. The concluſion of a book in an epic poem, or of an act in a play, cannot be altogether arbitrary; nor be intended for ſo ſlight a purpoſe as to make the parts of equal length. The ſuppoſed pauſe at the end of every book, and the real pauſe at the end of every act, ought always to coincide with ſome pauſe in the action. In this reſpect, a dramatic or epic poem ought to reſemble a ſentence or period in language, divided into members that are diſtinguiſhed from each other by proper pauſes; or it ought to reſemble a piece of muſic, having a full cloſe at the end, preceded by imperfect cloſes that contribute to the melody. Every act in a dramatic poem ought therefore to cloſe with ſome incident that makes a pauſe in the action; for otherwiſe there can be no pretext for interrupting the repreſentation: it would be abſurd to break off in the very heat of action; againſt which every one would exclaim: the abſurdity ſtill remains, though the action relents, if it be not actually ſuſpended for ſome time. This rule is alſo applicable to an epic poem: though there, a deviation from the rule is leſs remarkable; becauſe it is in the reader's power to hide the abſurdity, by proceeding inſtantly to another book. The firſt book of the Paradiſe Loſt ends without any regular cloſe, perfect or imperfect: it breaks off abruptly, where Satan, ſeated on his throne, is prepared to make a ſpeech to the convocated hoſt of the fallen angels; and the ſecond book begins with the ſpeech. Milton ſeems to have copied the Æneid, of which the two firſt books are divided much in the ſame manner. Neither is there any proper pauſe at the end of the fifth book of the Æneid. There is no proper pauſe at the end of the ſeventh book of Paradiſe Loſt, nor at the end of the eleventh.

This branch of the ſubject ſhall be cloſed with a general rule, That action being the fundamental part of every compoſition whether epic or dramatic, the ſentiments and tone of language ought to be ſubſervient to the action, ſo as in every reſpect to appear natural, and proper for the occaſion. The application of this rule to our modern plays, would reduce the bulk of them to a ſkeleton.

After carrying on together epic and dramatic compoſitions, we proceed to handle them ſeparately, and to mention circumſtances peculiar to each, beginning with the epic kind. In a theatrical entertainment, which employs both the eye and the ear, it would be a groſs abſurdity to introduce upon the ſtage ſuperior beings in a viſible ſhape. There is not place for this objection in an epic poem; and Boileau, with many other critics, declares ſtrongly for this ſort of machinery in an epic poem. But waving authority, which is apt to impoſe upon the judgment, let us draw what light we can from reaſon. This matter is but indiſtinctly handled by critics: the poetical privilege of animating inſenſible objects for enlivening a deſcription, is very different from what is termed *machinery*, where deities, angels, devils, or other ſupernatural powers, are introduced as real perſonages, mixing in the action, and contributing to the cataſtrophe; and yet theſe two things are conſtantly jumbled together in the reaſoning. The former is founded on a natural principle: but can the latter claim the ſame authority? ſo far from it, that nothing can be more unnatural. Its effects, at the ſame time, are deplorable. Firſt, it gives an air of fiction to the whole; and prevents that impreſſion of reality which is requiſite to intereſt our affections, and to move our paſſions: this of itſelf is ſufficient to explode machinery, whatever entertainment it may afford to readers of a fantaſtic taſte or irregular imagination. And, next, were it poſſible, by diſguiſing the fiction, to delude us into a notion of reality, an inſuperable objection would ſtill remain, which is, that the aim or end of an epic poem can never be attained in any perfection where machinery is introduced; for an evident reaſon, that virtuous emotions cannot be raiſed ſucceſsfully but by the actions of thoſe who are endued with paſſions and affections like our own, that is, by human actions: and as for moral inſtruction, it is clear, that none can be drawn from beings who act not upon the ſame principles with us. A fable in Æſop's manner is no objection to this reaſoning: his lions, bulls, and goats, are truly men under diſguiſe: they act and feel in every reſpect as human beings; and the moral we draw is founded on that ſuppoſition. Homer, it is true, introduces the gods into his fable: but he was authoriſed to take that liberty by the religion of his country; it being an article in the Grecian creed, that the gods often interpoſe viſibly and bodily in human affairs. We muſt however obſerve, that Homer's deities do no honour to his poems: fictions that tranſgreſs the bounds of nature, ſeldom have a good effect: they may inflame the imagination for a moment, but will not be reliſhed by any perſon of a correct taſte. Let us add, that of whatever uſe ſuch fictions may be to a mean genius, an able writer has much finer materials of Nature's production, for elevating his ſubject, and making it intereſting.

The marvellous is indeed ſo much promoted by machinery, that it is not wonderful to find it embraced by the bulk of writers, and perhaps of readers. If indulged at all, it is generally indulged to exceſs. Homer introduces his deities with no greater ceremony than his mortals; and Virgil has ſtill leſs moderation: a pilot ſpent with watching cannot fall aſleep and drop into the ſea by natural means: one bed cannot hold the two lovers, Æneas and Dido, without the immediate interpoſition of ſuperior powers. The ridiculous in ſuch fictions muſt appear, even through the thickeſt vail of gravity and ſolemnity.

Angels and devils ſerve equally with the Heathen deities, as materials for figurative language, perhaps better among Chriſtians, becauſe we believe in them, and not in the Heathen deities. But every one is ſenſible, as well as Boileau, that the inviſible powers in our creed make a much worſe figure as actors in a modern poem, than the inviſible powers in the Heathen creed did in ancient times. The reaſon ſeems to be what follows. The Heathen deities, in the opinion of their votaries, were beings elevated one ſtep only above mankind, actuated by the ſame paſſions, and directed by the ſame motives; therefore not altogether improper to mix with men in an important action. In our creed, ſuperior beings are placed at ſuch a mighty diſtance from us, and are of a nature ſo different, that with no propriety can they appear with us upon the ſame ſtage: man is a creature ſo much inferior, that he loſes all dignity when ſet in oppoſition.

There can be no doubt, that an hiſtorical poem admits the embelliſhment of allegory, as well as of metaphor, ſimile, or other figure. Moral truth, in particular, is finely illuſtrated in the allegorical manner: it amuſes the fancy to find abſtract terms, by a ſort of magic, converted into active beings; and it is delightful to trace a general propoſition in a pictured event. But allegorical beings ſhould be confined within their own ſphere, and never be admitted to mix in the principal action, nor to co-operate in retarding or advancing the cataſtrophe; which would have a ſtill worſe effect than inviſible powers, and we are ready to aſſign the reaſon. The impreſſion of real exiſtence, eſſential to an epic poem, is inconſiſtent with that figurative exiſtence which is eſſential to an allegory; and therefore no method can be more effectual to prevent the impreſſion of reality, than to introduce allegorical beings co-operating with thoſe whom we conceive to be really exiſting. The love-epiſode in the Henriade, inſufferable by the diſcordant mixture of allegory with real life, is copied from that of Rinaldo and Armida in the *Gieruſalemme liberata*, which hath no merit to intitle it to be copied. An allegorical object, ſuch as Fame in the Æneid, and the Temple of Love in the Henriade, may find place in a deſcription: but to introduce Diſcord as a real perſonage, imploring the aſſiſtance of Love as another real perſonage, to enervate the courage of the hero, is making theſe figurative beings act beyond ther ſphere, and creating a ſtrange jumble of truth and fiction.

What is the true notion of an epiſode? or how is it to be diſtinguiſhed from the principal action? Every incident that promotes or retards the cataſtrophe, muſt be a part of the principal action. This clears the nature of an epiſode; which may be defined, "An incident connected with the principal action, but contributing neither to advance nor retard it." The deſcent of Æneas into hell doth not advance nor retard the cataſtrophe; and therefore is an epiſode. The ſtory of Niſus and Euryalus, producing an alteration in the affairs of the contending parties, is a part of the principal action. The family-ſcene in the ſixth book of the Iliad is of the ſame nature: by Hector's retiring from the field of battle to viſit his wife, the Grecians had liberty to breathe, and even to preſs upon the Trojans. Such being the nature of an epiſode, the unavoidable effect of it muſt be, to break in upon the unity of action; and therefore it ought never to be indulged, unleſs to unbend the mind after the fatigue of a long narration. This purpoſe of an epiſode demands the following conditions: it ought to be well connected with the principal action: it ought to be lively and intereſting: it ought to be ſhort: and a time ought to be choſen when the principal action relents.

Next, upon the peculiarities of a dramatic poem. And the firſt we ſhall mention is a double plot; one of which muſt be of the nature of an epiſode in an epic poem; for it would diſtract the ſpectator, inſtead of entertaining him, if he were forced to attend, at the ſame time, to two capital plots equally intereſting. And even ſuppoſing it an under-plot, of the nature of an epiſode, it ſeldom hath a good effect in tragedy, of which ſimplicity is a chief property; for an intereſting ſubject that engages our warmeſt affections, occupies our whole attention, and leaves no room for any ſeparate concern. Variety is more tolerable in comedy, which pretends only to amuſe, without totally occupying the mind. But even here to make a double plot agreeable, is no ſlight effort of art: the under plot ought not to vary greatly in its tone from the principal; for diſcordant paſſions are unpleaſant when jumbled together; which, by the way, is an inſuperable objection to tragi-comedy. Upon this account, we blame the Provoked Huſband: all the ſcenes that bring the family of the Wrongheads into action, being ludicrous and farcical, agree very ill with the principal ſcenes, diſplaying ſevere and bitter expoſtulations between lord Townly and his lady. The ſame objection touches not the double plot of the Careleſs Huſband; the different ſubjects being ſweetly connected, and having only ſo much variety as to reſemble ſhades of colours harmoniouſly mixed. But this is not all. The under plot ought to be connected with that which is principal, ſo much at leaſt as to employ the ſame perſons: the under-plot ought to occupy the intervals or pauſes of the principal action; and both ought to be concluded together. This is the caſe of the Merry Wives of Windſor.

Violent action ought never to be repreſented on the ſtage. While the dialogue runs on, a thouſand particulars concur to delude us into an impreſſion of reality, genuine ſentiments, paſſionate language, and perſuaſive geſture: the ſpectator once engaged, is willing to be deceived, loſes ſight of himſelf, and without ſcruple enjoys the ſpectacle as a reality. From this abſent ſtate, he is rouſed by violent action: he wakes as from a pleaſing dream, and gathering his ſenſes about him, finds all to be a fiction.

The French critics join with Horace in excluding from the ſtage the ſhedding blood; but they have overlooked the moſt ſubſtantial objection, that above-mentioned, urging only that it is barbarous, and ſhocking to a polite audience. But the Greeks had no notion of ſuch delicacy, or rather effeminacy; witneſs the murder of Clytemneſtra by her ſon Oreſtes, paſſing behind the ſcene, as repreſented by Sophocles: her voice is heard calling out for mercy, bitter expoſtulations on his part, loud ſhrieks upon her being ſtabbed, and then a deep ſilence. We appeal to every perſon of feeling, whether this ſcene be not more horrible, than if the deed had been committed in ſight of the ſpectators upon a ſudden guſt of paſſion. If Corneille, in repreſenting the affair between Horatius and his ſiſter upon which murder enſues behind the ſcene, had no other view but to remove from the ſpectators a ſhocking action, he certainly was in a capital miſtake: for murder in cold blood, which in ſome meaſure was the caſe as repreſented, is more ſhocking to a polite audience, even where the concluſive ſtab is not ſeen, than the ſame act performed in their preſence, when it is occaſioned by violent and unpremeditated paſſion, as ſuddenly repented of as committed. We heartily agree with Addiſon, that no part of this incident ought to have been repreſented, but reſerved for a narrative, with every alleviating circumſtance in favour of the hero. This is the only method to avoid the difficulties that unqualify this incident for repreſentation, a deliberate murder on the one hand, and on the other a violent action performed on the ſtage, which muſt rouſe the ſpectator from his dream of reality.

A few words upon the dialogue, which ought to be ſo conducted as to be a true repreſentation of nature. Every ſingle ſpeech, ſhort or long, ought to ariſe from what is ſaid by the former ſpeaker, and furniſh matter for what comes after, till the end of the ſcene. In this view, the whole ſpeeches, from firſt to laſt, repreſent ſo many links, all connected together in one regular chain. No author, ancient or modern, poſſeſſes the art of dialogue equal to Shakeſpeare. Dryden in this particular may juſtly be placed as his oppoſite: he frequently introduces three or four perſons ſpeaking upon the ſame ſubject, each throwing out his own ſentiments ſeparately, without regarding what is ſaid by the reſt; take for an example the firſt ſcene of Aurenzebe: ſometimes he makes a number club in relating an event, not to a ſtranger, ſuppoſed ignorant of it, but to one another, for the ſake merely of ſpeaking: of which notable ſort of dialogue, we have a ſpecimen in the firſt ſcene of the firſt part of the Conqueſt of Granada. In the ſecond part of the ſame tragedy, ſcene ſecond, the king, Abenamar, and Zulema, make their ſeparate obſervations, like ſo many ſoliloquies, upon the fluctuating temper of the mob: a dialogue ſo uncouth, puts one in mind of two ſhepherds in a paſtoral, excited by a prize to pronounce verſes alternately, each in praiſe of his own miſtreſs.

The bandying ſentiments in this manner, beſide an unnatural air, has another bad effect: it ſtays the courſe of the action, becauſe it is not productive of any conſequence. In Congreve's comedies, the action is often ſuſpended to make way for a play of wit.

No fault is more common among writers, than to prolong a ſpeech after the impatience of the perſon to whom it is addreſſed ought to prompt him or her to break in. Conſider only how the impatient actor is to behave in the mean time. To expreſs his impatience in violent action without interrupting, would be unnatural; and yet to diſſemble his impatience by appearing cool where he ought to be highly inflamed, would be no leſs unnatural.

Rhyme being unnatural and diſguſtful in dialogue, is happily baniſhed from our theatre: the only wonder is, that it ever found admittance, eſpecially among a people accuſtomed to the more manly freedom of Shakeſpeare's dialogue. By baniſhing rhyme, we have gained ſo much as never once to dream that there can be any further improvement. And yet, however ſuitable blank verſe may be to elevated characters and warm paſſions, it muſt appear improper and affected in the mouths of the lower ſort. Why then ſhould it be a rule, that every ſcene in tragedy muſt be in blank verſe? Shakeſpeare, with great judgment, has followed a different rule; which is, to intermix proſe with verſe, and only to employ the latter where the importance or dignity of the ſubject requires it. Familiar thoughts and ordinary facts ought to be expreſſed in plain language; and if it appear not ridiculous to hear a footman deliver a ſimple meſſage in blank verſe, a vail muſt be drawn over the ridiculous appearance by the force of cuſtom. In ſhort, that variety of characters and of ſituations, which is the life of a play, requires not only a ſuitable variety in the ſentiments, but alſo in the diction.

Composition, in painting, conſiſts of two parts, invention and diſpoſition; the firſt whereof is the choice of the objects which are to enter into the compoſition of the ſubject the painter intends to execute, and is either ſimply hiſtorical or allegorical.

Composition, in commerce, a contract between an inſolvent debtor and his creditors, whereby the latter accept of a part of the debt in compenſation for the whole, and give a general acquittance accordingly.

Composition, in printing, commonly termed compoſing, the arranging of ſeveral types, or letters, in the compoſing-ſtick, in order to form a line; and of ſeveral lines ranged in order in the galley, to make a page; and of ſeveral pages, to make a form. See Printing.

COMPOST, in huſbandry and gardening, ſeveral ſorts of ſoils, or earthy matter, mixed together, in order to make a manure, for aſſiſting the natural earth in the work of vegetation, by way of amendment or improvement. See Agriculture.

COMPOSTELLA, the capital of Galicia, in Spain, remarkable for the devotion paid there by pilgrims from all countries to the relics of St James.

COMPOUND, in a general ſenſe, an appellation given to whatever is compoſed, or made up of different things: thus we ſay, a compound word, compound ſound, compound taſte, compound force, *&c.*

Compound-interest. See Interest.

Compound numbers, thoſe which may be divided by ſome other number beſides unity, without leaving any remainder: ſuch are 18, 20, *&c.* the firſt being meaſured by the numbers 2, 6, or 9; and the ſecond by the numbers 2, 4, 5, 10.

COMPREHENSION, in logic, the ſame with apprehenſion.

COMPRESSION, the act of preſſing or ſqueezing ſome matter, ſo as to ſet its parts nearer to each other, and make it poſſeſs leſs ſpace.

COMPRINT, among bookſellers, ſignifies a ſurreptitious printing of another's copy, in order to gain thereby, which is expreſsly contrary to ſtatute 14 Car. II.

COMPROMISE, a treaty, or contract, whereby two contending parties eſtabliſh one or more arbitrators, to judge of and terminate their difference in an amicable way.

COMPUNCTION, in theology, an inward grief of mind, for having offended God.

COMPUTATION, in a general ſenſe, the manner of eſtimating time, weights, meaſure, moneys, or quantities of any kind.

CONARION, or CONOIDES, a name for the pineal gland. See Vol. I. p. 286.

CONATUS, a term frequently uſed in philoſophy and mathematics, defined by ſome to be a quantity of motion, not capable of being expreſſed by any time, or length; as the *conatus recedendi ab axe motus*, is the endeavour which a body, moved circularly, makes to recede, or fly off from the centre or axis of its motion. See MECHANICS.

CONCATENATION, a term chiefly uſed in ſpeaking of the mutual dependence of ſecond cauſes upon each other.

CONCAVE, an appellation uſed in ſpeaking of the inner ſurface of hollow bodies, but more eſpecially of ſpherical ones.

CONCAVE GLASSES, ſuch as are ground hollow, and are uſually of a ſpherical figure, though they may be of any other, as parabolical, *&c.* All objects ſeen through concave glaſſes, appear erect and diminiſhed. See OPTICS.

CONCENTRATION, in general, ſignifies the bringing things nearer a center. Hence the particles of ſalt, in ſea-water, are ſaid to be concentrated; that is, brought nearer each other, by evaporating the watery part. See CHEMISTRY.

CONCENTRIC, in mathematics, ſomething that has the ſame common center with another: it ſtands in oppoſition to excentric.

CONCEPTION, among phyſicians, *&c.* denotes the firſt formation of an embryo in the womb of its parent, who from that time becomes pregnant. See GENERATION.

CONCEPTION, in logic. See APPREHENSION.

CONCEPTION, in geography, a city of Chili, in South America, ſituated on the Pacific Ocean, in 79° W. long. and 37° S. lat.

CONCEPTION is alſo the capital of the province of Veragua, in Mexico, about 100 miles weſt of Porto Bello: W. long. 83°, and N. lat. 10°.

CONCERT, or CONCERTO, in muſic, a number or company of muſicians, playing or ſinging the ſame piece of muſic or ſong at the ſame time. See MUSIC.

CONCERTATO intimates the piece of muſic to be compoſed in ſuch a manner, as that all the parts may have their recitativos, be it for two, three, four, or more voices or inſtruments.

CONCERTO GROSSI, the grand chorus of a concert, or thoſe places where all the ſeveral parts perform or play together.

CONCHA, in zoology, a ſynonime of the MYTILUS, SOLEN, *&c.* See theſe articles.

CONCHA, in anatomy. See Vol. I. p. 297.

CONCHOID, in geometry, the name of a curve, given it by its inventor Nicomedes. See FLUXIONS.

CONCHYLIA, a general name for all kinds of petrified ſhells, as limpets, cochlea, nautili, conchæ, lepades, *&c.*

CONCINNOUS *intervals*, in muſic, are ſuch as are fit for muſic, next to, and in combination with concords; being neither very agreeable, nor diſagreeable in themſelves, but having a good effect, as by their oppoſition they heighten the more eſſential principles of pleaſure; or as by their mixture and combination with them, they produce a variety neceſſary to our being better pleaſed.

CONCINNOUS *ſyſtem*, in muſic. A ſyſtem is ſaid to be concinnous, or divided concinnouſly, when its parts, conſidered as ſimple intervals, are concinnous; and are beſides placed in ſuch an order between the extremes, as that the ſucceſſion of ſounds, from one extreme to the other, may have an agreeable effect.

CONCLAVE, the place in which the cardinals of the Romiſh church meet, and are ſhut up, in order to the election of a pope.

The conclave is a range of ſmall cells, ten feet ſquare, made of wainſcot: theſe are numbered, and drawn for by lot. They ſtand in a line along the galleries and hall of the Vatican, with a ſmall ſpace between each. Every cell has the arms of the cardinal over it. The conclave is not fixed to any one determinate place, for the conſtitutions of the church allow the cardinals to make choice of ſuch a place for the conclave as they think moſt convenient; yet it is generally held in the Vatican.

The conclave is very ſtrictly guarded by troops: neither the cardinals, nor any perſon ſhut up in the conclave, are ſpoke to, but at the hours allowed of, and then in Italian or Latin; even the proviſions for the conclave are examined, that no letters be conveyed by that means from the miniſters of foreign powers, or other perſons who may have an intereſt in the election of the pontiff.

CONCLAVE is alſo uſed for the aſſembly, or meeting, of the cardinals ſhut up, for the election of a pope.

CONCLUSION, in logic, the conſequence or judgment, drawn from what was aſſerted in the premiſſes; or the previous judgments in reaſoning, gained from combining the extreme ideas between themſelves.

CONCOCTION, in medicine, the change which the food undergoes in the ſtomach, *&c.* to become chyle. See CHYLE.

CONCOMITANT, ſomething that accompanies or goes along with another.

CONCORD, in grammar, that part of conſtruction called ſyntax, in which the words of a ſentence agree; that is, in which nouns are put in the ſame gender, number, and caſe; and verbs in the ſame number and perſon with nouns and pronouns.

CONCORD, in muſic, the relation of two ſounds that are always agreeable to the ear, whether applied in ſucceſſion or conſonance. See MUSIC.

CONCORDANCE, a ſort of dictionary of the Bible, explaining the words thereof in alphabetical order, with the ſeveral books, chapters, and verſes quoted, in which they are contained.

CONCORDIA, in geography, a town of the dutchy of Mantua in Italy, about fifteen miles ſouth eaſt of the city of Mantua: E. long. 11° 20′, and N. lat. 45°.

CONCRETE, in the ſchool-philoſophy, an aſſemblage or compound.

CONCRETE, in natural philoſophy and chemiſtry, ſignifies a body made up of different principles, or any mixed body: thus ſoap is a factitious concrete, or a body mixed together by art; and antimony is a natural concrete, or a mixed body, compounded in the bowels of the earth.

CONCRETION, the uniting together ſeveral ſmall particles of a natural body into ſenſible maſſes, or concretes, whereby it becomes ſo and ſo figured and determined, and is endued with ſuch and ſuch properties.

CONCRETION is alſo the act whereby ſoft bodies are rendered hard; or an inſenſible motion of the particles of a fluid or a ſoft body, whereby they come to a conſiſtence. It is indifferently uſed for induration, condenſation, congelation, and coagulation.

CONCUBINAGE, denotes ſometimes a criminal or prohibited commerce between the ſexes; in which ſenſe it comprehends adultery, inceſt, and ſimple fornication: but, in a more limited ſenſe, it ſignifies the cohabitation of a man and a woman in the way of marriage, without having paſſed the ceremony thereof.

CONCUBINE, a woman whom a man takes to cohabit with in the manner of a wife, without being authoriſed thereto by a legal marriage.

CONCUPISCENCE, according to divines, an irregular appetite, or luſt after carnal things, inherent in the nature of man ever ſince the fall.

CONDAMIN, in botany. See CINCHONA.

CONDE, a town of the French Netherlands, in the province of Hainault, ſituated on the river Scheld, about twelve miles weſt of Mons: E. long. 3° 40′, N. lat. 50° 35′.

CONDENSATION, the act whereby a body is rendered more denſe, compact, and heavy.

CONDENSER, a pneumatic engine, or ſyringe, whereby an uncommon quantity of air may be crouded into a given ſpace; ſo that ſometimes ten atmoſpheres, or ten times as much air as there is at the ſame time, in the ſame ſpace, without the engine, may be thrown in by means of it, and its egreſs prevented by valves properly diſpoſed. See PNEUMATICS.

CONDITION, in the civil law, a clauſe of obligation ſtipulated as an article of a treaty or contract; or in a donation of teſtament, legacy, *&c.* in which laſt caſe a donee does not loſe his donative, if it be charged with any diſhoneſt or impoſſible conditions.

CONDITIONALS, ſomething not abſolute but ſubject to conditions.

CONDOM, the capital of the Condomois, in the province of Gaſcony, in France, about ſixty miles ſouth-eaſt of Bourdeaux. It is a biſhop's ſee, and ſituated in 20′ E. long. and 44° 5′ N. lat.

CONDORMIENTES, in church hiſtory, religious ſectaries, who hold their name from lying all together, men and women, young and old. They aroſe in the thirteenth century near Cologne, where they are ſaid to have worſhipped an image of Lucifer, and to have received anſwers and oracles from him.

CONDUCTOR, in ſurgery, an inſtrument which ſerves to conduct the knife in the operation of cutting for the ſtone, and in laying up ſinuſes and fiſtulas. See SURGERY.

CONDUIT, a canal or pipe for the conveyance of water, or other fluid.

There are ſeveral ſubterraneous conduits through which the waters paſs that form ſprings. Artificial conduits for water are made of lead, ſtone, caſt-iron, potter's earth, timber, *&c.*

CONDYLOMA, in medicine, a tubercle or callous eminence which ariſes in the folds of the anus, or rather a ſwelling or hardening of the wrinkles of that part.

CONDYLUS, a name given by anatomiſts to a knot in any of the joints, formed by the epiphyſis of a bone.

CONE, in geometry, a ſolid figure, having a circle for its baſe, and its top terminated in a point or vertex. See CONIC SECTIONS.

CONE *of rays*, in optics, includes all the ſeveral rays which fall from any radiant point on the ſurface of a glaſs. See OPTICS.

CONESSI, a ſort of bark of a tree which grows on the Coromandel coaſt in the Eaſt-Indies. It is recommended in a letter to Dr Monro, in the Medical Eſſays, as a ſpecific in diarrhœas. It is to be pounded into a fine powder, and made into an electuary with ſyrup of oranges; and the bark ſhould be freſh, and the electuary new made every day, or ſecond day, otherwiſe it loſes its auſtere but grateful bitterneſs on the palate, and its proper effects on the inteſtines.

CONFECTION, in pharmacy, ſignifies in general any thing prepared with ſugar: in particular, it imports ſomething preſerved, eſpecially dry ſubſtances. It alſo ſignifies a liquid or ſoft electuary, of which there are various ſorts directed in diſpenſatories.

CONFECTS, a denomination given to fruits, flowers, herbs, roots, *&c.* when boiled or prepared with ſugar or honey, to diſpoſe them to keep, and render them more agreeable to the taſte.

CONFERVA, in botany, a genus of the cryptogamia algæ claſs, conſiſting of oblong, capillary filaments; without any joints. There are twenty-one ſpecies.

CONFESSION, in a legal ſenſe, an acknowledgment of ſome truth, though in prejudice of the perſon that makes the declaration.

CONFESSION, among divines, the verbal acknowledgement which a Chriſtian makes of his ſins.

Among the Jews it was a cuſtom, on the annual feaſt of expiation, for the high-prieſt to make confeſſion of ſins to God in the name of the whole people: beſides this general confeſſion, the Jews were enjoined, if their ſins were a breach of the firſt table of the law, to make confeſſion of them to God; but violations offered the ſecond table, were to be acknowledged to their brethren. The confeſſions of the primitive Chriſtians were all voluntary, and not impoſed on them by any laws of the church; yet private confeſſion was not only allowed, but encouraged.

The Romiſh church requires confeſſion not only as a duty, but has advanced it to the dignity of a ſacrament: this confeſſion is made to the prieſt, and is private and auricular; and the prieſt is not to reveal them under pain of the higheſt puniſhment.

Confession *of faith*, a liſt of the ſeveral articles of belief in any church.

CONFESSIONAL, or **Confessionary**, a place in churches, under the great altar, where the bodies of deceaſed ſaints, martyrs, and confeſſors, were depoſited.

CONFESSOR, in the Romiſh church, a prieſt who is impowered to receive the confeſſion of penitents, and to give them abſolution.

CONFIGURATION, the outward figure which bounds bodies, and gives them their external appearance; being that which, in a great meaſure, conſtitutes the ſpecific difference between bodies.

CONFIRMATION *by a ſuperior*. See Scots Law, title, *Tranſmiſſion of rights by confirmation*.

Confirmation *of a teſtament*. See Scots Law, title, *Succeſſion in moveables*.

Confirmation, in theology, the ceremony of laying on of hands, for the conveyance of the Holy Ghoſt.

The antiquity of this ceremony is, by all ancient writers, carried as high as the apoſtles, and founded upon their example and practice. In the primitive church, it uſed to be given to Chriſtians immediately after baptiſm, if the biſhop happened to be preſent at the ſolemnity. Among the Greeks, and throughout the Eaſt, it ſtill accompanies baptiſm: but the Romaniſts make it a diſtinct independent ſacrament. Seven years is the ſtated time for confirmation: however, they are ſometimes confirmed before, and ſometimes after that age. The perſon to be confirmed has a god father and god mother appointed him, as in baptiſm. The order of confirmation in the church of England, does not determine the preciſe age of the perſons to be confirmed.

CONFISCATION, in law, the adjudication of goods or effects to the public treaſury; as the bodies and effects of criminals, traitors, &c.

CONFLAGRATION, the general burning of a city, or other conſiderable place.

This word is commonly applied to that grand period or cataſtrophe of our world, when the face of nature is to be changed by fire, as formerly it was by water.

CONFLUENT, among phyſicians, &c. an appellation given to that kind of ſmall-pox wherein the puſtules run into each other. See Medicine.

CONFORMATION, the particular conſiſtence and texture of the parts of any body, and their diſpoſition to compoſe a whole.

Conformation, in medicine, that make and conſtruction of the human body, which is peculiar to every individual.

CONFORMITY, among ſchoolmen, the relation of agreement between one thing and another; as that between any thing and the diviſion thereof, the object and the underſtanding, &c.

CONFUSION, in Scots law, is a method of extinguiſhing and ſuſpending obligations. See Scots Law, title, *Extinction of obligations*.

CONGE' *d'lire*, in eccleſiaſtical polity, the king's permiſſion royal to a dean and chapter in the time of a vacancy, to chuſe a biſhop; or to an abbey, or priory, of his own foundation, to chuſe their abbot or prior.

The king of England, as ſovereign patron of all archbiſhoprics, biſhoprics, and other eccleſiaſtical benefices, had of ancient time free appointment of all eccleſiaſtical dignities, whenſoever they chanced to be void; inveſting them firſt *per bacculum & annulum*, and afterwards by his letters patent; and in courſe of time he made the election over to others, under certain forms and limitations, as that they ſhould at every vacation, before they chuſe, demand the king's congé d'lire, and after the election crave his royal aſſent, &c.

Conge', in architecture, a mould in form of a quarter round or a cavetto, which ſerves to ſeparate two members from one another, ſuch as that which joins the ſhaft of the column to the cincture, called alſo apophyge.

Conges are alſo rings or ferrels formerly uſed in the extremities of wooden pillars, to keep them from ſplitting, afterwards imitated in ſtone-work.

CONGELATION, freezing, or ſuch a change produced by cold in a fluid body, that it quits its former ſtate, and becomes congealed. See Freezing.

CONGER, in zoology. See Muræna.

CONGERIES, a conſtellation or aggregate of ſeveral particles or bodies united into one maſs.

CONGIUS, a liquid meaſure of the ancient Romans, containing the eighth part of the amphora, or the fourth of the urna, or ſix ſextarii. The congius in Engliſh meaſure contains 2,070 676 ſolid inches; that is, ſeven pints, 4,942 ſolid inches.

CONGLOBATE *gland*, in anatomy. See Vol. I. p. 263.

CONGLOMERATE *gland*, in anatomy. See Vol. I. p. 265. *bottom*.

CONGLUTINATION, the gluing or faſtening any two bodies together by the intromiſſion of a third, whoſe parts are unctuous and tenacious, in the nature of glue. See Glue.

CONGO, a large country on the weſtern coaſt of Africa, between 10° and 20° E. long. and between the equator and 18° S. lat. comprehending the countries of Loango, Angola, and Benguella. It is bounded by the kingdom of Benin on the north; by Mataman, a part of Caffraria, on the ſouth; and by the Atlantic ocean, on the weſt; and is ſometimes called the lower Guinea.

CONGREGATION, an aſſembly of ſeveral eccleſiaſtics united, ſo as to conſtitute one body; as an aſſembly of cardinals, in the conſtitution of the pope's court, met for the diſpatch of ſome particular buſineſs.

Theſe aſſemblies, being ſixteen in number, are diſtributed into ſeveral chambers, after the manner of our offices and courts: the firſt whereof is the pope's congregation, whoſe buſineſs it is to prepare the moſt difficult beneficiary matters to be afterward debated in the conſiſtory: the ſecond is the congregation of the holy office, or the inquiſition: the third is the congregation *de propaganda fide:* the fourth is the congregation for explaining the council of Trent: the fifth is the congregation of the index, deputed to examine into pernicious and heretical books: the ſixth is the congregation of immunities, eſtabliſhed to obviate the difficulties that ariſe in the judgments of ſuch ſuits as are carried on againſt churchmen: the ſeventh is the congregation of biſhops and regulars: the eighth is the congregation for the examination of biſhops, *&c.* It is alſo uſed for a company or ſociety of religious, cantoned out of any order, ſo as to make a ſubdiviſion of the order itſelf; as the congregation of Cluny, *&c.* among the Benedictines. It is likewiſe uſed for aſſemblies of pious perſons, in manner of fraternities.

CONGREGATIONALISTS, in church-hiſtory, a ſect of proteſtants who reject all church-government, except that of a ſingle congregation.

CONGRESS, in political affairs, an aſſembly of commiſſioners, envoys, deputies, *&c.* from ſeveral courts meeting to concert matters for their common good.

CONGRESS, in a judicial ſenſe, the trial made by appointment of a judge, before ſurgeons and matrons, in order to prove whether or no a man be impotent, before ſentence is paſſed for the diſſolution of a marriage, ſolicited upon ſuch a complaint.

CONGRUITY, a ſuitableneſs or relation of agreement between things.

The terms *congruity* and *propriety* are not applicable to any ſingle object: they imply a plurality, and obviouſly ſignify a particular relation between different objects. Thus we ſay currently, that a decent garb is ſuitable or proper for a judge, modeſt behaviour for a young woman, and a lofty ſtyle for an epic poem: and, on the other hand, that it is unſuitable or incongruous to ſee a little woman ſunk in an overgrown farthingale, a coat richly embroidered covering coarſe and dirty linen, a mean ſubject in an elevated ſtyle, an elevated ſubject in a mean ſtyle, a firſt miniſter darning his wife's ſtocking, or a reverend prelate in lawn ſleeves dancing a hornpipe.

The perception we have of this relation, which ſeems peculiar to man, cannot proceed from any other cauſe, but from a *ſenſe* of congruity or propriety; for, ſuppoſing us deſtitute of that ſenſe, the terms would be to us unintelligible.

It is a matter of experience, that congruity or propriety, where-ever perceived, is agreeable; and that incongruity or impropriety, where-ever perceived, is diſagreeable. The only difficulty is, to aſcertain what are the particular objects that in conjunction ſuggeſts these relations; for there are many objects that do not: the ſea, for example, viewed in conjunction with a picture, or a man viewed in conjunction with a mountain, ſuggeſt not either congruity or incongruity. It ſeems natural to infer, what will be found true by induction, that we never perceive congruity nor incongruity but among things that are connected together by ſome relation; ſuch as a man and his actions, a principal and its acceſſories, a ſubject and its ornaments. We are indeed ſo framed by nature, as among things ſo connected, to require a certain ſuitableneſs or correſpondence, termed *congruity* or *propriety*; and to be diſpleaſed when we find the oppoſite relation of *incongruity* or *impropriety*.

If things connected be the ſubject of congruity, it is reaſonable beforehand to expect, that a degree of congruity ſhould be required proportioned to the degree of the connection. And upon examination we find this to hold in fact: where the relation is intimate, as between a cauſe and its effect, a whole and its parts, we require the ſtricteſt congruity; but where the relation is ſlight, or accidental, as among things jumbled together in the ſame place, we require little or no congruity: the ſtricteſt propriety is required in behaviour and manner of living; becauſe a man is connected with theſe by the relation of cauſe and effect: the relation between an edifice and the ground it ſtands upon, is of the moſt intimate kind, and therefore the ſituation of a great houſe ought to be lofty; its relation to neighbouring hills, rivers, plains, being that of propinquity only, demands but a ſmall ſhare of congruity: among members of the ſame club, the congruity ought to be conſiderable, as well as among things placed for ſhow in the ſame niche: among paſſengers in a ſtage-coach, we require very little congruity; and leſs ſtill at a public ſpectacle.

Congruity is ſo nearly allied to beauty, as commonly to be held a ſpecies of it; and yet they differ ſo eſſentially, as never to coincide: beauty, like colour, is placed upon a ſingle ſubject; congruity upon a plurality: further, a thing beautiful in itſelf, may, with relation to other things, produce the ſtrongeſt ſenſe of incongruity.

Congruity and propriety are commonly reckoned ſynonymous terms; but they are diſtinguiſhable; and the preciſe meaning of each muſt be aſcertained. Congruity is the genus, of which propriety is a ſpecies; for we call nothing *propriety*, but that congruity or ſuitableneſs, which ought to ſubſiſt between ſenſible beings and their thoughts, words, and actions.

In order to give a full view of theſe ſecondary relations, we ſhall trace them through ſome of the moſt conſiderable primary relations. The relation of a part to the whole, being extremely intimate, demands the utmoſt degree of congruity; even the ſlighteſt deviation is diſguſtful.

Examples of congruity and incongruity are furniſhed in plenty by the relation between a ſubject and its ornaments. A literary performance intended merely for amuſement, is ſuſceptible of much ornament, as well as a muſic-room, or a play-houſe; for in gaiety, the mind hath a peculiar reliſh for ſhow and decoration. The moſt gorgeous apparel, however improper in tragedy, is not unſuitable to opera-actors: the truth is, an opera, in its preſent form, is a mighty fine thing; but as it deviates from nature in its capital circumſtances, we look not for nature nor propriety in thoſe which are acceſſory. On the other hand, a ſerious and important ſubject admits not much ornament; nor a ſubject that of itſelf is extremely beautiful: and a ſubject that fills the mind with its loftineſs and grandeur, appears beſt in a dreſs altogether plain.

To a perſon of a mean appearance, gorgeous apparel is unſuitable; which, beſides the incongruity, has a bad effect; for by contraſt it ſhows the meanneſs of appearance in the ſtrongeſt light. Sweetneſs of look and manner, requires ſimplicity of dreſs joined with the greateſt elegance. A ſtately and majeſtic air requires ſumptuous apparel, which ought not to be gaudy, nor crouded with little ornaments. A woman of conſummate beauty can bear to be highly adorned, and yet ſhows beſt in a plain dreſs:

——— For lovelineſs
Needs not the foreign aid of ornament,
But is when unadorn'd, adorn'd the moſt.
Thomſon's Autumn, 208.

Congruity regulates not only the quantity of ornament, but alſo the kind. The ornaments that embelliſh a dancing-room ought to be all of them gay. No picture is proper for a church, but what has religion for its ſubject. All the ornaments upon a ſhield ought to relate to war; and Virgil, with great judgment, confines the carvings upon the ſhield of Æneas to the military hiſtory of the Romans: but this beauty is overlooked by Homer; for the bulk of the ſculpture upon the ſhield of Achilles, is of the arts of peace in general, and of joy and feſtivity in particular: the author of Telemachus betrays the ſame inattention, in deſcribing the ſhield of that young hero

In judging of propriety with regard to ornaments, we muſt attend, not only to the nature of the ſubject that is to be adorned, but alſo to the circumſtances in which it is placed: the ornaments that are proper for a ball, will appear not altogether ſo decent at public worſhip; and the ſame perſon ought to dreſs differently for a marriage-feaſt and for a burial.

Nothing is more intimately related to a man, than his ſentiments, words, and actions; and therefore we require here the ſtricteſt conformity. When we find what we thus require, we have a lively ſenſe of propriety: when we find the contrary, our ſenſe of impropriety is not leſs lively. Hence the univerſal diſtaſte of affectation, which conſiſts in making a ſhew of greater delicacy and refinement than is ſuited either to the character or circumſtances of the perſon.

Congruity and propriety, where-ever perceived, appear agreeable; and every agreeable object produceth in the mind a pleaſant emotion: incongruity and impropriety, on the other hand, are diſagreeable; and of courſe produce painful emotions. Theſe emotions, whether pleaſant or painful, ſometimes vaniſh without any conſequence; but more frequently occaſion other emotions, which we proceed to exemplify.

When any ſlight incongruity is perceived, in an accidental combination of perſons or things, as of paſſengers in a ſtage-coach, or of individuals dining at an ordinary; the painful emotion of incongruity, after a momentary exiſtence, vaniſheth without producing any effect. But this is not the caſe of propriety and impropriety: voluntary acts, whether words or deeds, are imputed to the author; when proper, we reward him with our eſteem; when improper, we puniſh him with our contempt. Let us ſuppoſe, for example, a generous action ſuited to the character of the author, which raiſes in him and in every ſpectator the pleaſant emotion of propriety: this emotion generates in the author both ſelf-eſteem and joy; the former when he conſiders his relation to the action, and the latter when he conſiders the good opinion that others will entertain of him: the ſame emotion of propriety produceth in the ſpectators eſteem for the author of the action; and when they think of themſelves, it alſo produceth, by means of contraſt, an emotion of humility. To diſcover the effects of an unſuitable action, we muſt invert each of theſe circumſtances: the painful emotion of impropriety generates in the author of the action both humility and ſhame; the former when he conſiders his relation to the action, and the latter when he conſiders what others will think of him: the ſame emotion of impropriety produceth in the ſpectators contempt for the author of the action; and it alſo produceth, by means of contraſt, when they think of themſelves, an emotion of ſelf-eſteem. Here then are many different emotions, derived from the ſame action conſidered in different views by different perſons; a machine provided with many ſprings, and not a little complicated. Propriety of action, it would ſeem, is a chief favourite of nature, when ſuch care and ſolicitude is beſtowed upon it. It is not left to our own choice; but, like juſtice, is required at our hands; and, like juſtice, is inforced by natural rewards and puniſhments: a man cannot, with impunity, do any thing unbecoming or improper; he ſuffers the chaſtiſement of contempt inflicted by others, and of ſhame inflicted by himſelf. An apparatus ſo complicated, and ſo ſingular, ought to rouſe our attention: for nature doth nothing in vain; and we may conclude with great certainty, that this curious branch of the human conſtitution is intended for ſome valuable purpoſe.

A groſs impropriety is puniſhed with contempt and indignation, which are vented againſt the offender by correſponding external expreſſions: nor is even the ſlighteſt impropriety ſuffered to paſs without ſome degree of contempt. But there are improprieties, of the ſlighter kind, that provoke laughter; of which we have examples without end, in the blunders and abſurdities of our own ſpecies: ſuch improprieties receive a different puniſhment, as will appear by what follows. The emotions of contempt and of laughter occaſioned by an impropriety of this kind, uniting intimately in the mind of the ſpectator, are expreſſed externally by a peculiar ſort of laugh, termed *a laugh of deriſion* or *ſcorn*. An impropriety that thus moves not only contempt but laughter, is diſtinguiſhed by the epithet of *ridiculous*; and a laugh of deriſion or ſcorn is the puniſhment provided for it by nature. Nor ought it to eſcape obſervation, that we are ſo fond of inflicting this puniſhment, as ſometimes to exert it even againſt creatures of an inferior ſpecies: witneſs a turkycock ſwelling with pride, and ſtrutting with diſplayed feathers; a ridiculous object, which in a gay mood is apt to provoke a laugh of deriſion.

We muſt not expect, that theſe different improprieties are ſeparated by diſtinct boundaries: for of improprieties, from the ſlighteſt to the moſt groſs, from the moſt riſible to the moſt ſerious, there are degrees without end. Hence it is, that in viewing ſome unbecoming actions, too riſible for anger, and too ſerious for deriſion, the ſpectator feels a ſort of mixt emotion, partaking both of deriſion and of anger; which accounts for an expreſſion, common with reſpect to the impropriety of ſome actions, That we know not whether to laugh or be angry.

It cannot fail to be obſerved, that in the caſe of a riſible impropriety, which is always ſlight, the contempt we have for the offender is extremely faint, though deriſion, its gratification, is extremely pleaſant. This diſproportion between a paſſion and its gratification, ſeems not conformable to the analogy of nature. In looking about for a ſolution, we muſt reflect upon what is laid down above, that an improper action not only moves our contempt for the author, but alſo, by means of contraſt, ſwells the good opinion we have of ourſelves. This contributes, more than any other article, to the pleaſure we have in ridiculing follies and abſurdities; and accordingly, it is well known, that they who put the greateſt value upon themſelves are the moſt prone to laugh at others. Pride, which is a vivid paſſion, pleaſant in itſelf, and not leſs ſo in its gratification, would ſingly be ſufficient to account for the pleaſure of ridicule, without borrowing any aid from contempt. Hence appears the reaſon of a noted obſervation, That we are the moſt diſpoſed to ridicule the blunders and abſurdities of others, when we are in high ſpirits; for in high ſpirits, ſelf-conceit diſplays itſelf with more than ordinary vigour.

With regard to the final cauſes of congruity and impropriety; one, regarding congruity, is pretty obvious, that the ſenſe of congruity, as one principle of the fine arts, contributes in a remarkable degree to our entertainment. Congruity, indeed, with reſpect to quantity, coincides with proportion: when the parts of a building are nicely adjuſted to each other, it may be ſaid indifferently, that it is agreeable by the congruity of its parts, or by the proportion of its parts. But propriety, which regards voluntary agents only, can never be the ſame with proportion: a very long noſe is diſproportioned, but cannot be termed *improper*. In ſome inſtances, it is true, impropriety coincides with diſproportion in the ſame ſubject, but never in the ſame reſpect; for example, a very little man buckled to a long toledo: conſidering the man and the ſword with reſpect to ſize, we perceive a diſproportion; conſidering the ſword as the choice of the man, we perceive an impropriety.

The ſenſe of impropriety with reſpect to miſtakes, blunders, and abſurdities, is happily contrived for the good of mankind. In the ſpectators, it is productive of mirth and laughter, excellent recreation in an interval from buſineſs. But this is a trifle in reſpect of what follows. It is painful to be the ſubject of ridicule; and to puniſh with ridicule the man who is guilty of an abſurdity, tends to put him more upon his guard in time coming. Thus even the moſt innocent blunder is not committed with impunity; becauſe, were errors licenſed where they do no hurt, inattention would grow into a habit, and be the occaſion of much hurt.

The final cauſe of propriety as to moral duties, is of all the moſt illuſtrious. To have a juſt notion of it, the moral duties that reſpect others muſt be diſtinguiſhed from thoſe that reſpect ourſelves. Fidelity, gratitude, and the forbearing injury, are examples of the firſt ſort; temperance, modeſty, firmneſs of mind, are examples of the other: the former are made duties by the ſenſe of juſtice; the latter by the ſenſe of propriety. Here is a final cauſe of the ſenſe of propriety, that muſt rouſe our attention. It is undoubtedly the intereſt of every man, to ſuit his behaviour to the dignity of his nature, and to the ſtation allotted him by Providence; for ſuch rational conduct contributes in every reſpect to happineſs, by preſerving health, by procuring plenty, by gaining the eſteem of others, and, which of all is the greateſt bleſſing, by gaining a juſtly-founded ſelf-eſteem. But in a matter ſo eſſential to our well-being, even ſelf-intereſt is not relied on: the powerful authority of duty is ſuperadded to the motive of intereſt. The God of nature, in all things eſſential to our happineſs, hath obſerved one uniform method: to keep us ſteady in our conduct, he hath fortified us with natural laws and principles, which prevent many aberrations, that would daily happen were we totally ſurrendered to ſo fallible a guide as is human reaſon. Propriety cannot rightly be conſidered in another light, than as the natural law that regulates our conduct with reſpect to ourſelves; as juſtice is the natural law that regulates our conduct with reſpect to others. We call propriety a law, not leſs than juſtice; becauſe both are equally rules of conduct that ought to be obeyed: propriety includes this obligation; for to ſay an action is proper, is, in other words, to ſay, that it *ought* to be performed; and to ſay it is improper, is, in other words, to ſay that it *ought* to be forborn. It is this very character of *ought* and *ſhould* that makes juſtice a law to us; and the ſame character is applicable to propriety, though perhaps more faintly than to juſtice: but the difference is in degree only, not in kind; and we ought, without heſitation or reluctance, to ſubmit equally to the government of both.

But it muſt, in the next place, be obſerved, that to the ſenſe of propriety, as well as of juſtice, are annexed the ſanctions of rewards and puniſhments; which evidently prove the one to be a law as well as the other. The ſatisfaction a man hath in doing his duty, joined with the eſteem and good will of others, is the reward that belongs to both equally. The puniſhments alſo, though not the ſame, are nearly allied; and differ in degree more than in quality. Diſobedience to the law of juſtice, is puniſhed with remorſe; diſobedience to the law of propriety, with ſhame, which is remorſe in a lower degree. Every tranſgreſſion of the law of juſtice raiſes indignation in the beholder; and ſo doth every flagrant tranſgreſſion of the law of propriety. Slighter improprieties receive a milder puniſhment: they are always rebuked with ſome degree of contempt, and frequently with deriſion. In general, it is true, that the rewards and puniſhments annexed to the ſenſe of propriety, are ſlighter in degree than thoſe annexed to the ſenſe of juſtice: which is wiſely ordered, becauſe duty to others is ſtill more eſſential to ſociety, than duty to ourſelves; for ſociety could not ſubſt a moment, were individuals not protected from the headſtrong and turbulent paſſion of their neighbours.

CONI, a ſtrong town of Piedmont in Italy, ſituated upon the river Stura, thirty two miles ſouth of Turin, in 7° 30′ E. long. and 44° 25′ N. lat.

CONIC SECTIONS.

CONIC SECTIONS are curve lines formed by the interſections of a cone and plane.

If a cone be cut by a plane through the vertex, the ſection will be a triangle ABC, Plate LXVII fig. 1.

If a cone be cut by a plane parallel to its baſe, the ſection will be a circle. If it be cut by a plane DEF, fig. 1. in ſuch a direction, that the ſide AC of a triangle paſſing through the vertex, and having its baſe BC perpendicular to EF, may be parallel to DP, the ſection is a parabola; if it be cut by a plane DR, fig. 2. meeting AC, the ſection is an ellipſe; and if it be cut by a plane DMO, fig. 3. which would meet AC extended beyond A, it is an hyperbola.

If any line HG, fig. 1. be drawn in a parabola perpendicular to DP, the ſquare of HG will be to the ſquare of EP, as DG to DP; for let LHK be a ſection parallel to the baſe, and therefore a circle, the rectangle LGK, will be equal to the ſquare of HG, and the rectangle BPC equal to the ſquare of EP; therefore theſe ſquares will be to each other as their rectangles; that is, as BP to LG, that is DP to DG.

Deſcription of Conic Sections on a Plane.

PARABOLA.

“Let AB, fig. 4. be any right line, and C any point without it, and DKF a ruler, which let be placed in ſame plane in which the right line and point are, in ſuch a manner that one ſide of it, as DK, be applied to the right line AB, and the other ſide KF coincide with the point C; and at F, the extremity of the ſide KF, let be fixed one end of the thread FNC, whoſe length is equal to KF, and the other extremity of it at the point C, and let part of the thread, as FG, be brought cloſe to the ſide KF by a ſmall pin G; then let the ſquare DKF be moved from B towards A, ſo that all the while its ſide DK be applied cloſe to the line BA, and in the mean time the thread being extended will always be applied to the ſide KF, being ſtopt from going from it by means of the ſmall pin; and by the motion of the ſmall pin N there will be deſcribed a certain curve, which is called a *ſemi parabola*.

“And if the ſquare be brought to its firſt given poſition, and in the ſame manner be moved along the line AB, from B towards H, the other ſemi-parabola will be deſcribed.”

The line AB is called the directrix; C, the focus; any line perpendicular to AB, a diameter; the point where it meets the curve, its vertex; and four times the diſtance of the vertex from the directrix, its latus rectum, or parameter.

ELLIPSE.

“If any two points, as A and B, fig. 5. be taken in any plane, and in them are fixed the extremities of a thread, whoſe length is greater than the diſtance between the points, and the thread extended by means of a ſmall pin C, and if the pin be moved round from any point until it return to the place from whence it began to move, the thread being extended during the whole time of the revolution, the figure which the ſmall pin by this revolution deſcribes is called an *Ellipſe*.”

The points AB are called the foci; D, the centre; EF, the tranſverſe axis; GH, the leſſer axis; and any other line paſſing through D, a diameter.

HYPERBOLA.

“If to the point A, fig. 6. in any plane, one end of the rule AB be placed, in ſuch a manner, that about that point, as a center, it may freely move; and if to the other end B, of the rule AB, be fixed the extremity of the thread BDC, whoſe length is ſmaller than the rule AB, and the other end of the thread being fixed in the point C, coinciding with the ſide of the rule AB, which is in the ſame plane with the given point A; and let part of the thread, as BD, be brought cloſe to the ſide of the rule AB, by means of a ſmall pin D; then let the rule be moved about the point A, from C towards T, the thread all the while being extended, and the remaining part coinciding with the ſide of the rule being ſtopt from going from it by means of the ſmall pin, and by the motion of the ſmall pin D, a certain figure is deſcribed which is called the *ſemi-hyperbola*.”

The other ſemi-hyperbola is deſcribed in the ſame way, and the oppoſite HKF, by fixing the ruler to C, and the thread to A, and deſcribing it in the ſame manner. A and C are called foci; the point G, which biſects AC, the center; KE, the traſverſe axis; a line drawn through the center meeting the hyperbolas, a tranſverſe diameter; a line drawn through the center, perpendicular to the tranſverſe axis, and cut off by the circle MN, whoſe center is E, and radius equal to CG, is called the ſecond axis.

If a line be drawn through the vertex E, equal and parallel to the ſecond axis GP and GO be joined, they are called aſſymptotes. Any line drawn through the center, not meeting the hyperbolas, and equal in length to the part of a tangent parallel to it, and intercepted betwixt the aſſymptotes, is called a ſecond diameter.

An ordinate to any ſection is a line biſected by a diameter and the abſciſſa, the part of the diameter cut off by the ordinate.

Conjugate diameters in the ellipſe and hyperbola are ſuch as mutually biſect lines parallel to the other; and a third proportional to two conjugate diameters is called the latus rectum of that diameter, which is the firſt in the proportion.

In the parabola, the lines drawn from any point to the focus are equal to perpendiculars to the directrix; being both equal to the part of the thread ſeparated from the ruler.

In the ellipſe, the two lines drawn from any point in the curve to the foci are equal to each other, being equal to the length of the thread; they are alſo equal to the tranſverſe axis. In the hyperbola the difference of the lines drawn from any point to the foci is equal, being equal to the difference of the lengths of the ruler and thread, and is equal to the tranſverſe axis.

From theſe fundamental properties all the others are derived.

The ellipſe returns into itſelf. The parabola and hyperbola may be extended without limit.

Every line perpendicular to the directrix of a parabola meets it in one point, and falls afterwards within it; and every line drawn from the focus meets it in one point, and falls afterwards without it. And every line that paſſes through a parabola, not perpendicular to the directrix, will meet it again, but only once.

Every line paſſing through the center of an ellipſe is biſected by it; the tranſverſe axis is the greateſt of all theſe lines; the leſſer axis the leaſt; and theſe nearer the tranſverſe axis greater than thoſe more remote.

In the hyperbola, every line paſſing through the center is biſected by the oppoſite hyperbola, and the tranſverſe axis is the leaſt of all theſe lines; alſo the ſecond axis is the leaſt of all the ſecond diameters. Every line drawn from the center within the angle contained by the aſſymptotes, meets it once, and falls afterwards within it; and every line drawn through the center without that angle never meets it; and a line which cuts one of the aſſymptotes, and cuts the other extended beyond the center, will meet both the oppoſite hyperbolas in one point.

If a line G M, fig. 4. be drawn from a point in a parabola perpendicular to the axis, it will be an ordinate to the axis, and its ſquare will be equal to the rectangle under the abſciſſa MI and latus rectum; for, becauſe GMC is a right angle, GM^q is equal to the difference of GC^q and CM^q; but GC is equal to GE, which is equal to MB; therefore GM^q is equal to $BM^q—CM^q$; which, becauſe CI and IB are equal, is (8 *Euc.* 2.) equal to four times the rectangle under MI and IB, or equal to the rectangle under MI and the *latus rectum*.

Hence it follows, that if different ordinates be drawn to the axis, their ſquares being each equal to the rectangle under the abſciſſa and latus rectum, will be to each other in the proportion of the abſciſſas, which is the ſame property as was ſhewn before to take place in the parabola cut from the cone, and proves thoſe curves to be the ſame.

This property is extended alſo to the ordinates of other diameters, whoſe ſquares are equal to the rectangle under the abſciſſas and parameters of their reſpective diameters.

In the ellipſe, the ſquare of the ordinate is to the rectangle under the ſegments of the diameter, as the ſquare of the diameter parallel to the ordinate to the ſquare of the diameter to which it is drawn, or as the firſt diameter to its latus rectum; that is, LK^q (fig. 5.) is to EKF as EF^q to GH^q.

In the hyperbola, the ſquare of the ordinate is to the rectangle contained under the ſegments of the diameters betwixt its vertices, as the ſquare of the diameter parallel to the ordinate to the ſquare of the diameter to which it is drawn, or as the firſt diameter to its *latus rectum*; that is, SX^q is to EXK as MN^q to KE^q.

Or if an ordinate be drawn to a ſecond diameter, its ſquare will be to the ſum of the ſquares of the ſecond diameter, and of the line intercepted betwixt the ordinate and centre, in the ſame proportion; that is, RZ^q (fig. 6.) is to ZG^q added to GM^q, as KE^q to MN^q. Theſe are the moſt important properties of the conic ſections: and, by means of theſe, it is demonſtrated, that the figures are the ſame deſcribed on a plane as cut from the cone; which we have demonſtrated in the caſe of the parabola.

Equations of the Conic Sections

ARE derived from the above properties. The equation of any curve, is an algebraic expreſſion, which denotes the relation betwixt the ordinate and abſciſſa; the abſciſſa being equal to x, and the ordinate equal to y.

If p be the parameter of a parabola, then $y^2 = px$; which is an equation for all parabolas.

If a be the diameter of an ellipſe, p its parameter; then $y^2 : ax — xx :: p : a$; and $y^2 = \frac{p}{a} \times \overline{ax — xx}$; an equation for all ellipſes.

If a be a tranſeverſe diameter of a hyperbola, p its parameter; then $y^2 : ax + xx :: p : a$, and $y^2 = \frac{p}{a} \times \overline{ax + xx}$.

If a be a ſecond diameter of an hyperbola, then $y^2 = aa + xx :: p : a$; and $y^2 = \frac{p}{a} \times aa + xx$; which are equations for all hyperbolas.

As all theſe equations are expreſſed by the ſecond powers of x and y, all conic ſections are curves of the ſecond order; and converſely, the locus of every quadratic equation is a conic ſection, and is a parabola, ellipſe, or hyperbola, according as the form of the equation correſponds with the above ones, or with ſome other deduced from lines drawn in a different manner with reſpect to the ſection.

General Properties of Conic Sections.

A TANGENT to a parabola biſects the angle contained by the lines drawn to the focus and directrix; in an ellipſe and hyperbola, it biſects the angle contained by the lines drawn to the foci.

In all the ſections, lines parallel to the tangent are ordinates to the diameter paſſing through the point of contact; and in the ellipſe and hyperbola, the diameters parallel to the tangent, and thoſe paſſing through the points of contact, are mutually conjugate to each other. If an ordinate be drawn from a point to a diameter and a tangent from the ſame point which meets the diameter produced; in the parabola the part of the diameter betwixt the ordinate and tangent will be biſected in the vertex; and in the ellipſe and hyperbola, the ſemi-diameter will be a mean proportion betwixt the ſegments of the diameter betwixt the center and ordinate, and betwixt the centre and tangent.

The parallelogram formed by tangents drawn through the vertices of any conjugate diameters, in the ſame ellipſe or hyperbola, will be equal to each other.

Properties peculiar to the Hyperbola.

As the hyperbola has ſome curious properties ariſing from its aſſymptotes, which appear at firſt view almoſt incredible, we ſhall briefly demonſtrate them.

1. The hyperbola and its aſſymptotes never meet: if not, let them meet in S, fig. 6.; then by the property of the curve the rectangle KXE is to SX^q as GE^q to GM^q or EP^q; that is, as GX^q to SX^q; wherefore, KXE will be equal to the ſquare of GX; but the rectangle KXE, together with the ſquare of GE, is alſo equal to the ſquare of GX; which is abſurd.

2. If a line be drawn through a hyperbola parallel to its ſecond axis, the rectangle, by the ſegments of that line, betwixt the point in the hyperbola and the aſſymptotes, will be equal to the ſquare of the ſecond axis.

For, if SZ, fig. 6. be drawn perpendicular to the ſecond axis, by the property of the curve, the ſquare of MG, that is, the ſquare of PE, is to the ſquare of GE, as the ſquares of ZG and the ſquare of MG together, to the ſquare of SZ or GX: and the ſquares of RX and GX are in the ſame proportion, becauſe the triangles RXG, PEG are equiangular; therefore the ſquares ZG and MG are equal to the ſquare of RX; from which taking the equal ſquares of SX and ZG, there remains the rectangle RSV, equal to the ſquare of MG.

3. Hence, if right lines be drawn parallel to the ſecond axis, cutting an hyperbola and its aſſymptotes, the rectangles contained betwixt the hyperbola and points where the lines cut the aſſymptotes will be equal to each other; for they are ſeverally equal to the ſquare of the ſecond axis.

4. If from any points, *d* and S, in a hyperbola, there be drawn lines parallel to the aſſymptotes *da* SQ and S*b* *dc*, the rectangle under *d a* and *d c* will be equal to the rectangle under QS and S *b*; alſo the parallelograms *d a*, G *c*, and SQG*b*, which are equiangular, and conſequently proportional to the rectangles, are equal.

For draw YW RV parallel to the ſecond axis, the rectangle Y *d* W is equal to the rectangle RSV; wherefore, WD is to SV as RS is to *d* Y. But becauſe the triangles RQS, AYD, and GSV *c d* W, are equiangular, W *d* is to SV as *cd* to S *b*, and RS is to DY as SQ to *d a*; wherefore, *d c* is to S *b* as SQ to *d a*: and the rectangle *d c*, *d a*, is equal to the rectangle QS, S *b*.

5. The aſſymptotes always approach nearer the hyperbola.

For, becauſe the rectangle under SQ and S *b*, or QG, is equal to the rectangle under *d a* and *d c*, or AG, and QG is greater than *a* G; therefore *a d* is greater than QS.

6. The aſſymptotes come nearer the hyperbola than any aſſignable diſtance.

Let X be any ſmall line. Take any point, as *d*, in the hyperbola, and draw *d a*, *d c*, parallel to the aſſymptotes; and as X is to *d a*, ſo let *a* G be to GQ. Draw QS parallel to *a d*, meeting the hyperbola in S, then QS will be equal to X. For the rectangle SQG will be equal to the rectangle *d a* G; and conſequently SQ is to *d a* as AG to GQ.

If any point be taken in the aſſymptote below Q, it can eaſily be ſhown that its diſtance is leſs than the line X.

Areas contained by Conic Sections.

The area of a parabola is equal to $\frac{2}{3}$ the area of a circumſcribed paralellogram.

The area of an ellipſe is equal to the area of a circle whoſe diameter is a mean proportional betwixt its greater and leſſer axes.

If two lines, *a d* and QS, be drawn parallel to one of the aſſymptotes of an hyperbola, the ſpace *a* Q S *d*, bounded by theſe parallel lines, the aſſymptotes and the hyperbola will be equal to the logarithm of *a* Q, whoſe module is *a d*, ſuppoſing *a* G equal to unity.

Curvature of Conic Sections.

The curvature of any conic ſection, at the vertices of its axis, is equal to the curvature of a circle whoſe diameter is equal to the parameter of its axis.

If a tangent be drawn from any other point of a conic ſection, the curvature of the ſection in that point will be equal to the curvature of a circle to which the ſame line is a tangent, and which cuts off from the diameter of the ſection, drawn through the point, a part equal to its parameter.

Uſes of Conic Sections.

Any body, projected from the ſurface of the earth, deſcribes a parabola, to which the direction wherein it is projected is a tangent; and the diſtance of the directrix is equal to the height from which a body muſt fall to acquire the velocity wherewith it is projected: hence the properties of the parabola are the foundation of gunnery.

All bodies acted on by a central force, which decreaſes as the ſquare of the diſtances increaſes, and impreſſed with any projectile motion, making any angle with the direction of the central force, muſt deſcribe conic ſections, having the central force in one of the foci, and

Fig. 1.

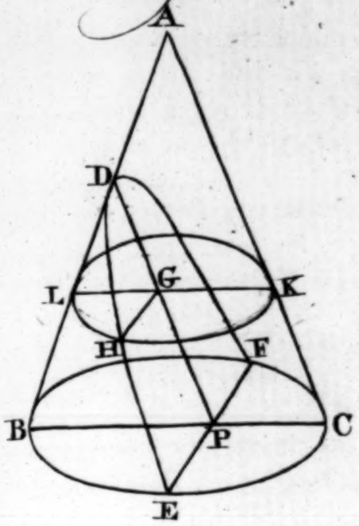

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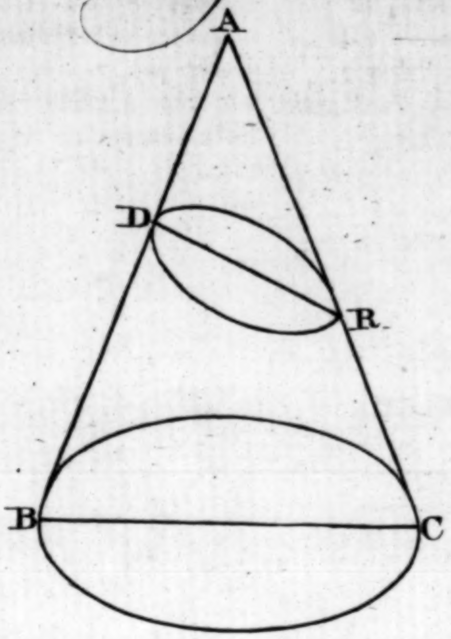
Fig. 2.



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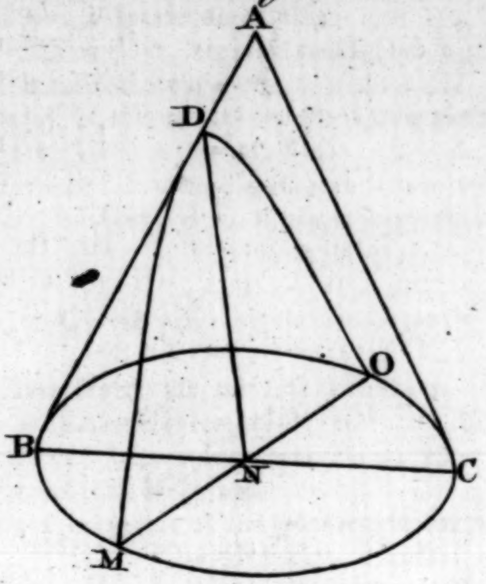

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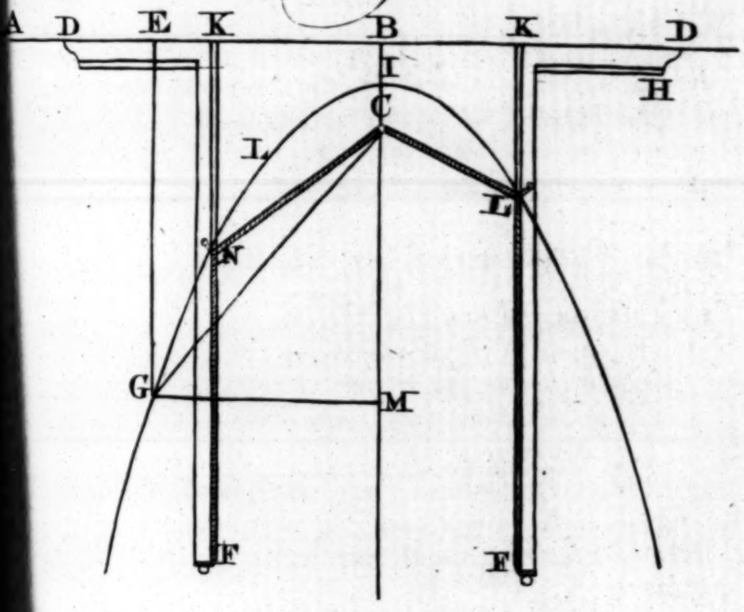
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Fig. 6.

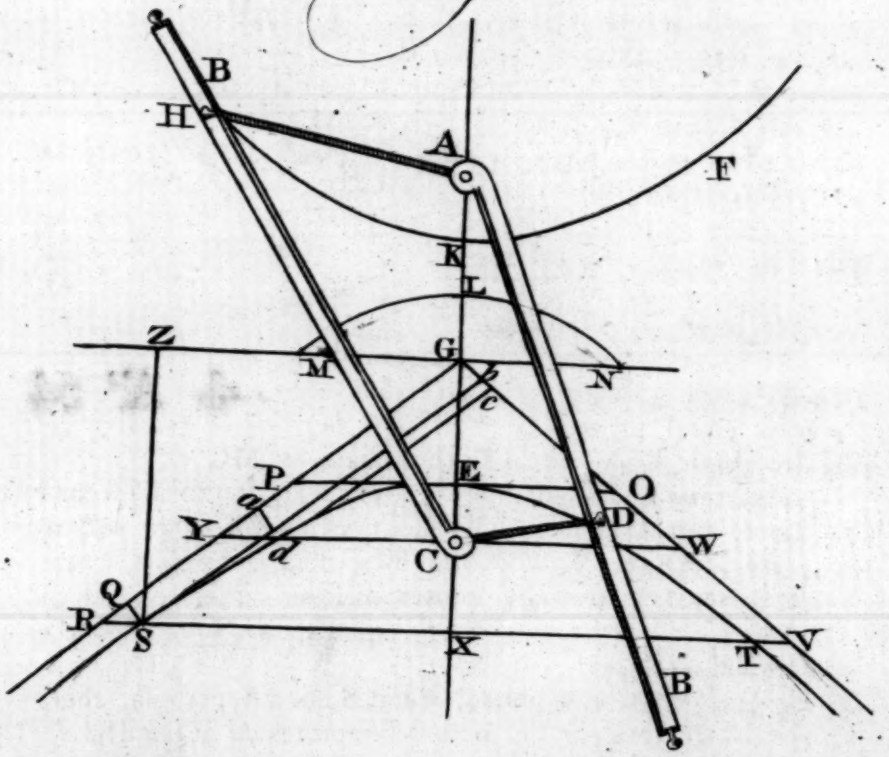
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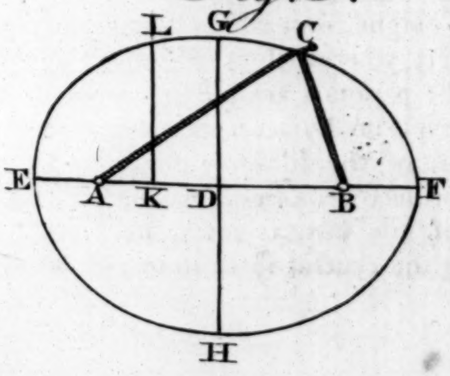
Fig. 5.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4. AP 54

will deſcribe parabolas, ellipſes, and hyperbolas, according to the proportion betwixt the central and projectile force. This is proved by direct demonſtration.

The great principle of gravitation acts in this manner; and all the heavenly bodies deſcribe conic ſections having the ſun in one of the foci; the orbits of the planets are ellipſes, whoſe tranſverſe and leſſer diameters are nearly equal; it is uncertain whether the comets deſcribe ellipſes with very unequal axes, and ſo return after a great number of years; or whether they deſcribe parabolas and hyperbolas, in which caſe they will never return.

Uſes of Conic Sections in the Solution of Geometrical Problems.

Many problems can be ſolved by conic ſections that cannot be ſolved by right lines and circles. The following theorems, which follow from the ſimpler properties of the ſections, will give a ſpecimen of this.

A point equally diſtant from a given point and a given line, is ſituated in a given parabola.

A point, the ſum of whoſe diſtances from two given points is given, is ſituated in a given ellipſe.

A point, the difference of whoſe diſtances from two given points is given, is ſituated in a given hyperbola.

CONICTHYODONTES, or Plectronitæ, in natural hiſtory, one of the three names the foſſile teeth of fiſhes are known by.

CONIFEROUS trees, ſuch as bear hard, dry ſeed-veſſels, of a conical figure, conſiſting of ſeveral woody parts, being moſtly ſcaly, adhering cloſely together, and ſeparating when ripe.

Of this ſort is the cedar of Lebanon, fir, *&c.*

CONINGSECK, the capital of a county of the ſame name, in the circle of Swabia, in Germany, about twenty miles north of Conſtance: E. long 9° 23′, N. lat. 47° 50′.

Conjoint degrees, in muſic, two notes which follow each other immediately in the order of the ſcale, as *ut* and *re*.

Conjoint tetrachords, two tetrachords, or fourths, where the ſame chord is the higheſt of one, and the loweſt of the other.

CONISSALÆ, in natural hiſtory, a claſs of foſſils, naturally and eſſentially compounded, not inflammable, nor ſoluble in water, found in detached maſſes, and formed of cryſtalline matter debaſed by earth.

Of this claſs there are two orders, and of each of theſe only one genus. Coniſſalæ of the firſt order are found in form of a naturally regular and uniform powder, all the genuine particles of which are nearly of one determinate ſhape, appearing regularly concreted, and not fragments of others once larger. Coniſſalæ of the ſecond order are found in form of a rude, irregular, and ſhapeleſs powder, the particles of which are never of any determinate particular figure, but ſeem broken fragments of ſome once larger maſſes.

To the former genus belong the different kinds of ſand; and to the latter, the ſaburræ, or gritts.

CONJUGATE diameter, or *axis of an ellipſis*, the ſhorteſt of the two diameters, or that biſecting the tranſverſe axis.

Conjugate hyperbolas. See Conicsections.

CONJUGATION, in grammar, a regular diſtribution of the ſeveral inflexions of verbs in their different voices, moods, tenſes, numbers and perſons, ſo as to diſtinguiſh them from one another.

The Latins have four conjugations, diſtinguiſhed by the terminations of the infinitive āre, ēre, ĕre, and īre. The Engliſh have ſcarce any natural inflexions, deriving all their variations from additional particles, pronouns, *&c.* whence there is ſcarce any ſuch thing as ſtrict conjugations in that language.

CONIUM, in botany, a genus of the pentandria digynia claſs of plants. The fruit is globular, crenated on each ſide, and has five ſtriæ or ſtreaks. There are three ſpecies, only one of which, *viz.* the conium maculatum, or hemlock, is a native of Britain. Within theſe few years paſt Dr Stork publiſhed a treatiſe recommending the extract of hemlock to be given internally, in ſeveral doſes, as a kind of ſpecific for cancers, the king's-evil, and all kinds of ſchirrous tumours. On the faith of this ſingle phyſician, the whole medical practitioners in Europe doſed their patients who laboured under diſeaſes of the above kinds with hemlock, which is unqueſtionbly a rank poiſon, if taken to any extent. After two or three years practice, it was at length diſcovered that the hemlock was not poſſeſſed of thoſe extraordinary virtues which Dr Stork had attributed to it; and of courſe its reputation began to ſink, and now, like many other great medicines, has had its day, and is gradually wearing out of practice.

CONJUNCT *rights.* See Scots Law, title, *Succeſſion in heritable rights.*

CONJUNCT, or Confident perſons. See Scots Law, title, *Actions.*

CONJUNCTION, in aſtronomy, the meeting of two ſtars or planets, in the ſame degree of the zodiac.

Conjunction, in grammar, an undeclinable word, or particle, which ſerves to join words and ſentences together, and thereby ſhews their relation or dependence one upon another.

CONJUNCTIVA, in anatomy. See Vol. I. p. 291.

CONNAUGHT, the moſt weſterly province of Ireland.

CONNARUS, in botany, a genus of the monodelphia decandria claſs. It has but one ſtylus; the ſtigma is ſimple; and the capſule has two valves, and contains one ſeed. There is but one ſpecies, *viz.* the monocarpus, a native of India.

CONNECTICUT, a Britiſh colony of North America, bounded by the Maſſachuſet colony on the north-eaſt; by the ſea, on the ſouth; and by New York, on the weſt; being about 100 miles in length, and 80 in breadth.

CONNECTION, or Connexion, the relation or dependence of one thing upon another.

CONNECTION, or Continuity, in the drama, conſiſts in the joining of the ſeveral ſcenes together.

The connection is ſaid to be obſerved, when the ſcenes of an act ſucceed one another immediately, and are ſo joined as that the ſtage is never left empty.

CONNOISSEUR, a French word much uſed of late in Engliſh, to ſignify a perſon well verſed in any thing: whence it is uſed for a critic, or a perſon who is a thorough judge of any ſubject.

CONNOR, a city of Ireland, in the county of Antrim, and province of Ulſter, ſituated about ſix miles north of Antrim, in 6° 30′ W. long. and 54° 50′ N. lat.

CONOCARPODENDRON, in botany. See Protea.

CONOCARPUS, the button-tree, in botany, a genus of the pentandria monogynia claſs. The corolla conſiſts of four petals; the ſeeds are naked, ſolitary, and below the flower; and the flowers are aggregated. There are three ſpecies, all natives of the Indies.

CONOID, in geometry, a ſolid body, generated by the revolution of a conic ſection about its axis. See Conic Sections.

CONOIDES, in anatomy, a gland found in the third ventricle of the brain, called *pinealis*, from its reſemblance to a pine-apple.

CONQUEST. See Scots Law, title, *Succeſſion in heritable rights*.

CONSANGUINITY, the relation ſubſiſting between perſons of the ſame blood, or who are ſprung from the ſame root.

Consanguinity and affinity, degrees of, forbidden in marriage; ſee Scots Law, title, *Marriage*. Conſanguinity or affinity, an objection againſt a judge; ſee title, *Juriſdiction and judges*: Againſt a witneſs; ſee title, *Probation*.

CONSCIENCE, a ſecret teſtimony of the ſoul, whereby it gives its approbation to things that are naturally good, and condemns thoſe that are evil. See Morals.

CONSCRIPT, in Roman antiquity, an appellation given to the ſenators of Rome, who were called conſcript-fathers on account of their names being entered all in one regiſter.

CONSECRATION, the act of devoting any thing to the ſervice and worſhip of God.

In England, churches have been always conſecrated with particular ceremonies, the form of which was left to the diſcretion of the biſhop.

CONSENT, in a general ſenſe, denotes much the ſame with aſſent. See Assent.

Consent *of parts*, in the animal œconomy. See Sympathy.

CONSEQENCE, in logic, the concluſion, or what reſults from reaſon or argument.

CONSERVATOR, an officer ordained for the ſecurity and preſervation of the privileges of ſome cities and communities. having a commiſſion to judge of and determine the differences among them.

CONSERVATORY, a term ſometimes uſed for a green-houſe, or ice-houſe.

CONSERVE, in pharmacy, a form of medicine, contrived to preſerve the flowers, herbs, roots, pills, or fruits, of ſeveral ſimples, as near as poſſible to what they are when freſh gathered.

Conſerves are made by beating up the thing to be preſerved, with ſugar, *viz.* a triple quantity thereof to thoſe that are moſt moiſt, and a double quantity to thoſe that are leaſt ſo.

CONSIGNATION of money; ſee Scots Law, title, *Obligations and contracts in general*: Of redemption-money; ſee title, *Redeemable rights*.

CONSISTENCE, in phyſics, that ſtate of a body wherein its component particles are ſo connected or entangled among themſelves, as not to ſeparate or recede from each other. It differs from continuity in this, that it implies a regard to motion or reſt, which continuity does not, it being ſufficient to denominate a thing continuous that its parts are contiguous to each other.

CONSISTORIAL, or Commissary court. See Scots Law, title, *Eccleſiaſtical perſons*.

CONSISTORY, at Rome, is an eccleſiaſtical aſſembly held in the preſence of the pope, for the reception of princes or their ambaſſadors, for the canonization of ſaints, for the promotion of cardinals, and other important affairs.

CONSOLE, in architecture, an ornament cut upon the key of an arch, which has a projecture, and, on occaſion, ſerves to ſupport little corniches, figures, buſts, and vaſes. See Architecture.

CONSOLIDA, in botany. See Ajuga.

CONSOLIDATION, in medicine, the action of uniting broken bones, or the lips of wounds, by means of conglutinating medicines.

CONSONANCE, in muſic, is ordinarily uſed in the ſame ſenſe with concord, *viz.* for the union or agreement of two ſounds produced at the ſame time, the one grave and the other acute; which mingling in the air in a certain proportion, occaſion an accord agreeable to the ear. See Music.

CONSONANT, a letter that cannot be ſounded without ſome ſingle or double vowel before or after it, as b, c, d, *&c.*

CONSPIRACY, in law, ſignifies an agreement between two or more, falſely to indict, or procure to be indicted, an innocent perſon, of felony.

CONSPIRATORS are, by ſtatute, defined to be ſuch as bind themſelves by oath, covenant, or other alliance, to aſſiſt one another falſely and maliciouſly to indict perſons, or falſely to maintain pleas.

Conſpirators in treaſon are thoſe that plot againſt the king and the government.

CONSTABLE, Lord High Conſtable, an ancient officer of the crowns both of England and France, whoſe authority was ſo very extenſive, that the office has been laid aſide in both kingdoms, except upon particular occaſions,

caſions, ſuch as the king's coronation. The conſtable of France had his perſon privileged, and, during the king's minority, was named next to the princes of the blood. The army obeyed him next the king: he managed all that belonged to war, either for puniſhment of delinquents, diſtribution of booty, ſurrender of places, *&c.* The juriſdiction and functions of this office are now in the mareſchals of France.

The function of the conſtable of England conſiſted in the care of the common peace of the land, in deeds of arms and matters of war. By a law of Richard II. the conſtable of England has the determination of things concerning wars and blazonry of arms, which cannot be diſcuſſed by the common law. The firſt conſtable was created by the Conqueror: the office continued hereditary till the thirteenth of Henry VIII. when it was laid aſide, as being ſo powerful as to become troubleſome to the king. We have alſo conſtables denominated from particular places, as conſtable of the Tower, of Dover caſtle, of Windſor-caſtle, of the caſtle of Caernarvon, and many other of the caſtles of Wales, whoſe office is the ſame with that of the caſtellani, or governors of caſtles.

Constable *of Scotland.* See Scots Law, title, *Of inferior judges.*

Constables *to juſtices of the peace,* in Scots law, are the proper officers for executing their orders. They have powers to ſuppreſs tumults, and to apprehend delinquents and thoſe who can give no good account of themſelves, and carry them to the next juſtice.

CONSTANCE, a city of Swabia, in Germany, ſituated on the weſtern ſhore of a lake to which it gives name, in 9° 12′ E. lon. and 47° 37′ N. lat.

It is the ſee of a biſhop, who is a prince of the German empire.

CONSTANTINA, the capital of a province of the ſame name, in the kingdom of Algiers, in Africa: E. long. 7°, and N. lat. 35° 30′.

CONSTANTINOPLE, the metropolis of the Turkiſh empire, called by the Turks themſelves Stamboul, and by many Europeans the Port, being one of the beſt harbours in Europe: E. long. 29° 15′, and N. lat. 41° 30′.

It is built on the weſtern ſhore of the Boſphorus, in the form of a triangle; the ſeraglio, or palace, occupying that angle which runs out between the Propontis and harbour; and underneath the palace are the gardens, which extend to the water-ſide.

CONSTELLATION, in aſtronomy. See Vol. I. p. 486.

CONSTIPATION, in medicine, a hardneſs of the belly, with great coſtiveneſs.

CONSTITUENT part, in phyſiology, an eſſential part in the compoſition of any thing, differing little from what is otherwiſe called element or principle.

CONSTITUTION, in matters of policy, ſignifies the form of government eſtabliſhed in any country or kingdom.

Constitution alſo denotes an ordinance, deciſion, regulation, or law, made by authority of any ſuperior, eccleſiaſtical or civil.

Apoſtolical **Constitutions**, a collection of regulations attributed to the apoſtles, and ſuppoſed to have been collected by St Clement, whoſe name they likewiſe bear.

It is the general opinion, however, that they are ſpurious, and that St Clement had no hand in them. They appeared firſt in the IVth age, but have been much changed and corrupted ſince that time. They are divided into eight books, conſiſting of a great number of rules and precepts, relating to the duties of Chriſtians, and particularly the ceremonies and diſcipline of the church. Mr Whiſton, in oppoſition to the general opinion, aſſerts them to be a part of the ſacred writings, dictated by the apoſtles in their meetings, and wrote down from their own mouth by St Clement, and intended as a ſupplement to the New Teſtament, or rather as a ſyſtem of Chriſtian faith and polity. The reaſon why the Conſtitutions are ſuſpected by the orthodox, and, perhaps, the reaſon alſo why their genuineneſs is defended by Mr Whiſton, is, that they ſeem to favour Arianiſm.

Constitution, in a phyſical ſenſe, ſignifies the particular temperature of the body.

CONSTRICTOR, an appellation given to ſeveral muſcles on account of their conſtringing or cloſing ſome of the orifices of the body. See Anatomy.

CONSTRUCTION *of equations*, in Algebra. See Algebra.

Construction, in grammar, the connecting the words of a ſentence according to the rules of the language.

CONSUALIA, in Roman antiquity, a feſtival inſtituted by Romulus, who, at the time of the rape of the Sabine virgins, found an altar under ground dedicated to the god Conſus, that is, Neptune. They were introduced with a magnificent cavalcade; and during the celebration, the horſes and aſſes were crowned with flowers, and a mule was ſacrificed to that god.

CONSUBSTANTIATION, a tenet of the Lutheran church with regard to the manner of the change made in the bread and wine in the euchriſt.

The divines of that profeſſion maintain, that after conſecration, the body and blood of our Saviour are ſubſtantially preſent, together with the ſubſtance of the bread and wine, which is called conſubſtantiation, or impanation.

CONSUL, the chief magiſtrate of the Roman commonwealth. They were two in number, choſen every year in the Campus Martius, by the people aſſembled in the comitia centuriata. In the firſt times of the commonwealth, no man could pretend to this dignity, but ſuch as were of a patrician family; but afterwards the people obtained, that one of the conſuls ſhould be choſen from among them. A conſul was commonly choſen at forty-three years of age, but this was not always obſerved: beſides, it was requiſite he ſhould have exerciſed other offices, as that of quæſtor, ædile, and prætor: and yet this condition was no better obſerved than the firſt; for Pompey had never been prætor nor quæſtor when he obtained the conſulſhip. Their authority and power was of very great extent, ſo long as the commonwealth ſubſiſted. They were the head of the ſenate: they commanded the armies, and were ſupreme judges of the differences between the citizens; but as they had made ſome abuſe of this power, it was allowed by the Valerian law for the party aggrieved to appeal from their tribunal to the people, eſpecially in caſes where the life of a citizen was concerned. Under the emperors, conſul was little more than an honourable title, and at laſt it became abſolutely extinct in the time of Juſtinian. From the eſtabliſhment of the republic to the conſulate of Baſil, that is, from the year of Rome 244, to the year of Rome 1294, the years are accounted by the conſuls; but after that period, the time was computed by the years of the emperors reigns and the indictions.

Consul, at preſent, is an officer eſtabliſhed by virtue of a commiſſion from the king and other princes, in all foreign countries of any conſiderable trade, to facilitate and diſpatch buſineſs, and protect the merchants of the nation. The conſuls are to keep up a correſpondence with the miniſters of England reſiding in the courts whereon their conſulate depends. They are to ſupport the commerce and the intereſt of the nation; to diſpoſe of the ſums given and the preſents made to the lords and principals of places, to obtain their protection, and prevent the inſults of the natives on the merchants of the nation.

CONSUMMATION, the end or completion of the work. Thus we ſay, the conſummation of all things, meaning the world.

CONSUMPTION, in medicine, a word of very extenſive ſignification, implies all diſorders that bring any decay or waſte upon the conſtitution; but is moſt uſed for the phthiſis pulmonalis. See Medicine.

CONTACT, is when one line, plane, or body, is made to touch another, and the parts that do thus touch, are called the points or places of contact.

CONTAGION, in phyſic, the communicating a diſeaſe from one body to another. In ſome diſeaſes it is only effected by an immediate contact or touch, as the venom of the pox; in others, it is conveyed by infected cloaths, as the itch; and in others, it is tranſmitted through the air at a conſiderable diſtance, by means of ſteams or effluvia expiring from the ſick, as in the plague and other peſtilential diſorders, in which caſe the air is ſaid to be contagious.

CONTEMPLATION, an act of the mind, whereby it applies itſelf to conſider and reflect upon the works of God, nature, *&c.*

CONTEMPORARY, a perſon or thing that exiſted in the ſame age with another. Thus, Socrates, Plato, and Ariſtophanes, were contemporaries.

CONTENT, in geometry, the area or quantity of matter or ſpace included in certain bounds. See Geometry.

CONTESSA, a port-town of Turkey, in Europe, in the province of Macedonia, ſituated on a bay of the Archipelago, about 200 miles weſt of Conſtantinople: E. long. 25°, and N. lat. 41°.

CONTEXT, among divines and critics, that part of ſcripture or of a writing that precedes and follows the text.

CONTI, a town of Picardy in France, about fifteen miles ſouth-weſt of Amiens: E. long. 2° 20′, N. lat. 49° 40′.

CONTIGUITY, in geometry, is when the ſurface of one body touches that of another.

CONTINENT, in general, an appellation given to things continued without interruption; in which ſenſe we ſay, continent fever, *&c.*

Continent, in geography, a great extent of land not interrupted by ſeas, in contradiſtinction to iſland and peninſula, *&c.* See Geography.

CONTINGENT, ſomething caſual or unuſual. Hence future contingent, denotes a conditional event which may or may not happen, according as circumſtances fall out.

Contingents are ſometimes uſed by mathematicians in the ſame ſenſe as tangent. See Tangent.

Continued *proportion*, in arithmetic, is that where the conſequent of the firſt ratio is the ſame with the antecedent of the ſecond; as 4 : 8 :: 8 : 16, in contradiſtinction to diſcrete proportion.

CONTINUITY, is defined by ſome ſchoolmen the immediate coheſion of parts in the ſame quantum; by others, a mode of body, whereby its extremities become one; and by others, a ſtate of body reſulting from the mutual implication of its parts. There are two kinds of continuity, mathematical and phyſical. The firſt is merely imaginary, ſince it ſuppoſes real or phyſical parts where there are none.

Phyſical continuity is that ſtate of two or more particles, in which their parts are ſo mutually implicated as to conſtitute one uninterrupted quantity or continuum.

CONTINUO, in muſic, ſignifies the thorough baſs, as baſſo continuo is the continual or thorough baſs, which is ſometimes marked in muſic books by the letters B. C.

CONTORSION, in medicine, has many ſignifications, 1. It denotes the iliac paſſion. 2. An incomplete diſlocation, when a bone is in part, but not entirely, forced from its articulation. 3. A diſlocation of the vertebræ of the back ſide-ways, or a crookedneſs of theſe vertebræ. And, 4. A diſorder of the head, in which it is drawn towards one ſide, either by a ſpaſmodic contraction of the muſcles on the ſame ſide, or a palſy of the antagoniſt muſcles on the other.

CONTOUR, in painting, the out-line, or that which defines a figure.

A great part of the ſkill of the painter lies in managing the contours well. Contour, with the Italian painters, ſignifies the lineaments of the face.

CONTOURNE, in heraldry, is uſed when a beaſt is repreſented ſtanding or running with its face to the ſiniſter ſide of the eſcutcheon, they being always ſuppoſed to look to the right, if not otherwiſe expreſſed.

CONTOURNIATED, a term among antiquaries applied to medals, the edges of which appear as if turned in a lath. This ſort of work ſeems to have had its origin in Greece, and to have been deſigned to perpetuate the memories of great men, particularly thoſe who had bore away the prize at the ſolemn games. Such are thoſe remaining of Homer, Solon, Euclid, Pythagoras, Socrates, and ſeveral athletæ.

CONTRABAND, in commerce, a prohibited commodity, or merchandiſe bought or ſold, imported or exported, in prejudice to the laws and ordinances of a ſtate, or the public prohibitions of the ſovereign. Contraband goods are not only liable to confiſcation themſelves, but alſo ſubject all other allowed merchandiſe found with them in the ſame box, bale or parcel, together with the horſes, waggons, *&c.* which conduct them. There are contrabands likewiſe, which, beſides the forfeiture of the goods, are attended with ſeveral penalties and diſabilities.

CONTRACT, in a general ſenſe, a mutual conſent of two or more parties, who voluntarily promiſe and oblige themſelves to do ſomething, pay a certain ſum, or the like. All donations, exchanges, leaſes, *&c.* are ſo many different contracts.

CONTRACTILE *force*, that property or power inherent in certain bodies, whereby, when extended, they are enabled to draw themſelves up again to their former dimenſions.

CONTRACTION, in grammar, is the reducing of two ſyllables into one, as *can't* for *cannot*, *ſhould'ſt* for *ſhouldeſt*, *&c.*

Contraction, in phyſics. the diminiſhing the extent or dimenſions of a body, or the cauſing its parts to approach nearer to each other, in which ſenſe it ſtands oppoſed to dilatation or expanſion.

CONTRA-FISSURE, in ſurgery, a kind of fracture, or fiſſure, in the cranium, which ſometimes happens on the ſide oppoſite to that which received the blow; or, at leaſt, at ſome diſtance from it. See Surgery.

CONTRARIETY, an oppoſition between two things, which imports their being contrary to one another; and conſiſts in this, that one of the terms implies a negation of the other, either mediately or immediately; ſo that contrariety may be ſaid to be the contraſt, or oppoſition of two things, one of which imports the abſence of the other, as love and hatred.

CONTRARY, a poſitive oppoſite, which, ſubſiſting by turns in the ſame ſubject with its oppoſite, is as remote from it as poſſible, expells it, and is mutually expelled by it. Blackneſs and whiteneſs, cold and heat, are ſuch contraries.

CONTRAST. See Resemblance.

CONTRATE-*wheel*, in watch-work, that next to the crown, the teeth and hoop whereof lie contrary to thoſe of the other wheels, from whence it takes its name. See Watch-making.

CONTRAVALLATION, or *the line* Contravallation, in fortification, a trench guarded with a parapet, and uſually cut round about a place by the beſiegers, to ſecure themſelves on that ſide, and to ſtop the ſallies of the garriſon. See Fortification.

CONTRAVENTION, in law, a man's failing to diſcharge his word, obligation, duty, or the laws or cuſtoms of the place.

CONTRAYERVA, in botany. See Dorstenia.

CONTRE, in heraldry, an appellation given to ſeveral bearings, on account of their cutting the ſhield contrary and oppoſite ways: thus we meet with contre-bend, contre-chevron, contre-pale, *&c.* when there are two ordinaries of the ſame nature oppoſite to each other, ſo as colour may be oppoſed to metal, and metal to colour. See Counter.

CONTRITION, in theology, a ſorrow for our ſins, reſulting from the reflexion of having offended God, from the ſole conſideration of his goodneſs, without any regard to the puniſhment due to the treſpaſs, and attended with a ſincere reſolution of reforming them.

CONTROL is properly a double regiſter kept of acts, iſſues, *&c.* of the officers or commiſſioners in the revenue, army, *&c.* in order to perceive the true ſtate thereof, and to certify the truth, and the due keeping of the acts ſubject to the enregiſterment.

CONTROLLER, an officer appointed to control or overſee the accounts of other officers, and, on occaſion, to certify whether or no things have been controlled or examined.

In Britain we have ſeveral officers of this name, as controller of the king's houſe, controller of the navy, controller of the cuſtoms, controller of the mint, *&c.*

Controller *of the hanaper*, an officer that attends the lord chancellor daily, in term and in ſeal-time, to take all things ſealed in leathern bags from the clerks of the hanaper, and to make the number and effect thereof, and enter them in a book, with all the duties belonging to the king and other officers for the ſame, and ſo charge the clerk of the hanaper with them.

Controller *of the pipe*, an officer of the exchequer, that makes out a ſummons twice every year, to levy the farms and debts of the pipe. See Pipe, and Exchequer.

Controllers *of the pells*, two officers of the exchequer, who are the chamberlain's clerks, and keep a control of the pell of receipts, and goings out.

CONTUSION, in medicine and ſurgery, any hurt of the body that is inflicted by a blunt inſtrument. See Surgery.

CONVALLARIA, or Lilly *of the* Valley, in botany, a genus of the hexandria monogynia claſs. The corolla is divided into ſix ſegments; and the berry is ſpotted, and has three cells. The ſpecies are eight, three of which are natives of Britain, *viz.* the majalis, or may-lily; the multiflora, or ſolomon's-ſeal; and the polygonatum, or ſweet-ſmelling ſolomon's-ſeal.

CONVENT, in church-hiſtory. See Monastery.

CONVENTICLE, a private aſſembly or meeting, for the exerciſe of religion. The word was firſt attributed as an appellation of reproach to the religious aſſemblies of Wickliffe, in this nation, in the reigns of Edward III. and Richard II. There were ſeveral ſtatutes made in former reigns, for the ſuppreſſion of conventicles; but, by 1 William and Mary, it is ordered, that diſſenters may aſſemble for the performance of religious worſhip, provided their doors be not locked, barred, or bolted.

CONVENTION, a treaty, contract, or agreement between two or more parties.

Convention is alſo a name given to an extraordinary aſſembly of parliament, or the eſtates of the realm, held without the king's writ; as was the convention of eſtates, who, upon the retreat of king James II. came to a concluſion that he had abdicated the throne, and that the right of ſucceſſion devolved to king William and queen Mary; whereupon their aſſembly expired as a convention, and was converted into a parliament.

CONVERGING, or Convergent *lines*, in geometry, are ſuch as continually approach nearer one another, or whoſe diſtances become ſtill leſs and leſs. Theſe are oppoſed to divergent lines, the diſtances of which become continually greater: thoſe lines which converge one way, diverge the other.

Converging *rays*, in optics, thoſe rays that, iſſuing from divers points of an object, incline towards another, till, at laſt, they meet and croſs, and then become diverging rays. See Optics.

CONVERSE, in mathematics. One propoſition is called the converſe of another, when, after a concluſion is drawn from ſomething ſuppoſed in the converſe propoſition, that concluſion is ſuppoſed; and then, that which in the other was ſuppoſed, is now drawn as a concluſion from it: thus, when two ſides of a triangle are equal, the angles under theſe ſides are equal; and, on the converſe, if theſe angles are equal, the two ſides are equal.

CONVERSION, in a moral ſenſe, implies a repentance for a temper and conduct unworthy our nature, and unbecoming our obligations to its Author, and a reſolution to act a wiſer and a better part for the future.

Conversion, in war, a military motion whereby the front of a battalion is turned where the flank was, in caſe the battalion is attacked in the flank.

Conversion *of equations*, in algebra. See Vol. I. p. 104.

CONVEX, an appellation given to the exterior ſurface of gibbous or globular bodies, in oppoſition to the hollow inner ſurface of ſuch bodies, which is called concave: thus we ſay, a convex frieze, lens, mirror, ſuperficies, *&c.*

CONVEXITY, that configuration or ſhape of a body, on account of which it is denominated convex.

CONVEYANCE, in law, a deed or inſtrument that paſſes land, *&c.* from one perſon to another.

CONVICT, in common law, a perſon that is found guilty of an offence by the verdict of a jury.

CONVICTION, in theology, expreſſes the firſt degree of repentance, wherein the ſinner becomes ſenſible of his guilt, of the evil nature of ſin, and of the danger of his own ways.

CONVOCATION, an aſſembly of the clergy of England, by their repreſentatives, to conſult of eccleſiaſtical matters. It is held during the ſeſſion of parliament, and conſiſts of an upper and a lower houſe. In the upper ſit the biſhops, and in the lower the inferior clergy, who are repreſented by their proctors, conſiſting of all the deans and archdeacons, of one proctor for every chapter, and two for the clergy of every dioceſe, in all one hundred and forty-three divines, *viz.* twenty-two deans, fifty-three archdeacons, twenty-four prebendaries, and forty-four proctors of the dioceſan clergy. The lower houſe chuſes its prolocutor, whoſe buſineſs it is to take care that the members attend, to collect their debates and votes, and to carry their reſolutions to the upper houſe. The convocation is ſummoned by the king's writ, directed to the archbiſhop of each province, requiring him to ſummon all biſhops, deans, archdeacons, *&c.*

The power of the convocation is limited by a ſtatute of Henry VIII. They are not to make any canons or eccleſiaſtical laws, without the king's licence; nor, when permitted to make any, can they put them in execution, but under ſeveral reſtrictions. They have the examining and cenſuring all heretical and ſchiſmatical books and perſons, *&c.* but there lies an appeal to the king in chancery, or to his delegates. The clergy in convocation, and their ſervants, have the ſame privileges as members of parliament.

CONVOLUTION, a winding motion, proper to the trunks of ſome plants, as the convolvulus, or bindweed; the claſpers of vines, bryony, *&c.*

CONVOLVULUS, or Bind-weed, in botany, a genus of the pentandria monogynia claſs. The corolla is bell-ſhaped, and plaited; it has two ſtigmata; and the capſule is bilocular, each cell containing two ſeeds. There are forty-three ſpecies, only three of which are natives of Britain, *viz.* the arvenſis, or ſmall bind-weed; the ſepium, or great bind-weed; and the ſoldanella, or ſea bind-weed.

CONVOY, in marine affairs, one or more ſhips of war, employed to accompany and protect merchant ſhips, and prevent their being inſulted by pirates, or the enemies of the ſtate in time of war.

Convoy, in military matters, a body of men that guard any ſupply of men, money, ammunition, or proviſions, conveyed by land into a town, army, or the like, in time of war.

CONVULSION, in medicine, a preternatural and violent contraction of the membranous and muſcular parts of the body. See Medicine.

CONWAY, a market-town of Carnarvonſhire in North Wales, ſituated near the mouth of a river of the ſame name, fifteen miles weſt of St Aſaph: W. long. 3° 50′, and N. lat. 53° 20′.

CONYZA, or Flea-bane, in botany, a genus of the ſyngeneſia polygamia ſuperflua claſs. The receptacle is naked; the pappus is ſimple; the calix is roundiſh and imbricated; and the rays of the corolla are divided into three ſegments. There are nineteen ſpecies, only one of which is a native of Britain, *viz.* the ſquarroſa, or plowman's ſpikenard.

CONZA, a town of the kingdom of Naples in Italy, ſituated on the farther Principate, on the river Offanto, fifty miles ſouth-eaſt of the city of Naples: E. long. 16°, N. lat. 41°. It is the ſee of an archbiſhop.

COOPER, in geography, the name of a river in Carolina in North America.

Cooper, on board a ſhip, he that looks to the caſks, and all other veſſels for beer, water, or any other liquor. He has a mate under him.

CO-ORDINATE, ſomething of equal order, rank, or degree with another. See Order.

COPAIBA, or *balſam of* Copaiba, a liquid reſinous juice, flowing from inciſions made in the trunk of the fera, a large tree which grows in the Spaniſh Weſt Indies, and is uſed as a corroborating and detergent medicine.

COPAL, in the materia medica, a reſin obtained from ſeveral ſorts of large trees in New Spain. It is brought to us in irregular lumps; but it has never come into uſe as a medicine, and is rarely to be met with in the ſhops.

COPENHAGEN, the capital of the kingdom of Denmark, ſituated on the eaſtern ſhore of the iſland of Zealand, upon a fine bay of the Baltic ſea, not far from the ſtrait called the Sound: E. long. 13°, and N. lat. 55° 30′.

COPERNICAN, in general, ſomething belonging to Copernicus. Hence,

Copernican *ſyſtem* or *hypotheſis*, that ſyſtem of the world, wherein the ſun is ſuppoſed to reſt in the centre, and the planets, with the earth, to move in ellipſes round him. See Vol. I. p. 434.

COPERNICUS, the name of an aſtronomical inſtrument, invented by Mr Whiſton, to exhibit the motion and phænomena of the planets, both primary and ſecondary. It is built upon the Copernican ſyſtem, and for that reaſon called by his name.

COPHTS, Cophti, or Copts, a name given to ſuch of the Chriſtians of Egypt as are of the ſect of Jacobites.

The Cophts have a patriarch, who is ſtyled the patriarch of Alexandria, having eleven or twelve biſhops under him, but no archbiſhop. The reſt of the clergy, whether ſecular or regular, are of the order of St Anthony, St Paul, and St Macarius, each of whom have their monaſteries. The Cophts have ſeven ſacraments, *viz.* baptiſm, the euchariſt, confirmation, ordination, faith, faſting, and prayer.

COPHTIC, or Coptic *language*, is that ſpoke by the Cophts, being the ancient language of the Egyptians, intermixed with the Greek, and the characters of it being thoſe of the Greek.

The ancient Coptic is now a dead language, to be met with no where but in books, and thoſe only tranſlations of the ſcriptures, and of eccleſiaſtical offices, or others that have a relation thereto; the language now uſed over all the country being that of the Arabic.

COPPEL, Copel, or Cuppel, a chemical veſſel made of earth, pretty thick, and of the form of a platter or diſh.

COPPELLING, or Cupelling, in chemiſtry, is the putting metallic ſubſtances into a coppel, or covered veſſel, made of bone aſhes, and ſet in a naked fire, to try what gold or ſilver they will afford. See p. 114.

COPPER conſtitutes a diſtinct genus of metals, being next to iron in ſpecific gravity, but lighter than gold, ſilver, or lead. See p. 80.

COPPERAS, a name given to the factitious green vitriol. See Chemistry.

The Engliſh copperas is made at Deptford, in the following manner, from pyritæ. See Pyritæ.

A heap of theſe ſtones, two or three foot thick, is laid in a bed well rammed; where being turned once in ſix months, in five or ſix years, by the action of the air and rain, they begin to diſſolve, and yield a liquor which is received in pits, and thence conveyed into a ciſtern, in a boiling-houſe. The liquor at length being pumped out of the ciſtern into a leaden boiler, and a quantity of iron added thereto, in two or three days the boiling is compleated; care having been taken all along to ſupply it with freſh quantities of iron, and to reſtore the boiling, whenever it ſeems to abate. When boiled ſufficiently, it is drawn off into a cooler, with ſticks acroſs, where it is left 14 or 15 days to ſhoot. The uſes of copperas are numerous. It is the chief ingredient in the dying of wool, cloths, and hats, black; in making ink, in tanning and dreſſing leather, *&c.* and from hence is prepared oil of vitriol, and a kind of Spaniſh brown for painters. In medicine it is rarely preſcribed under the name of copperas, but it is a true ſalt of iron, and often preſcribed under that name, and uſed inſtead of the genuine preparation; our chemiſts in general giving themſelves no further trouble about the making of that ſalt, than to diſſolve and purify the common copperas, and ſhoot it again into cryſtals.

COPPICE, or Copse, a little wood, conſiſting of under-woods, or ſuch as may be raiſed either by ſowing or planting.

COPULATION, the act of generation, or the congreſs of the male and female, otherwiſe called coition. See Generation.

COPY-HOLD, a tenure for which a tenant has nothing to ſhew but the copy of the rolls made by the ſteward of the lords court.

It is called a baſe tenure, becauſe the tenant holds the land at the will of the lord. However, it is not ſimply at the will of the lord, but according to the cuſtom of the manor by which ſuch eſtate is deſcendible, and the tenants heirs may inherit it; and a copyholder, ſo long as he does his ſervices, and does not break the cuſtom, cannot be ejected by the lord; and if he be, he ſhall have treſpaſs againſt him.

Copy-holder, one who is admitted tenant of lands or tenements within a manor, which time out of mind, by uſe and cuſtom of the manor, have been demiſable and demiſed to ſuch as will take them in fee-ſimple or fee-tale, for life, years, or at will, according to the cuſtom of the manor by copy of court-roll; but is generally where the tenant has ſuch eſtate either in fee or for three lives.

COQUIMBO, a port-town of Chili, in South America, ſituated at the mouth of a river of the ſame name, which diſcharges itſelf into the pacific ocean: W. long 75° 10′, and N. lat. 30.°

COR caroli, in aſtronomy, an extraconſtellated ſtar in the northern hemiſphere, ſituated between the coma berenices, and urſa major, ſo called by Dr Halley in honour of king Charles.

Cor hydræ, a fixed ſtar of the firſt magnitude, in the conſtellation of hydra.

Cor leonis, or Regulus, in aſtronomy, a fixed ſtar of the firſt magnitude in the conſtellation leo.

CORACO-BRACHIALIS, in anatomy. See Vol. I. p. 196.

CORACOIDES, in anatomy. See Vol I. p. 177.

CORACOMANTES, in antiquity, perſons who foretold events from their obſervations on crows.

CORACO-RADIALIS, in anatomy. See Vol. I. p. 197.

CORALLINA, or Coral, in zoology, a genus belonging to the order of vermes zoophyta. The trunk is radicated, jointed, and calcarious. The ſpecies are eight, diſtinguiſhed by the form of their branches, and are found in the ocean adhering to ſtones, bones, ſhells, *&c.* The corals were formerly believed to be vegetable ſubſtances hardened by the air; but are generally believed to be compoſed of a congeries of animals, which are even endued with the faculty of moving ſpontaneouſly. Linnæus's order of zoophyta is compoſed of animals of this kind, as the ſpongia, ſertularia, *&c.* See Natural History.

CORALLODENDRON, in botany. See Erythrina.

Coral *fiſhery*. Red coral is found in the Mediterranean, on the ſhores of Provence, from Cape de la Couronne to that of St Tropez; about the iſles of Majorca and Minorca; on the ſouth of Sicily; on the coaſts of Africa; and, laſtly, in the Ethiopic ocean, about cape Negro. The divers ſay, that the little branches are found only in the caverns whoſe ſituation is parallel to the earth's ſurface, and open to the ſouth. The manner of fiſhing being nearly the ſame whereever coral is found, it will ſuffice to inſtance the method uſed at the baſtion of France, under the direction of the company eſtabliſhed at Marſeilles for that fiſhery. Seven or eight men go in a boat commanded by the patron or proprietor, and when the net is thrown by the caſter, the reſt work the veſſel, and help to draw the net in. The net is compoſed of two rafters of wood tied croſs-wiſe, with leads fixed to them: to theſe they faſten a quantity of hemp twiſted looſely round, and intermingled with ſome large netting. This inſtrument is let down where they think there is coral, and pulled up again, when the coral is ſtrongly intangled in the hemp and netting. For this purpoſe, ſix boats are ſometimes required; and if in hauling in, the rope happens to break, the fiſhermen run the hazard of being loſt. Before the fiſhers go to ſee, they agree for the price of the coral, which is ſometimes more, ſometimes leſs a pound; and they engage, on pain of corporal puniſhment, that neither they nor their crew ſhall embezzle any, but deliver the whole to the proprietors. When the fiſhery is ended, which amounts one year with another to twenty-five quintals for each boat, it is divided into thirteen parts, of which the proprietor hath four, the caſters two, and the other ſix men one each, the thirteenth belongs to the company for payment of the boat furniſhed them.

CORAN, or Alcoran. See Alcoran.

CORAX, in ornithology, the trivial name of a ſpecies of corvus. See CORVUS.

CORBAN, a ſcripture term of an offering which had life, in oppoſition to the minchab which had no life.

Corban is alſo a ceremony which the Mahometans perform at the foot of mount Ararat, in Arabia, near Mecca. It conſiſts in killing a great number of ſheep, and diſtributing them among the poor.

CORBEILS, in fortification. See Basket.

CORBEL, in architecture, a repreſentation of a baſket, ſometimes ſeen on the heads of the caryatides.

CORBY, a town of Germany, thirty miles eaſt of Paderborn, in Weſtphalia: Eaſt long. 9° 20′, N. lat. 51° 40′.

CORCHORUS, Jews-sallad, in botany, a genus of the polyandria monogynia claſs. The corolla conſiſts of five petals; the calix is deciduous, and conſiſts of five leaves; and the capſule has many cells and valves. The ſpecies are ſix, none of them natives of Britain.

Cord *of wood*, a certain quantity of wood for burning, ſo called becauſe formerly meaſured with a cord. The dimenſions of a ſtatute cord of wood are eight feet long, four feet high, and four feet broad.

Cord-wood, is new wood, and ſuch as, when brought by water, comes on board a veſſel, in oppoſition to that which is floated.

CORDAGE, a term uſed, in general, for all ſorts of cord, whether ſmall, middling, or great. See Rope.

CORDATED, an appellation frequently given by naturaliſts to things ſomewhat reſembling a heart.

CORDED, in heraldry. A croſs corded ſome authors take for a croſs wound or wrenched about with cords. See Cabled-cross.

Others, with more probability, take it for a croſs made of two pieces of cord.

CORDELERAS, mountains of ſouth America, otherwiſe called Andes. See Andes.

CORDELIER, in church-hiſtory, a Franciſcan or religious of the order of St Francis.

CORDIA, in botany, a genus of the pentandria monogynia claſs. The corolla is tunnel-ſhaped, and has but one petal; the ſtylus is dichotomous; and the fruit is a bilocular drupa. The ſpecies are five, none of them natives of Britain.

CORDIAL, in medicine, whatever raiſes the ſpirits, and gives them a ſudden ſtrength and chearfulneſs, as wine, ſpirits, the effluvia of flowers, fruit, and many other ſubſtances.

CORDON, in fortification, a row of ſtones, made round on the outſide, and ſet between the wall of the fortreſs which lies aſlope, and the parapet which ſtands perpendicular, after ſuch a manner, that this difference may not be offenſive to the eye: whence the cordons ſerve only as an ornament, ranging round about the place, being only uſed in fortification of ſtone-work. For in thoſe made with earth, the void ſpace is filled up with pointed ſtakes.

CORDOUA, Cordova, a city of Andaluſia, in Spain, ſituated on the river Guadalquivir, ſeventy-two miles north-eaſt of Seville, and ſeventy-five north of Malaga: W. long. 4° 45′, and N. lat. 37° 45′.

COREA, an iſland or peninſula on the north-eaſt coaſt of China, between 36° and 42° N. lat.

CORDWAINERS a term whereby ſhoemakers are denominated in ſtatutes. By a ſtatute of Jac. I. the maſter and wardens of the cordwainers company, *&c.* are to appoint ſearchers and triers of leather; and no leather is to be ſold before ſearched, ſealed, *&c.*

CORDYLINA, in botany. See Yucca.

CORDYLUS, the trivial name of a ſpecies of Lacerta. See Lacerta.

COREGONUS, in ichthyology, a ſynonime of a ſpecies of Salmo. See Salmo.

COREIA, in antiquity, a feſtival in honour of Proſerpine.

COREOPSIS, in botany, a genus of the ſyngeneſia polygamia fruſtranea claſs. The receptacle is paleaceous, the pappus has two double horns; the calix is erect, and conſiſts of many leaves. There are eleven ſpecies, none of them natives of Britain.

CORFE-CASTLE, a borough-town of Dorſetſhire, about twelve miles eaſt of Dorcheſter, near the ſea: W. long. 2° 10′, and N. lat. 50° 36′. It ſends two members to Parliament.

CORFU, an iſland ſubject to the Venetians, ſituated in the Mediterranean, near the entrance of the gulph of Venice.

Corfu is alſo the capital of the above iſland: E. long. 20° 40′, and N. lat. 39° 40′

CORIA, a city of Eſtremadura, in Spain, thirty-five miles north of Alcantara: W. long 6° 40′, and N. lat 39° 55′. It is a biſhop's ſee.

CORIANDRUM, in botany, a genus of the pentandria digynia claſs. The corolla is radiated; the involucrum univerſale conſiſts of one leaf, and the partiale is dimidiated; and the fruit is ſpherical. The ſpecies are two, only one of which, *viz.* the ſativum, or coriander, is a native of Britain. The ſeeds are uſed as a ſtomachic.

CORIARIA, myrtle-sumach, in botany, a genus of the diœcia decandria claſs. The calix of both male and female conſiſts of five leaves, and the corolla of each has five petals. The antheræ are divided into two parts: The female has five ſtyli, and five ſeeds. The ſpecies are two, none of them natives of Britain.

CORINDUM, in botany. See Cardiospermum.

CORINTH, a city of European Turky, ſituated near the iſthmus into the Morea, about fifty miles weſt of Athens, in 23° E. long. and 37° 30′ N. lat.

Corinthian order, in architecture. See Vol. I. p. 352.

CORIS, in botany, a genus of the pentandria monogynia claſs. The corolla has but one irregular leaf; the calix is prickly, and the capſule has five valves. There is but one ſpecies, a native of Montpelier.

CORISPERMUM, in botany, a genus of the monandria digynia claſs of plants, whoſe corolla conſiſts of two compreſſed, crooked, pointed petals, equal in ſize, and placed oppoſite one another: its fruit is a roundiſh capſule, compreſſed, bilocular, and having a furrowed edge; the ſeeds are of an oblong figure, and ſtand ſingle. There are two ſpecies, none of them natives of Britain.

CORK, or Cork-tree, in botany. See Quercus.

Cork, or **Corking** *of a ſaddle*, the pieces to which the bolſters are made faſt; ſo called as having formerly been made of cork.

Cork, in geography, the capital of a county of the ſame name, in Ireland, and province of Munſter, ſituated on the river Lee, about fifty miles ſouth of Limerick: W. long. 8° 25′, and N. lat. 51° 40′.

CORMANDEL-COAST, comprehends the eaſtern coaſt of the hither India, bounded by Golconda on the north, the bay of Bengal on the eaſt, Madura on the ſouth, and Biſnagar on the weſt: it lies between 10° and 20° N. lat.

CORMORANT, in ornithology. See Tantalus.

CORN, in country affairs, the grain or ſeeds of plants, ſeparated from the ſpica, or ear, and uſed for making bread.

There are ſeveral ſpecies of corn, ſuch as wheat, rye and barley, millet and rice, oats, maize and lentils, peaſe, and a number of other kinds, each of which has its uſefulneſs and propriety. Corn is very different from fruits, with reſpect to the manner of its preſervation; and is capable of being preſerved in public granaries, for preſſing occaſions, and of being kept for ſeveral centuries.

The firſt method is to let it remain in the ſpike; the only expedient for conveying it to the iſlands and provinces of America. The inhabitants of thoſe countries ſave it in the ear, and raiſe it to maturity by that precaution: but this method of preſerving it, is attended with ſeveral inconveniencies among us; corn is apt to rot or ſprout, if any the leaſt moiſture is in the heap; the rats likewiſe infeſt it, and our want of ſtraw alſo obliges us to ſeparate the grain from the ear. The ſecond is to turn and winnow it frequently; or to pour it through a trough or mill-hopper, from one floor to another; being thus moved and aired every fifteen days, for the firſt ſix months, it will require leſs labour for the future, if lodged in a dry place: but if, through neglect, mites ſhould be allowed to ſlide into the heap, they will ſoon reduce the corn to a heap of duſt: this muſt be avoided by moving the corn anew, and rubbing the places adjacent with oils and herbs, whoſe ſtrong odour may chace them away; for which garlic and dwarf-elder are very effectual: they may likewiſe be expoſed to the open ſun, which immediately kills them, When the corn has been preſerved from all impurities for the ſpace of two years, and has exhaled all its fires, it may be kept for fifty or even a hundred years, by lodging it in pits, covered with ſtrong planks, cloſely joined together: but the ſafer way is to cover the heap with quick-lime, which ſhould be diſſolved by ſprinkling it over with a ſmall quantity of water; this cauſes the grains to ſhoot to the depth of two or three fingers, and incloſes them with an incruſtation, through which neither air nor inſects can penetrate.

Corn not exceeding the under-mentioned prices have the following bounties *per* quarter, *viz.*

	Price *per* qr.		Bounty *per* qr.	
	l.	s.	s.	d.
Wheat	2	8	5	0
Rye	1	12	3	6
Barley and Malt	1	4	2	6
Oat-meal	0	15	2	6

In France corn of the growth of the kingdom is reckoned a contraband commodity.

Corn-mill, a water-engine for grinding of corn. See Mechanics.

Corn, in medicine and ſurgery, a hard tubercle like a flat wart, growing in ſeveral parts of the feet, eſpecially upon the joints of the toes. See Medicine.

CORNACHINE-*powder*, the ſame with what is ſometimes called the earl of Warwick's powder, and *pulvis de tribus*. It is prepared thus: Take four ounces of ſcammony; calcined hartſhorn prepared, three ounces; grind them together into a powder. It is given as a purge.

CORNAGE, an ancient tenure, the ſervice whereof was to blow a horn when any invaſion of the Scots was perceived.

This tenure was very frequent in the northern counties near the Picts wall.

CORNEA *tunica*, in anatomy. See Vol. I. p. 289.

CORNEL-*tree*, in botany. See Cornus.

CORNELIAN. See Carnelian.

CORNER, in a general ſenſe, the ſame with angle. See Angle.

CORNET, in the military art of the ancients, an inſtrument much in the nature of a trumpet, which when it only ſounded, the enſigns were to march alone, without the ſoldiers; whereas, when the trumpet only ſounded, the ſoldiers were to move without the enſigns. The cornets and buccinæ ſounded the charge and retreat, and the cornets and trumpets ſounded during the courſe of the battle.

Cornet, in the military art of the moderns, the third commiſſion-officer in a troop of horſe or dragoons.

This is a very honourable poſt: he commands in the lieutenant's abſence; his principal duty being to carry the ſtandard, near the middle of the firſt rank of the ſquadron.

CORNEUS, the name by which Linnæus calls a kind of tin-ore, found in black columns, with irregular ſides, and terminating in priſms.

CORNICHE, Cornish, or Cornice, in architecture. See Architecture.

Corniche is alſo uſed, in general, for all little projectures in maſonry or joinery, even where there are no columns, as the corniche of a chimney, beaufet, &c.

Corniche-*ring*, of a piece of ordnance, is that next from the muzzle-ring, backward.

CORNICULARIUS, in Roman antiquity, an officer of the army, appointed to aſſiſt the military tribune in quality of lieutenant.

CORNIX, in ornithology, the trivial name of a ſpecies of corvus. See Corvus.

CORNU. See Horn.

Cornu *ammonis*, in natural hiſtory, foſſile ſhells, called alſo ſerpent-ſtones, or ſnake-ſtones.

They are found of all ſizes, from the breadth of a ſixpence, to more than two feet in diameter; ſome of them rounded, others greatly compreſſed, and lodged in different ſtrata of ſtones and clays; ſome again are ſmooth, and others ridged in different manners, their ſtriæ and ridges being either ſtraight, irregularly crooked, or undulated.

Cornu *cervi*. See Hartshorn.

CORNUCOPIA, or Horn of plenty, among painters, &c. is repreſented under the figure of a large horn, out of which iſſue fruits, flowers, &c. Upon medals the cornucopia is given to all deities, genii, and heroes, to mark the felicity and abundance of all the wealth procured by the goodneſs of the former, or the care and valour of the latter.

Cornucopiæ, in botany, a genus of the triandria digynia claſs. The involucrum conſiſts of one tunnel-ſhaped crenated leaf, containing many flowers; and the calices are double-valved. There is but one ſpecies, *viz.* the cucullatum, a native of Smyrna.

CORNUS, or Cornel-tree, in botany, a genus of the tetrandria monogynia claſs. The involucrum conſiſts moſtly of four leaves; the petals are four, and above the fruit, which is a bilocular gluma. There are five ſpecies, none of them natives of Britain.

CORNUTIA, in botany, a genus of the didynamia angioſpermia claſs. The calix has five teeth; the ſtamina are longer than the corolla; the ſtylus is very long; and the berry contains but one ſeed.

CORNWAL, the moſt weſterly county of England, which gives the title of duke to the prince of Wales. It ſends forty-four members to parliament.

COROLLA, among botaniſts, the moſt conſpicuous part of a flower, ſurrounding the organs of generation, and compoſed of one or more flower-leaves, moſt commonly called petals, to diſtinguiſh them from the leaves of the plant; according as there is one, two, or three of theſe petals, the corolla is ſaid to be monopetalous, dipetalous, tripetalous, &c.

COROLLARY is a conſequence drawn from ſomething already advanced or demonſtrated.

COROLLULA, a term uſed by botaniſts, to expreſs the little partial flowers, which together make up the compound ones.

CORONA, among anatomiſts, denotes that edge of the glans penis where the preputium begins. See Anatomy.

Corona, among botaniſts. See Pappus.

Corona borealis, the Northern crown, in aſtronomy. See Vol. I. p. 486.

Corona *imperialis*, in zoology, a ſynonime of a ſpecies of conus. See Conus.

Corona *imperialis*, in botany. See Fritillaria.

Corona *ſolis*, in botany. See Helianthus.

Coronæ *jus*. See Jus.

CORONAL, in anatomy. See Vol. I. p. 152.

CORONALE *os*, in anatomy, the ſame with the os frontis. See Vol. I. p. 152.

CORONARIA, in botany. See Agrostema.

CORONARY *veſſels*, in anatomy. See Anatomy, Part III. and IV.

CORONEOLA, in botany. See Lysimachia.

CORONER, an ancient officer of this kingdom, ſo called becauſe he is wholly employed for the king and crown.

The office of coroners eſpecially concerns the pleas of the crown; and they are conſervators of the peace in the county where elected, being uſually two for each county. Their authority is judicial and miniſterial: judicial, where a perſon comes to a violent death; to take and enter appeals of murder, pronounce judgment on outlawries, *&c.* and to inquire into the lands, goods, and eſcape of murders, treaſure-trove, wreck of the ſea, deodands, *&c.* The miniſterial power is when coroners execute the king's writs, on exception taken to the ſheriff, as being party in a ſuit, of kin to either of the parties, or on the default of the ſheriff, *&c.* The authority of the coroner does not terminate on the demiſe of the king, as that of judges, *&c.* does, who act by the king's commiſſion. On default of ſheriffs, coroners are to impannel juries, and to return iſſues on juries not appearing, *&c.*

CORONET. See Crown.

Coronet, or Cronet *of a horſe*, the loweſt part of the poſtern, which runs round the coffin, and is diſtinguiſhed by the hair joining and covering the upper part of the hoof.

CORONILLA, in botany, a genus of the diadelphia decandria claſs. The calix is bilabiated, and the vexillum is hardly longer than the alæ. There are 11 ſpecies, none of them natives of Britain.

CORONOPUS, in botany. See Plantago.

CORPORA *cavernoſa*, in anatomy. See Vol. I. p. 272.

Corpora *olivaria*, in anatomy. See Vol. I. p. 287.

Corpora *pyramidalia*, in anatomy. See Vol. I. p. 287.

Corpora *ſtriata*, in anatomy. See Vol. I. p. 286.

CORPORAL, an inferior officer under a ſerjeant, in a company of foot, who has charge over one of the diviſions, places and relieves centinels, and keeps good order in the corps de garde: he alſo receives the word from the inferior rounds, which paſſes by his corps de garde. This officer carries a fuſee, and is commonly an old ſoldier: there are generally three corporals in each company.

Corporal *of a ſhip*, an officer who has the charge of ſetting and relieving the watches and centries, and who ſees that the ſoldiers and ſailors keep their arms neat and clean: he teaches them how to uſe their arms, and has a mate under him.

CORPORATION, a body politic, or incorporate, ſo called, becauſe the perſons or members are joined into one body, and are qualified to take and grant, *&c.*

Corporations are either ſpiritual or temporal: ſpiritual, as biſhops, deans, archdeacons, parſons, vicars, *&c.* Temporal, as mayor, commonalty, bailiff, burgeſſes, *&c.* And ſome corporations are of a mixed nature, compoſed of ſpiritual and temporal perſons, ſuch as heads of colleges and hoſpitals, *&c.* All corporations are ſaid to be eccleſiaſtical or lay: eccleſiaſtical are either regular, as abbeys, priories, chapters, *&c.* or ſecular, as biſhoprics, deanries, archdeaconries, *&c.* lay, as thoſe of cities, towns, companies, or communities of commerce, *&c.*

CORPOREAL, thoſe qualities which denominate a body. See Quality, Body, and Incorporeal.

CORPULENCY, in medicine, the ſtate of a perſon too much loaded with fleſh or fat.

CORPUS *calloſum*, in anatomy. See Vol. I. p. 285.

Corpus *cavernoſum*, in anatomy. See Vol. I. p. 272.

Corpus *reticulare*. See Reticulare.

Corpus *Chriſti*, a feſtival of the church, kept on the next Thurſday after Trinity-ſunday, inſtituted in honour of the euchariſt; to which alſo one of the colleges in Oxford is dedicated.

CORPUSCLE, in phyſics, a minute particle, or phyſical atom, being ſuch as a natural body is made up of. By this word is not meant the elementary particles, nor the hypoſtatical principles of chemiſts; but ſuch particles, whether of a ſimple or compound nature, whoſe parts will not be diſſolved nor diſſipated by ordinary degrees of heat.

CORPUSCULAR *philoſophy*, that way of philoſophiſing which endeavours to explain things, and to account for the phenomena of nature by the motion, figure, reſt, poſition, *&c.* of the corpuſcles, or the minute particles of matter.

Mr Boyle ſums up the chief principles of the corpuſcular hypotheſis, which now flouriſhes under the mechanical philoſophy, in theſe particulars:

1. They ſuppoſe that there is but one catholic or univerſal matter, which is an extended, impenetrable, and diviſible ſubſtance, common to all bodies, and capable of all forms. 2. That this matter, in order to form the vaſt variety of natural bodies, muſt have motion in ſome or all its aſſignable parts; and that this motion was given to matter by God the Creator of all things, and has all manner of directions and tendencies. 3. Matter muſt alſo be actually divided into parts, and each of theſe primitive particles, fragments, or atoms of matter, muſt have its proper magnitude or ſize, as alſo its peculiar figure or ſhape. 4. They ſuppoſe alſo, that theſe differently ſized and ſhaped particles may have as different orders and poſitions, whereof great variety may ariſe in the compoſition of bodies.

CORRECTION, in printing, the pointing out or diſcovering the faults in a printed ſheet, in order to be amended by the compoſitor before it be printed off. See Printing.

CORRECTOR, in general, denotes ſomething that mends the faults or bad qualities of others.

Corrector *of the ſtaple*, a clerk belonging to the ſtaple, whoſe buſineſs is to write down and record the bargains that merchants make there.

Corrector, in medicine and pharmacy, an ingredient in a compoſition, which guards againſt or abates the force of another.

CORRELATIVE, ſomething oppoſed to another in a certain relation. Thus, father and ſon are correlatives. Light and darkneſs, motion and reſt, are correlative and oppoſite terms.

CORRIGIOLA, in botany. See Illecebrum.

CORROBORANTS, or Corroborative *medicines*. See Strengtheners.

CORROSION, in a general ſenſe, the action of gnawing away, by degrees, the continuity of the parts of bodies.

Corrosion, in chemiſtry, an action of bodies, by means of proper menſtruums, that produces new combinations, and a change of their form, without converting them to fluidity. See Chemistry.

CORRUGATOR, in anatomy. See Vol I. p 291.

CORROSIVES, in ſurgery, are medicines which corrode whatever part of the body they are applied to: ſuch are burnt alum, white precipitate of mercury, white vitriol, red precipitate of mercury, butter of antimony, lapis infernalis, *&c.*

CORRUPTION, the deſtruction, extinction, or, at leaſt, ceſſation for a time, of the proper mode of exiſtence of any natural body. See Putrefaction.

Corruption *of blood*, in law, an infection accruing to a man's ſtate, attainted of felony and treaſon, and to his iſſue; for as he loſes all to the prince, *&c.* his iſſue cannot be heirs to him, or to any other anceſtor by him: and if he were noble, his heirs are rendered ignoble.

CORSA, in architecture. See Plat-*band*.

CORSAIR, a pirate, or perſon who ſcours the ſea for plunder, with an armed veſſel, without commiſſion from any prince or power. A corſair differs from a privateer, in that the latter acts under a commiſſion, and only attacks the veſſels of thoſe at war with the ſtate whence he had his commiſſion.

CORSELET, a little cuiraſs; or, according to others, an armour or coat made to cover the whole body, anciently worn by the pike-men, uſually placed in the front and flanks of the battle, for the better reſiſting the enemy's aſſaults, and guarding the ſoldiers placed behind them.

CORSICA, an iſland in the Mediterranean, between 8° and 10° E. long. and between 41° and 43° N. lat. about one hundred miles ſouth of Genoa, and ſubject to that republic; though the natives for many years diſputed their right. This iſland is now in the hands of the French, after a glorious ſtruggle for liberty under general Paoli.

CORTEX, or Cortex *Peruvianus*. See Cinchona.

Cortex *cerebri*. See Vol. p. 285.

CORTONA, a city of Tuſcany, in Italy, about thirty-five miles ſouth-eaſt of Sienna: E. long. 13°, and N. lat. 43° 15′.

CORTUSA, in botany, a genus of the pentandria monogynia claſs. The corolla is rotated, with an open limbus; and the capſule has two valves. There are two ſpecies, none of them natives of Britain.

CORUNNA, or Groyne, a port-town of Gallicia in Spain, ſituated on a fine bay of the Atlantic ocean, about thirty-two miles north of Compoſtella: W. long. 9°, and N. lat 43°.

CORUS, in Jewiſh antiquity. See Homer.

Corus, in our old writers, denotes eight buſhels, or a quarter.

Corus is alſo a wind, ſo called by the Jews, riſing in the ſummer in the weſt; and is that at preſent called the north-eaſt-wind.

CORUSCATION, a glittering, or gleam of light iſſuing from any thing It is chiefly uſed for a flaſh of lightening darting from the clouds in time of thunder.

CORVUS, the Raven, or Crow-kind, in ornithology, a genus of birds, of the order of picæ, the diſtinguiſhing characteriſtics of which are theſe: The beak is convex and cultrated; the noſtrils are covered with briſtly feathers; the tongue is forked and cartilaginous; and the feet are of the walking kind. The ſpecies are nineteen, *viz.* 1. The hottentottus, is of a greeniſh black colour, with long myſtaches, and an equal tail. It is found at the Cape of Good Hope. 2. The corax, or raven of Engliſh authors, is black, with a blueiſh back, and a roundiſh tail. It is a native of Europe, and feeds upon carrion: it is much given to theft, and may be taught to utter articulate ſounds. 3. The corone, or carrion-crow, is of a black blueiſh colour, with the prime wing-feathers ſharp, and a round tail: it lives upon carrion and fruits, and is a native of Europe. 4. The frugilegus, or rook, is black, with an aſh-coloured forehead, and a roundiſh tail. The rooks aſſemble in flocks, and infeſt the corn-fields: many of them ſleep together in the ſame tree, by which means they are eaſily taken. 5. The cornix, or royſton-crow, is aſh-coloured, with the throat, wings, and tail black. It feeds upon worms, ſnails, frogs, caterpillars, *&c* 6. The monedula, or jack-daw, is of a duſky colour, with a hoary hind-head; and the wings, tail, and forehead black. It is a native of Europe. They flock together in winter, ſleep, and build their neſts in old turrets and walls. 7. The glandularius, or jay, has blueiſh wings, with tranſverſe black and white lines; and the body is variegated with an iron-colour. It is a native of Europe, and feeds upon nuts, corn, and ſometimes ſmall birds. 8. The criſtatus, or blue-creſted jay, has the covert feathers of the wings marked with tranſverſe black lines, a blueiſh body, and a black collar. It is a native of North America. 9. The cayanus, is of a violet colour above, and white below, with a black front and throat, and the point of the tail white: the feathers of the hind head are erect and rigid. It is a native of Cayenne. 10. The caryocatactes, is brown, and ſpotted with white; the wings and tail are black; the prime tail-feathers are white at the points, but the intermediate ones have a worn appearance. It is a native of Europe, and feeds upon nuts. 11. The balicaſſius is of a greeniſh black colour, with a forked tail.

It is found on the Philippine iſles. 12. The aſer, is of a violet blackiſh colour, and has a wedge-like tail. It is a native of Africa. 13. The pica, or magpye, is variegated with black and white, and its tail is ſhaped like a wedge. They build their neſts in trees in a very artificial manner; the outſide conſiſts of thorns both above and below, leaving only a hole for their entrance. They lay five or ſix eggs, which are pale and ſpotted: they feed upon ſmall birds, *&c.* and carefully lay up ſuperfluous food till they become hungry again. They may be learned to talk pretty diſtinctly. 14. The ſenegalenſis, is of a blackiſh violet colour, with black legs, and a wedge-ſhaped tail. It is a native of Senegal. 15. The brachyurus, is green below, with yellow lines on the head, and white ſpots on the wings. It is found in the Molucca iſles. 16. The canadenſis, is of a duſky colour, with a yellow forehead, and white below: it has a roundiſh tail, and is a native of Canada. 17. The pyrrhocorax, is blackiſh, with a yellow beak, and black legs. 18. The graculus, is of a blackiſh violet colour, with a yellow back and legs. 19. The eremita, is greeniſh, with a yellowiſh head, a ſmall creſt on the back part of the head, and a red beak and legs. The three laſt are natives of Switzerland.

Corvus, the Raven, in aſtronomy. See Vol. I. p. 487.

Corvus, in Roman antiquity, a military engine, or rather gallery, moveable at pleaſure by means of pullies, chiefly uſed in boarding the enemy's ſhips, to cover the men.

CORYBANTES, in antiquity, prieſts of the goddeſs Cybele, who, inſpired with a ſacred fury, danced up and down, toſſing their heads, and beating on cymbals or brazen drums. They inhabited mount Ida, in the iſland of Crete, where they nouriſhed the infant Jupiter, keeping a continual rattling with their cymbals, that his father Saturn, who had reſolved to devour all his male offspring, might not hear the child's cries.

CORYBANTICA, in Grecian antiquity, a feſtival kept in honour of the Corybantes.

CORYCOMACHIA, among the ancients, was a ſort of exerciſe in which they puſhed forwards a ball, ſuſpended from the ceiling, and at its return either caught it with their hands, or ſuffered it to meet their body. Oribaſius informs us it was recommended for extenuating too groſs bodies.

CORYDALIS, in botany. See Fumaria.

CORYLUS, the Hazle, in botany, a genus of the monoecia polyandria claſs. The calix of the male conſiſts of one trifid leaf, and contains but one flower; it has no corolla, but eight ſtamina: the calix of the female conſiſts of two lacerated leaves; it has no corolla; the ſtyli are two; and the nut is oval. There are two ſpecies, *viz.* the avellana, a native of Britain; and the colurna, a native of Bizantium.

CORYMBIUM, in botany, a genus of plants belonging to the ſyngeneſia monogynia claſs. The calix conſiſts of two leaves ſhaped like a priſm, and containing one flower; the corolla has but one regular petal; and the fruit contains one downy ſeed. There is but one ſpecies, a native of Africa.

CORYMBUS, in botany. See Vol. I. p. 637.

CORYPHA, in botany, a genus belonging to the order of palmæ flabellifoliæ. The corolla conſiſts of three petals; it has ſix ſtamina, and one piſtillum; and the fruit is a drupa containing one ſeed. There is but one ſpecies, a native of India.

CORYPHÆNA, in ichthyology, a genus belonging to the order of thoracici. The head is declined and truncated; the branchioſtege membrane has ſix rays; and the back fin runs the whole length of the back. There are twelve ſpecies, moſt of them found in foreign ſeas.

CORYZA, in medicine, a catarrh of the noſe. See Catarrh.

CORZOLA, or Curscola, an iſland in the gulf of Venice, divided from Raguſa in Dalmatia, by a narrow ſtrait: E. long. 18°, and N. lat. 42° 35′.

COS, the Whet-stone, in natural hiſtory, a genus of vitreſcent ſtones, conſiſting of fragments of an indeterminate figure, ſub-opaque, and granulated.

Of this genus there are ſeveral ſpecies, ſome conſiſting of rougher, and others of ſmoother, or even of altogether impalpable particles; and uſed not only for whet-ſtones, but alſo for mill-ſtones, and other the like purpoſes.

CO-SECANT, in geometry, the ſecant of an arch which is the complement of another to 90°. See Geometry.

COSENZA, the capital of the hither Calabria, in the kingdom of Naples: E. long. 16° 35′, N. lat. 39° 15′. It is an archbiſhop's ſee.

CO-SINE, in trigonometry, the ſine of an arch, which is the complement of another to 90°. See Geometry.

COSMETIC, in phyſic, any medicine or preparation which renders the ſkin ſoft and white, or helps to beautify and improve the complexion; as lip-ſalves, cold creams, ceruſs, *&c.*

COSMICAL, a term in aſtronomy, expreſſing one of the poetical riſings of a ſtar: thus a ſtar is ſaid to riſe coſmically, when it riſes with the ſun, or with that point of the ecliptic in which the ſun is at that time: and the coſmical ſetting is when a ſtar ſets in the weſt at the ſame time that the ſun riſes in the eaſt.

COSMOGRAPHY, a deſcription of the ſeveral parts of the viſible world; or the art of delineating the ſeveral bodies according to their magnitudes, motions, relations, *&c.*

Coſmography conſiſts of two parts, aſtronomy and geography. See Astronomy, and Geography.

COSSACKS, people inhabiting the banks of the rivers Neiper and Don, near the Black-ſea and frontiers of Turky. Their country is commonly called the Ukraine, and is moſtly ſubject to Ruſſia.

COSSET, among farmers, a colt, calf, lamb, *&c.* brought up by hand, without the dam.

COSTAL, an appellation given by anatomiſts to ſeveral parts belonging to the ſides: thus we meet with coſtal muſcles, vertebræ, *&c.*

COSTA-RICA, a province of Mexico, bounded by the North ſea on the north-eaſt, and by the Pacific ocean on the ſouth-weſt. Its chief town is New-Carthage.

COSTARUM *depreſſores*, in anatomy. See Vol. I. p. 215.

COSTIVENESS, in medicine, a preternatural detention of the fæces, with an unuſual dryneſs and hardneſs thereof, and thence a ſuppreſſion of their evacuation. See MEDICINE.

COSTMARY, the Engliſh name of a ſpecies of tanzy. See TANACETUM.

COSTRANGULA, in botany. See SCROPHULARIA.

COSTUME, a term among painters: thus a painter muſt obſerve the coſtume; that is, he muſt make every perſon and thing ſuſtain its proper character, and not only obſerve the ſtory, but the circumſtances, the ſcene of action, the country or place, and make the habits, arms, manners, proportions, and the like, to correſpond.

COSTUS, in botany, a genus of the monandria monogynia claſs. The interior part of the corolla is inflated and ringent; the inferior lip being trifid. There is but one ſpecies, *viz.* the arabicus, a native of both the Indies. The root of the coſtus is ſaid to attenuate acid humours, and to promote expectoration, perſpiration, and urine; but is now rarely to be met with in the ſhops.

CO-TANGENT, the tangent of an arch, which is the complement of another to 90°. See GEOMETRY.

COTHURNIX, in ornithology. See TETRAO.

COTICE, or COTISE, in heraldry, is the fourth part of the bend; and with us ſeldom if ever borne but in couples, with a bend between them. See BEND.

The bend thus bordered, is ſaid to be cotiſed; as, he bears ſable, on a bend cotiſed argent, three cinquefoils. See Plate LXV. fig. 11.

COTINUS, in botany, the trivial name of a ſpecies of rhus. See RHUS.

COTONASTER, in botany. See CRATÆGUS.

COTRONA, a town of the further Calabria, in the kingdom of Naples, ſituated on the Mediterranean, about fifteen miles ſouth-eaſt of St Severino: E. long. 17° 40′, and N. lat. 38° 50′. It is the ſee of a biſhop.

COTTON, in commerce, a ſoft downy ſubſtance found on the bombax, or cotton-tree. See BOMBAX.

Cotton is ſeparated from the ſeeds of the plant by a mill, and then ſpun and prepared for all ſorts of fine works, as ſtockings, waiſtcoats, quilts, tapeſtry, curtains, *&c.* With it they likewiſe make muſlin, and ſometimes it is mixed with wool, ſometimes with ſilk, and even with gold itſelf.

The fineſt ſort comes from Bengal and the coaſt of Coromandel.

Cotton makes a very conſiderable article in commerce, and is diſtinguiſhed into cotton-wool, and cotton-thread. The firſt is brought moſtly from Cyprus, St John d'Acre, and Smyrna: the moſt eſteemed is white, long, and ſoft. Thoſe who buy it in bales ſhould ſee that it has not been wet, moiſture being very prejudicial to it. The price of the fineſt is uſually from ſix to ſeven piaſters the quintal of forty-four ocos.

Of cotton thread, that of Damas, called cotton d'ounce, and that of Jeruſalem, called bazas, are the moſt eſteemed; as alſo that of the Antilles iſlands. It is to be choſen white, fine, very dry, and evenly ſpun. The other cotton-threads are the half bazas, the rames, the beledin, and gondezel; the payas and montaſiri, the geneguins, the baquins, the joſſelaſſars, of which there are two ſorts. Thoſe of India, known by the name of Tutucorin, Java, Bengal, and Surat, are of four or five ſorts, diſtinguiſhed by the letters A, B, C, *&c.* They are ſold in bags, with a deduction of one pound and a half on each of thoſe of Tutucorin, which are the deareſt, and two pounds on each bag of the other ſorts. For thoſe of Fielebas, Smyrna, Aleppo, and Jeruſalem, the deduction at Amſterdam is eight in the hundred for the tare, and two in the hundred for weight, and on the value one *per cent.* for prompt payment.

Cotton of Siam, is a kind of ſilky cotton in the Antilles, ſo called becauſe the grain was brought from Siam. It is of an extraordinary fineneſs, even ſurpaſſing ſilk in ſoftneſs. They make hoſe of it there preferable to ſilk ones, for their luſtre and beauty. They ſell from ten to twelve and fifteen crowns a pair, but there are very few made, unleſs for curioſity.

The manner of packing COTTON, *as practiſed in the Antilles.* The bags are made of coarſe cloth, of which they take three ells and a half each: the breadth is one ell three inches. When the bag has been well ſoaked in water, they hang it up, extending the mouth of it to croſs pieces of timber nailed to poſts fixed in the ground ſeven or eight feet high. He who packs it goes into the bag, which is ſix feet nine inches deep, or thereabouts, and preſſes down the cotton, which another hands him, with hands and feet; obſerving to tread it equally every where, and putting in but little at a time. The beſt time of packing is in rainy moiſt weather, provided the cotton be under cover. The bag ſhould contain from 300 to 320 pounds. The tare abated in the Antilles is three in the hundred. Cotton being a production applicable to a great variety of manufactures, it cannot be too much cultivated in our own plantations that will admit of it.

Cotton-wool, not of the Britiſh plantations, pays on importation $\frac{77}{100}$d. the pound, and draws back on exportation $\frac{67\frac{1}{2}}{100}$d. Cotton yarn the pound, not of the Eaſt Indies, pays $2\frac{87\frac{1}{4}}{100}$d. and draws back $2\frac{58\frac{3}{4}}{100}$d. Cotton yarn the pound of the Eaſt Indies pays $4\frac{56}{100}$d. and draws back $4\frac{27}{100}$d.

Lavender COTTON. See SANTOLINA.

Philoſophic COTTON, a name given to the flowers of zinc, on account of their white colour, and reſemblance to cotton.

COTTON WEED. See GNAPHALIUM.

COTTUS, in ichthyology, a genus belonging to the order of thoracici. The head is broader than the body, and the gill-membrane has ſix rays. There are ſix ſpecies, *viz.* the cataphractus, quadricornis, grunniens, ſcaber, ſcorpius, and gobio.

COTULA, in botany, a genus of the ſyngeneſia polygamia ſuperflua claſs. The receptacle is naked; the pappus is marginated; and the corollulæ of the diſk are divided into four ſegments; the ſpecies are ſix, none of them natives of Britain.

Cotula, or Cotyla, in antiquity, a liquid meaſure among the Greeks, equal to the bemina of the Romans, containing half a ſextary, or four acetabula: hence it appears that it contained ten ounces of wine, and nine of oil.

COTURNIX, in ornithology. See Tetrao.

COTYLEDON, in botany, a genus of the decandria pentagynia claſs. The calix is divided into five ſegments; the corolla conſiſts of one petal; there are five nectariferous ſcales at the baſe of the germen; and it has five capſules. The ſpecies are eight, only one of which is a native of Britain, *viz.* the umbilicus, or navel-wort.

COTYLEDONES, in anatomy, are certain glandular bodies, adhering to the chorion of ſome animals.

COUGH, in medicine. See Medicine.

Cough, in painting, a term uſed for each lay or impreſſion of colour, either in oil or water, wherewith the painter covers his canvas, wall, wainſcot, or other matter to be painted.

Cough-grass, in botany. See Triticum.

COUCHANT, in heraldry, is underſtood of a lion, or other beaſt, when lying down, but with his head raiſed, which diſtinguiſhes the poſture of couchant from dormant, wherein he is ſuppoſed quite ſtretched out and aſleep. See Plate LXV. fig. 9.

COUCHE', in heraldry, denotes any thing lying along: thus, chevron couché, is a chevron lying ſideways, with the two ends on each ſide of the ſhield, which ſhould properly reſt on the baſe.

Couching *of a cataract*, in ſurgery. See Surgery.

COVENANT, a contract or agreement, made between two or more perſons, to perform ſomething.

COVENTRY, a city and biſhop's ſee in Warwickſhire, ſituated 80 miles north-weſt of London, and 10 miles north of Warwick: W. long. 1° 26', and N. lat. 52° 25'.

Coventry-bells, in botany. See Campanula.

COVERDEN, a town of the united provinces, ſituated in that of Overyſſel, near the confines of Weſtphalia: E. long. 6° 45', and N. lat. 52° 50'.

CO-VERSED sine, in geometry, the remaining part of the diameter of a circle, after the verſed ſine is taken from it. See Geometry.

Covert way, or Corridor, in fortification, a ſpace of ground, level with the field on the edge of the ditch, three or four fathoms broad, ranging quite round the half moons, and other works toward the the country. It has a parapet raiſed on a level, together with its banquets and glacis. See Fortification.

COVERTURE, in law, is applied to the ſtate and condition of a married woman, who is under the power of her huſband, and therefore called *femme couvert*.

COVING, in building, is when houſes are built projecting over the ground-plot, and the turned projecture arched with timber, lathed and plaiſtered.

COULTER, in huſbandry, an iron-inſtrument, fixed in the beam of a plough, and ſerving to cut the edge of each furrow. See Agriculture.

COUNCIL, or Counsel, in a general ſenſe, an aſſembly of divers conſiderable perſons to concert meaſures relating to the ſtate.

Aulic Council. See Aulic.

Cabinet Council. See Privy-council.

Common Council, in the city of London, is a court wherein are made all bye-laws which bind the citizens. It conſiſts, like the parliament, of two houſes; an upper, compoſed of the lord mayor and aldermen; and a lower, of a number of common-council men, choſen by the ſeveral wards, as repreſentatives of the body of the citizens.

Privy Council, the *primum mobile* of the civil government of Great Britain, bearing part of that great weight in the government which otherwiſe would be too heavy upon the king.

It is compoſed of eminent perſons, the number of whom is at the ſovereign's pleaſure, who are bound by oath to adviſe the king to the beſt of their judgment, with all the fidelity and ſecrecy that becomes their ſtation. The king may declare to, or conceal from, his privy-council whatever he thinks fit; and has a ſelect council out of their number, commonly called the *cabinet council*, with whom his majeſty determines ſuch matters as are moſt important, and requires the utmoſt ſecrecy.

Privy-counſellors, though but gentlemen, have precedence of all the knights and younger ſons of barons and viſcounts, and are ſtyled right honourable.

Council *of war*, an aſſembly of the principal officers of an army or fleet, occaſionally called by the general or admiral to concert meaſures for their conduct with regard to ſieges, retreats, engagements, *&c.*

Council, in church-hiſtory, an aſſembly of prelates and doctors, met for the regulating matters relating to the doctrine or diſcipline of the church.

National Council, is an aſſembly of prelates of a nation under their primate or patriarch.

Oecumenical or general Council, is an aſſembly which repreſents the whole body of the univerſal church. The Romaniſts reckon eighteeen of them; Bullinger, in his treatiſe de Conciliis, ſix; Dr Prideaux, ſeven; and biſhop Beveridge has increaſed the number to eight, which, he ſays, are all the general councils which have ever been held ſince the time of the firſt Chriſtian emperor. They are as follows: 1. The council of Nice, held in the reign of Conſtantine the Great, on account of the hereſy of Arius. 2. The council of Conſtantinople, called under the reign and by the command of Theodoſius the Great, for much the ſame end that the former council was ſummoned. 3. The council of Epheſus, convened by Theodoſius the younger, at the ſuit of Neſtorius. 4. The council of Calcedon, held in the reign of Martianus, which approved of the Eutychian hereſy. 5. The ſecond council of Conſtantinople, aſſembled by the emperor

Juſtinian, condemned the three chapters taken out of the book of Theodorus of Mopſueſtia, having firſt decided that it was lawful to anathematize the dead. Some authors tell us, that they likewiſe condemned the ſeveral errors of Origen about the Trinity, the plurality of worlds, and pre-exiſtence of ſouls. 6. The third council of Conſtantinople, held by the command of Conſtantinus Pogonatus the emperor, in which they received the definitions of the five firſt general councils, and particularly that againſt Origen and Theodorus of Mopſueſtia. 7. The ſecond Nicene council. 8. The fourth council of Conſtantinople, aſſembled when Lewis II. was emperor of the weſt. The regulations which they made are contained in twenty-ſeven canons, the heads of which are ſet down by M. du Pin, to whom the reader is referred.

COUNSELLOR, in general, a perſon who adviſes another: thus we ſay, a counſellor at law, a privy counſellor, *&c.*

Counsellor *at law*, a perſon retained by a client to plead his cauſe in a public court of judicature.

COUNT, a nobleman who poſſeſſes a domain erected into a county. The dignity is a medium between that of a duke and a baron.

Counts were originally lords of the court, or of the emperor's retinue, and had their name comites *a comitando*.

Count-wheel, in the ſtriking part of a clock, a wheel which moves round once in twelve or twenty-four hours. It is ſometimes called the locking wheel.

COUNTER, a term which enters into the compoſition of diverſe words of our language, and generally implies oppoſition; but when applied to deeds, means an exact copy kept of the contrary party, and ſometimes ſigned by both parties.

Counter alley, in gardening. See Alley.

Counter approaches, in fortification, lines and trenches made by the beſieged in order to attack the works of the beſiegers, or to hinder their approaches.

Counter barry, or **Contre-barre'**, in heraldry, is the ſame as our bendy ſiniſter *per* bend counterchanged. See Barry.

Counter battery, is a battery raiſed to play upon another to diſmount the guns.

Counter-changed, in heraldry, is when any field or charge is divided or parted by any line or lines of partition, conſiſting all interchangeably of the ſame tinctures. See plate LXV. fig. 12.

Counter-charge, a reciprocal charge or recrimination brought againſt an accuſer.

Counter-chevroned, a chield chevrony, parted by one or more partition lines.

Counter-componed, in heraldry, is when the figure is compounded of two panes, as in Plate LXV. fig. 13.

Counter-drawing, in painting, is the copying a deſign, or painting, by means of a fine linen-cloth, an oiled paper, or other tranſparent matter, where the ſtrokes appearing through are followed with a pencil, with or without colour. Sometimes it is done on glaſs, and with frames or nets divided into ſquares with ſilk or with thread, and alſo by means of inſtruments invented for the purpoſe, as the parallelogram.

Counter-ermine, in heraldry, is the contrary of ermine, being a black field with white ſpots. See Plate LXV. fig. 14.

Counterfeits, in law, are perſons that obtain any money or goods by counterfeit letters or falſe tokens, who being convicted before juſtices of aſſize or of the peace, *&c.* are to ſuffer ſuch puniſhment as ſhall be thought fit to be inflicted under death, as impriſonment, pillory, *&c.*

Counter-faced, or **Conter-face'**, in heraldry, is the ſame that we call barry *per* pale counterchanged; but then the number of panes into which the field is divided is always ſpecified. See Barry.

Counter-foil, or **Counter-stock**, in the exchequer, that part of a tally which is kept by an officer of the court.

Counter-forts, ſpurs or buttreſſes ſerving as props to a wall ſubject to bulge or be thrown down.

Counter-fugue, in muſic, is when the fugues go contrary to one another. See Fugue.

Counter guard, in fortification, is a work raiſed before the point of a baſtion, conſiſting of two long faces parallel to the faces of the baſtion, making a ſalliant angle: they are ſometimes of other ſhapes, or otherwiſe ſituated.

Counter-light, or **Conter-jour**, a light oppoſite to any thing, which makes it appear to diſadvantage. A ſingle counter-light is ſufficient to take away all the beauty of a fine painting.

Counter-*march*, in military affairs, a change of the face or wings of a battalion, by which means thoſe that were in the front come to be in the rear.

It alſo ſignifies returning, or marching back again.

Counter-mine, in war, a well and gallery drove and ſunk till it meet the enemy's mine, to prevent its effect.

Counter-paled, *contre pale*, in heraldry, is when the eſcutcheon is divided into twelve pales parted per feſſe, the two colours being counter-changed; ſo that the upper are of one colour, and the lower of another.

Counter-part, in muſic, denotes one part to be applied to another. Thus the baſs is ſaid to be a counter-part to the treble.

Counter-passant, is when two lions are in a coat of arms, and the one ſeems to go quite the contrary way from the other.

Counter-point, in muſic, the art of compoſing harmony, or of diſpoſing ſeveral parts in ſuch a manner as to make an agreeable whole or a concert.

Counter-pointed, *contre pointé*, in heraldry, is when two chevrons in one eſcutcheon meet in the points, the one riſing as uſual from the baſe, and the other inverted falling from the chief; ſo that they are counter to one another in the points. They may alſo be counter-pointed when they are founded upon the ſides of the ſhield, and the points meet that way, called counter-pointed in feſſe.

COUNTER-POTENT, *contre-potencé*, in heraldry, is reckoned a fur as well as vair and ermine, but compoſed of ſuch pieces as repreſent the tops of crutches, called in French *potences*, and in old Engliſh *potents*.

COUNTER-PROOF, in rolling-preſs printing, a print taken off from another freſh printed; which by being paſſed through the preſs, gives the figure of the former, but inverted. To counter-prove, is alſo to paſs a deſign in black lead, or red chalk, through the preſs, after having moiſtened with a ſpunge both that and the paper on which the counter-proof is to be taken.

COUNTER-QUARTERED, *contre-ecartelé*, in heraldry, denotes the eſcutcheon, after being quartered, to have each quarter again divided into two.

COUNTER-SALIENT, is when two beaſts are borne in a coat leaping from each other directly the contrary way.

COUNTER-SCARP, in fortification, is properly the exterior talus or ſlop of the ditch; but it is often taken for the covered way and the glacis. In this ſenſe we ſay, the enemy have lodged themſelves on the counterſcarp.

Angle of the **COUNTER-SCARP**, is that made by the two ſides of the counter-ſcarp meeting before the middle of the curtin.

COUNTER-SIGNING, the ſigning the writing of a ſuperior in quality of ſecretary. Thus charters are ſigned by the king, and counter-ſigned by a ſecretary of ſtate or lord chancellor.

COUNTER-SWALLOW-TAIL, in fortification, an outwork in form of a ſingle tenaille, wider at the gorge than the head.

COUNTER-TENOR, called by the French *haut-contre*, one of the middle parts of muſic oppoſite to the tenor. See TENOR.

COUNTER-TIME, in the menage, is the defence or reſiſtance of a horſe that interrupts his cadence, and the meaſure of his menage, occaſioned either by a bad horſeman, or by the malice of the horſe.

COUNTER is alſo the name of a counting-board in a ſhop, and of a piece of metal with a ſtamp on it, uſed in playing at cards.

COUNTER *of a horſe*, that part of a horſe's forehand which lies between the ſhoulders and under the neck.

COUNTERS *in a ſhip*, are two. 1. The hollow arching from the gallery to the lower part of the ſtraight piece of the ſtern, is called the upper counter. 2. The lower counter is between the tranſom and the lower part of the gallery.

COUNTER is alſo the name of two priſons in the city of London, *viz.* the Poultry and Woodſtreet.

COUNTING. See ACCOUNTING.

COUNTY, in geography, originally ſignified the territory of a count or earl, but now it is uſed in the ſame ſenſe with ſhire. See SHIRE.

COUNTY-COURT, a court of juſtice, held every month in each county, by the ſheriff or his deputy.

COUPED, in heraldry, is uſed to expreſs the head, or any limb, of an animal, cut off from the trunk, ſmooth; diſtinguiſhing it from that which is called eraſſed, that is, forcibly torn off, and therefore is ragged and uneven.

COUPED is alſo uſed to ſignify ſuch croſſes, bars, bends, chevrons, *&c.* as do not touch the ſides of the eſcutcheons, but are, as it were, cut off from them.

COUPER, the name of two towns of Scotland, the one ſituated about twelve miles north-eaſt of Perth, in the ſhire of Angus, W. long. 3°, and N. lat. 56° 30′; and the other in the county of Fife, about ten miles weſt of St Andrews: W. long. 2° 40′, and N. lat. 56° 20′.

COUPLE-CLOSS, in heraldry, the fourth part of a chevron, never borne but in pairs, except there be a chevron between them, ſaith Guillim, though Bloom gives an inſtance to the contrary.

COUPLET, a diviſion of a hymn, ode, ſong, *&c.* wherein an equal number, or equal meaſure of verſes is found in each part; which diviſions, in odes, are called ſtrophes.

COURBARIL, in botany. See HYMENÆA.

COURIER, a meſſenger ſent poſt, or expreſs, to carry diſpatches.

COURLAND, a dutchy ſituated between 21° and 26° of E. long. and between 56° 30′, and 57° 30′ N. lat. It is bounded by the river Dwina, which divides it from Livonia, on the north; by Lithuania, on the eaſt; by Samogitia, on the ſouth; and by the Baltic ſea on the weſt; being 130 miles long, and 30 broad.

COURSING, among ſportſmen, is of three ſorts, *viz.* at the deer, at the hare, and at the fox. Theſe courſings are with greyhounds; for the deer there are two ſorts of courſings, the one with the paddock, the other either in the foreſt or purlieu. See PADDOCK, *&c.*

In courſing the hare, the beſt way is to find one ſitting, and when ſhe is firſt ſtarted, to give her ground, or law, which is generally twelve-ſcore yards. In courſing a fox, you are to ſtand cloſe, and on a clear wind.

COURT, in a law ſenſe, the place where judges diſtribute juſtice, or exerciſe juriſdiction: alſo the aſſembly of judges, jury, *&c.* in that place.

Courts are divided into ſuperior and inferior, and into courts of record and baſe courts: again, courts are either ſuch as are held in the king's name, as all the ordinary courts; or where the precepts are iſſued in the name of the judge, as the admiral's court.

The ſuperior courts are thoſe of the king's-bench, the common-pleas, the exchequer, and the court of chancery. See KING'S-BENCH, COMMON-PLEAS, EXCHEQUER, and CHANCERY.

A court of record is that which has a power to hold plea, according to the courſe of the common law, of real, perſonal, and mixt actions; where the debt or damage is forty ſhillings, or above, as the court of King's-Bench, *&c.*

COURT *of admiralty*. See ADMIRALTY.

COURT *of arches*. See ARCHES.

COURT-BARON, a court that every lord of a manor has within his own precincts. This court muſt be held by preſcription, and is of two kinds, *viz.* by common law, and by cuſtom: the former is where the barons or freeholders, being ſuitors, are the judges; the other is that where the lord, or his ſteward, is the judge.

Court *of chivalry*, or *the marſhal's* Court, that whereof the judges are the lord high conſtable, and the earl marſhal of England.

This court is the fountain of martial law; and the earl marſhal is not only one of the judges, but is to ſee execution done.

Court *of conſcience*, a court in the cities of London, Weſtminſter, and ſome other places, that determines matters in all caſes where the debt or damage is under forty ſhillings.

Court *of delegates*, a court where delegates are appointed by the king's commiſſion, under the great ſeal, upon an appeal to him from the ſentence of an archbiſhop, *&c.* in eccleſiaſtical cauſes; or of the court of admiralty, in any marine cauſe.

Court *of huſtings*, a court of record held at Guildhall, for the city of London, before the lord mayor and aldermen, ſheriffs and recorder, where all pleas, real, perſonal, and mixt, are determined; where all lands, tenements, *&c.* within the ſaid city, or its bounds, are pleadable in two huſtings; the one called the huſtings of plea of lands, and the other the huſtings of common pleas. The court of huſtings is the higheſt court within the city, in which writs of exigent may be taken out, and outlawries awarded, wherein judgment is given by the recorder.

There are alſo other courts called wardmotes, or meeting of the wards; and courts of holymote, or aſſemblies of the guilds and fraternities.

Court-leet, a court ordained for the puniſhment of offences under high treaſon againſt the crown.

Court-martial, a court appointed for the puniſhing offences in officers, ſoldiers, and ſailors, the powers of which are regulated by the mutiny-bill.

Court *of requeſts*, was a court of equity, of the ſame nature with the chancery, but inferior to it.

COURTESY, or Curtesy *of England*, a certain tenure whereby a man marrying an heireſs ſeized of lands of fee ſimple, or fee tail general, or ſeized as heir of the tail ſpecial, and getteth a child by her that cometh alive into the world, though both it and his wife die forthwith; yet, if ſhe were in poſſeſſion, he ſhall keep the land during his life, and is called *tenant per legem Angliæ*, or tenant by the courteſy of England; becauſe this privilege is not allowed in any country except Scotland, where it is called *curialitas Scotiæ*.

COURTISAN, a woman who proſtitutes herſelf for hire, eſpecially to people of ſuperior rank.

COURTRAY, a town of the Auſtrian Netherlands, ſituated on the river Lys, about twenty-three miles ſouth-weſt of Ghent, and fourteen eaſt of Ypres: E. long. 3° 10′, and N. lat. 50° 48′.

COUSIN, a term of relation between the children of brothers and ſiſters, who in the firſt generation are called couſin-germans, in the ſecond generation ſecond couſins, *&c.* If ſprung from the relations of the father's ſide, they are denominated paternal couſins; if on the mother's, maternal.

COUSU, in heraldry, ſignifies a piece of another colour or metal placed on the ordinary, as if it were ſewed on, as the word imports. This is generally of colour upon colour, or metal upon metal, contrary to the general rule of heraldry.

COVERT, in heraldry, denotes ſomething like a piece of hanging, or a pavillion falling over the top of a chief or other ordinary, ſo as not to hide, but only to be a covering to it.

COW, in zoology. See Bos.

Sea-Cow, in zoology. See Trichecus.

Cow-itch, in botany. See Phaseolus.

Cow's-lip, in botany. See Primula.

Cow's-lip *of Jeruſalem* See Pulmonaria.

COWARD, in heraldry, a term given to a lion borne in an eſcutcheon with his tail doubled or turned in between his legs.

COWES, a town and harbour on the northern coaſt of the iſle of Wight, ſituated about eight miles ſouth of Plymouth: W. long. 1° 25′, and N. lat. 50° 45′.

COWL, or Coul, a habit worn by the Bernardines and Benedictines, of which there are two kinds; one white, very large, worn in ceremonies; the other black, worn on ordinary occaſions, in the ſtreets, *&c.*

Friar's Cowl, in botany. See Arisarum.

COXWOLD, a market-town in the north riding of Yorkſhire, about fourteen miles north of the city of York: W. long. 50′, and N. lat. 54° 20′.

COZUMEL, an iſland near the weſtern coaſt of Jucatan, where Cortez landed and refreſhed his troops, before entering upon the conqueſt of Mexico: W. long. 89°, and N. lat. 13°.

CRAB, in zoology. See Cancer.

Crab's claws, in the materia medica, are the tips of the claws of the common crab broken off at the verge of the black part, ſo much of the extremity of the claws only being allowed to be uſed in medicine as is tinged with this colour. The blackneſs, however, is only ſuperficial; they are of a greyiſh white within, and when levigated furniſh a tolerable white powder.

Crab's claws are of the number of the alkaline abſorbents, but they are ſuperior to the generality of them in ſome degree, as they are found on a chemical analyſis to contain a volatile urinous ſalt.

Crab's eyes, in pharmacy, are a ſtrong concretion in the head of the cray-fiſh. They are rounded on one ſide, and depreſſed and ſinuated on the other, conſiderably heavy, moderately hard, and without ſmell. We have them from Holland, Muſcovy, Poland, Denmark, Sweden, and many other places.

Crab's eyes are much uſed both in the ſhop-medicines and extemporaneous preſcriptions, being accounted not only abſorbent and drying, but alſo diſcuſſive and diuretic.

Crab, an engine of wood, with three claws, placed on the ground like a capſtan, and uſed at launching or heaving ſhips into the dock.

CRABRO, in zoology, See TENTHREDO.

CRACOA, in botany. See VICIA.

CRACKER, in ornithology, See ANAS.

CRACOW, by ſome accounted the capital city of Poland, is ſituated in the province of little Poland, and palatinate of Cracow, in a fine plane near the banks of the Viſtula. It has an univerſity, and is the ſee of a biſhop, and the ſeat of the ſupreme courts of juſtice: it ſtands about 140 miles ſouth-weſt of Warſaw, in 19° 30′ of E. long. and 50° N. lat.

CRADLE, a well known machine in which infants are rocked to ſleep.

It denotes alſo that part of the ſtock of a croſs bow where the bullet is put.

CRADLE, in ſurgery, a caſe in which a broken leg is laid after being ſet.

CRADLE, among ſhipwrights, a timber frame made along the outſide of a ſhip by the bilge, for the convenience of launching her with eaſe and ſafety.

CRAFT, in the ſea-language, ſignifies all manner of nets, lines, hooks, *&c.* uſed in fiſhing. Hence all ſuch little veſſels as ketches, hoys, and ſmacks, *&c.* uſed in the fiſhing trade, are called ſmall craft.

CRAIL, or CAREIL, a parliament town of Scotland, ſituated on the ſea-coaſt of the county of Fife, about ſeven miles ſouth-eaſt of St Andrews: W. long. 2° 20′ and N. lat. 56° 17′.

CRAMBE, *wild* SEA-CABBAGE, in botany, a genus of the tetradynamia ſiliquoſa claſs. The four long filaments are forked at the points, and the antheræ are fixed upon one of them; the berry is dry, globular, and deciduous. The ſpecies are three, only one of which, *viz.* the maritima, or ſea-colewort, is a native of Britain.

CRAMP, in medicine, a convulſive contraction of a muſcular part of the body.

CRAMP FISH. See TORPEDO.

CRAMP IRON, or CRAMPS, a piece of iron bent at each end, which ſerves to faſten together pieces of wood, ſtones, or other things.

CRAMPER, in ichthyology. See CYPRINUS.

CRAMPONE'E, in heraldry, an epithet given to a croſs which has at each end a cramp or ſquare piece coming from it; that from the arm in chief towards the ſiniſter angle, that from the arm on that ſide downwards, that from the arm in baſe towards the dexter ſide, and that from the dexter arm upwards. See Plate LXVI. fig. 5.

CRANAGE, the liberty of uſing a crane at a wharf, and alſo the money paid for drawing up wares out of a ſhip, *&c.* with a crane.

CRANE, in ornithology. See ARDEA.

CRANE, in mechanics, a machine uſed in building and commerce for raiſing large ſtones and other weights. See MECHANICS.

CRANE'S BILL, among ſurgeons, a kind of forceps, ſo called from its figure.

CRANE'S BILL, in botany. See GERANIUM.

CRANE-FLY, in zoology. See TIPULA.

CRANGANOR, a Dutch factory on the Malabar-coaſt, in the hither India, about thirty miles north of Cochin: E. long. 75° 5′, and N. lat. 10°.

CRANIOLARIA, in botany, a genus of the didynamia angioſpermia claſs. The perianthium conſiſts of four leaves, and the ſpatha of one; and the tube of the corolla is very long. There are two ſpecies, none of them natives of Britain.

CRANIUM, in anatomy. See Vol. I. p. 151.

CRANNY, in glaſs-making, an iron-inſtrument, wherewith the necks of glaſſes are formed.

CRAPE, in commerce, a kind of ſtuff, made in the manner of gauze, with raw ſilk, gummed and twiſted on the mill.

CRAPULA, among phyſicians. See SURFEIT.

CRASIS, among phyſicians, is uſed to ſignify ſuch a due mixture of qualities in a human body, as conſtitutes a ſtate of health.

CRASSAMENTUM, in phyſic, the thick red or fibrous part of the blood, otherwiſe called cruor, in contradiſtinction to the ſerum or aqueous part.

CRASSULA, in botany, a genus of the pentandria pentagynia claſs. The calix conſiſts of five leaves, and the corolla of five petals; there are five nectariferous glands at the baſe of the germen; and it has five capſules. There are 17 ſpecies, none of them natives of Britain.

CRATÆGUS, in botany, a genus of the icoſandria digynia claſs. The calix has five ſegments, and the corolla five petals; the berry is below the flower, and contains two ſeeds. There are nine ſpecies, three of which are natives of Britain, *viz.* the aria, or white bean-tree; the torminalis, ſervice-tree, or ſorb; and the oxyacantha, white-thorn, or hawthorn.

CRATCHES, in the menage, a ſwelling on the paſtern, under the fet lock, and ſometimes under the hoof; for which reaſon it is diſtinguiſhed into the ſinew cratches, which affect the ſinew, and thoſe upon the cronet, called quitter-bones.

CRATER, in aſtronomy. See Vol. I. p. 487.

CRATEVA, in botany, a genus of the polyandria monogynia claſs.

CRATO, a town of Alentejo, in Portugal, ſituated about ſeven miles ſouth of Portalegre: W. long. 8°, and N. lat. 38° 50′.

CRAVEN, in geography, a diviſion of the weſt riding of Yorkſhire, ſituated on the river Are.

CRAX, in ornithology, a genus of birds, belonging to the order of gallinæ. The baſe of the beak of each mandible is covered with wax; and the feathers of the head are curled. There are five ſpecies, *viz.* 1. The alecator, or Indian hen of Sloane, is about the ſize of a common hen: It is black, with a white belly. A yellow wax covers about one half of each mandible: The tongue is entire; the temples are bare, and black; the tail is roundiſh, and conſiſts of 14 prime feathers; and it has no ſpur. It is found in the warm parts of America. 2. The rubra, or Peruvian hen, is red, with a blueiſh head: It is a native of Peru. 3. The mitu, or Braſilian pheaſant, is black, with a duſky belly, and red wax: It is a native of Guinea and Brazil.

zil. 4. The globicera, has a yellow protuberance between the noſtrils, and is of a blueiſh black colour: It is likewiſe a native of Brazil. 5. The pauxi, or Mexican pheaſant of Briſſonius, is of a blueiſh colour, with blue wax, and the tip of the tail and belly white: It is a native of Mexico.

CRAYON, a name for all coloured ſtones, earths, or other minerals uſed in deſigning or painting in paſtel. Crayons may be made of any colour, and adapted for the faces of men, women, landſcapes, clouds, ſunbeams, buildings, and ſhadows, in the following manner: Take plaſter of Paris, or alabaſter calcined, and of the colour of which you intend to make your crayons, a ſufficient quantity: grind them firſt aſunder, and then together, and with a little water make them into a paſte: then roll them with your hand upon the grinding ſtone into long pieces, and let them dry moderately in the air: when they are to be uſed, ſcrape them to a point like a common pencil.

CREAM, the fat part of the milk that ſwims upon the ſurface.

Cream *of tartar*. See Chemistry.

CREAT, in the menage, an uſher to a riding maſter; or, a gentleman bred in the academy, with intent to make himſelf capable of teaching the art of riding the great horſe.

CREATION, the producing ſomething out of nothing, which ſtrictly and properly is the effect of the power of God alone, all other creations being only transformations, or change of ſhape.

CREDENTIALS, letters of recommendation, and power, eſpecially ſuch as are given to ambaſſadors, or public miniſters, by the prince or ſtate that ſends them to foreign courts.

CREDIBILITY, a ſpecies of evidence, leſs indeed than abſolute certainty or demonſtration, but greater than mere poſſibility: it is nearly allied to probability, and ſeems to be a mean between poſſibility and demonſtration.

CREDIT, in commerce, a mutual truſt or loan of merchandize, or money, on the reputation of the probity and ſufficiency of a dealer. See Commerce.

CREDITON, a market-town in Devonſhire, conſiderable for a good woolen manufactory: it is ſituated about nine miles north-weſt of Exeter, in 3° 50′ W. long. and 50° 50′ N. lat.

CREDITOR, a perſon to whom any ſum of money is due, either by obligation, promiſe, or otherwiſe.

CREED, a brief ſummary of the articles of a Chriſtian's belief.

The moſt ancient form of creeds is that which goes under the name of the apoſtolic creed; beſides this, there are ſeveral other ancient forms and ſcattered remains of creeds to be met with in the primitive records of the church. The firſt is a form of apoſtolical doctrine, collected by Origen; the ſecond is a fragment of a creed preſerved by Tertullian; the third remains of a creed, is in the works of Cyprian; the fourth, a creed compoſed by Gregory Thaumaturgus, for the uſe of his own church; the fifth, the creed of Lucian the martyr; the ſixth, the creed of the apoſtolical conſtitutions. Beſides theſe ſcattered remains of the ancient creeds, there are extant ſome perfect forms, as thoſe of Jeruſalem, Cæſarea, Antioch, *&c.*

The moſt univerſal creeds are, the apoſtolical, the Athanaſian, and the Nicene creeds.

CREEK, the part of a haven where any thing is landed from the ſea.

CREEPER, in ornithology. See Certhia.

CREMA, a city and biſhop's ſee of Italy, capital of a diſtrict of the Milaneſe, called from it Cremaſco: it ſtands almoſt in the middle between Milan and Mantua, in 10° 15′ E. long. and 45° 20′ N. lat.

CREMASTER, in anatomy. See Vol. I. p. 272.

CREMONA, a city of Italy, and capital of a diſtrict of the Milaneſe, called from it the Cremoneſe, is ſituated forty-five miles ſouth-eaſt of Milan, in 10° 30′. E. long. and 45° N. lat.

CRENATED, in botany. See Vol. I. p. 640.

CRENCLES, in a ſhip, ſmall ropes, ſpliced into the bolt-ropes of the ſails of the main-maſt and fore-maſt. They are faſtened to the bow-line bridles; and are alſo to hold by, when a bonnet is ſhaken off.

CRENELLE', or Imbattled, in heraldry, is uſed when any honourable ordinary is drawn, like the battlements on a wall to defend men from the enemies ſhot. See Plate LXVI. fig. 6.

CRENOPHYLAX, in antiquity, a magiſtrate at Athens, who had the inſpection of fountains.

CREPANCE, in the menage, a chop, or cratch, in a horſe's leg, given by the ſpunges of the ſhoes of one of the hinder feet croſſing and ſtriking againſt the other hinder foot. This cratch degenerates into an ulcer.

CREPIS, in botany, a genus of the ſyngeneſia polygamia æqualis claſs. The receptacle is naked; the calix is caliculated, with deciduous ſcales; and the pappus is plumoſe, and furniſhed with a ſtipes. The ſpecies are fourteen, three of which are natives of Britain, *viz.* the tectarum, or ſmooth ſuccory hawk-weed; the biennis, or rough ſuccory hawk-weed; and the fœtida, or ſtinking hawk-weed.

CREPUNDIA, in antiquity, a term uſed to expreſs ſuch things as were expoſed along with children, as rings, jewels, *&c.* ſerving as tokens whereby they afterwards might be known.

CRESCENT, the new moon, which, as it begins to recede from the ſun, ſhews a little rim of light, terminating in points, called horns, that are ſtill encreaſing, till it is in oppoſition to the ſun, at which time it is full moon, or quite round.

Crescent, in heraldry, a bearing in form of a new moon. See Plate LXV. fig. 10.

It is uſed either as an honourable bearing, or as the difference to diſtinguiſh between elder and younger families; this being generally aſſigned to the ſecond ſon, and thoſe that deſcend from him. The figure of the creſcent is the Turkiſh ſymbol, with its points looking towards the top of the chief, which is its moſt ordinary repreſentation, called creſcent montant. Creſcents are ſaid to be adoſſed, when their backs are turned towards each other; a creſcent is ſaid to be inverted, when its points look towards the bottom; turned creſcents have their points looking to the dexter ſide of the ſhield; cornuted creſcents, to the ſiniſter ſide; and affronted creſcents, contrary to the adoſſed, have their points turned to each other.

Crescent, a term among farriers. Thus a horſe is ſaid to have creſcents when that part of the coffin-bone, which is moſt advanced, falls down and preſſes the ſole outwards, and the middle of her hoof above ſhrinks, and becomes flat, by reaſon of the hollowneſs beneath it.

CRESCENTIA, in botany, a genus of the didynamia angioſpermia claſs. The calix is ſplit into two equal parts; the corolla is gibbous; and the berry is unilocular, and contains many ſeeds. There is but one ſpecies, a native of Jamaica.

CRESS, or Cresses, in botany. See Sisymbrium.

Indian Cress. See Tropæolum.

CRESSY, a port-town of Picardy in France, about forty-four miles ſouth of Calais, and twenty-ſeven north-weſt of Abbeville, remarkable on account of the victory obtained there over the French, by Edward III. of England, in the year 1346: E. long. 2°, N. lat. 50° 20′.

CREST, in armoury, the top-part of the armour, for the head, mounting over the helmet, in manner of a comb, or tuft of a cock, deriving its name from *criſta*, a cock's comb.

The creſt was for the moſt part made of feathers, or the hair of horſes tails or mains. The ſoldiers took great pride in adorning them.

Crest, in heraldry, the uppermoſt part of an armoury, or that part of the caſk or helmet next to the mantle. Guillim ſays, the creſt, or cognizance, claims the higheſt place, being ſeated on the moſt eminent part of the helmet; yet ſo as to admit of an interpoſition of ſome eſcrol, wreathe, chapeau, crown, *&c.*

The creſt is eſteemed a greater mark of nobility than the armory; being borne at tournaments, to which none were admitted till ſuch time as they had given proof of their nobility: ſometimes it ſerves to diſtinguiſh the ſeveral branches of a family; and it has ſerved, on occaſion, as a diſtinguiſhing badge of factions: ſometimes the creſt is taken for the device; but more uſually is formed of ſome piece of the arms. Families that exchange arms do not change their creſt.

Crest, among carvers, an imagery, or carved work, to adorn the head or top of any thing, like our modern corniche.

Crest-*fallen*, a fault of an horſe, when the upper part of his neck, called the creſt, hangs to one ſide: this they cure by placing it upright, clipping away the ſpare ſkin, and applying plaſters to keep it in a proper poſition.

CRESTED, ſomething furniſhed with a creſt. See Crest.

CRETA, or Chalk, in natural-hiſtory. See Chalk.

CREUX, a French term uſed among artiſts, and literally ſignifies a hollow cavity or pit, out of which ſomething has been ſcooped or dug: whence it is uſed to ſignify that kind of ſculpture, where the lines and figures are cut and formed within the face or plan of the plate or matter engraved; and thus it ſtands in oppoſition to relievo, where the lines and figures are emboſſed, and riſe prominent above the face of the matter engraved on.

CREW, the company of ſailors belonging to a ſhip, boat, or other veſſel.

CREX, in ornithology. See Rallus.

CRIBBAGE, a game at cards, to be learnt only by practice.

CRIBRATION, in pharmacy, the paſſing any ſubſtance through a ſieve, or ſearch, in order to ſeparate the finer particles from the groſſer.

CRIBROSUM *os*, in anatomy, called alſo os ethmoides. See Vol. I. p. 157.

CRICETUS, in zoology. See Mus.

CRICK, among farriers, is when a horſe cannot turn his neck any manner of way, but holds it fore right, inſomuch that he cannot take his meat from the ground without great pain.

CRICKET, in zoology. See Gryllus.

Mole Cricket. See Gryllotalpa.

CRICKLADE, a borough-town of Wiltſhire, ſituated on the river Iſis, about twenty-ſix miles ſouth-weſt of Oxford: W. long. 1° 55′, and N. lat. 51° 35′.

CRICO-ARYTANOIDÆUS, in anatomy. See Vol. I. p. 300.

CRICOIDES, in anatomy. See Vol. I. p. 300.

CRICO-THYROIDÆUS, in anatomy. See Vol. I. p. 300.

CRIM, or Crim-Tartary, a peninſula in the Black ſea, between 33° and 37° E. long. and between 44° and 46° N. lat. It is joined to Little Tartary by a narrow iſthmus.

CRIME, the tranſgreſſion of a law, either natural or divine, civil or eccleſiaſtic.

CRIMSON, one of the ſeven red colours of the dyers. See Dying.

CRINONES, among phyſicians, ſmall worms that breed in the ſkin, called alſo dracunculi.

CRINUM, in botany, a genus of the hexandria monogynia claſs. The corolla is tunnel-ſhaped, and conſiſts of one leaf, divided into ſix ſegments; and the germen is at the bottom of the corolla. There are four ſpecies, none of them natives of Britain.

CRISIS, in medicine, is uſed in different ſenſes, both by the ancient and modern phyſicians. With ſome it means frequently no more than the excretion of any noxious ſubſtance from the body. Others take the word for a ſecretion of the noxious humours made in a fever. Others uſe it for the critical motion itſelf; and Galen defines a criſis in fevers, a ſudden and inſtantaneous change, either for the better or the worſe, productive of recovery or death.

CRISTÆ, in ſurgery, a term for certain excreſcences about the anus and pudenda. See Vol. I. p. 157.

Crista galli, in anatomy. See Vol. I p. 157.

Crista galli, or Cock's comb. See Rhinanthus.

Crista pavonis, in botany. See Poinciana.

CRITERIUM, a ſtandard by which propoſitions and opinions are compared, in order to diſcover their truth or falſehood.

CRITHE, in ſurgery, commonly called the ſtye, is a tubercle that grows in different parts of the eye lids.

CRITHMUM, in botany, a genus of the pentandria digynia claſs. The fruit is oval and compreſſed. There are two ſpecies, one of which, *viz.* the maritimum, or ſampire, is a native of Britain; the leaves are ſaid to be ſtomachic, aperient, and diuretic.

CRITICAL *days* and *ſymptoms*, among phyſicians, are certain days and ſymptoms in the courſe of acute diſeaſes, which indicate the patient's ſtate, and determine him either to recover or grow worſe. See MEDICINE.

CRITICISM, the art of judging with propriety concerning any object or combination of objects. But, in a more limited ſenſe, the ſcience of criticiſm is confined to the fine arts. The principles of the fine arts are beſt unfolded by ſtudying the ſenſitive part of our nature, and by learning what objects are naturally agreeable, and what are naturally diſagreeable. The man who aſpires to be a critic in theſe arts, muſt pierce ſtill deeper: he muſt clearly perceive what objects are lofty, what low, what are proper or improper, what are manly, and what are mean or trivial. Hence a foundation for judging of taſte, and for reaſoning upon it: where it is conformable to principles, we can pronounce with certainty, that it is correct; otherwiſe, that it is incorrect, and perhaps whimſical. Thus the fine arts, like morals, become a rational ſcience; and, like morals, may be cultivated to a high degree of refinement.

Manifold are the advantages of criticiſm, when thus ſtudied as a rational ſcience. In the firſt place, a thorough acquaintance with the principles of the fine arts, redoubles the entertainment theſe arts afford. To the man who reſigns himſelf entirely to ſentiment or feeling, without interpoſing any ſort of judgment, poetry, muſic, painting, are mere paſtime; in the prime of life, indeed, they are delightful, being ſupported by the force of novelty, and the heat of imagination: but they loſe their reliſh gradually with their novelty; and are generally neglected in the maturity of life, which diſpoſes to more ſerious and more important occupations. To thoſe who deal in criticiſm as a regular ſcience, governed by juſt principles, and giving ſcope to judgment as well as to fancy, the fine arts are a favouraite entertainment; and in old age maintain that reliſh which they produce in the morning of life.

In the next place, a philoſophical inquiry into the principles of the fine arts, inures the reflecting mind to the moſt enticing ſort of logic: the practice of reaſoning upon ſubjects ſo agreeable tends to a habit; and a habit ſtrengthening the reaſoning faculties, prepares the mind for entering into ſubjects more difficult and abſtract. To have, in this reſpect, a juſt conception of the importance of criticiſm, we need but reflect upon the common method of education; which, after ſome years ſpent in acquiring languages, hurries us, without the leaſt preparatory diſcipline, into the moſt profound philoſophy: a more effectual method to alienate the tender mind from abſtract ſcience, is beyond the reach of invention; and accordingly, with reſpect to ſuch ſpeculations, the bulk of our youth contract a ſort of hobgoblin terror, which is ſeldom, if ever ſubdued. Thoſe who apply to the arts, are trained in a very different manner: they are led, ſtep by ſtep, from the eaſier parts of the operation, to what are more difficult; and are not permitted to make a new motion, till they be perfected in thoſe which regularly precede it. The ſcience of criticiſm appears then to be a middle link, connecting the different parts of education into a regular chain. This ſcience furniſheth an inviting opportunity to exerciſe the judgment: we delight to reaſon upon ſubjects that are equally pleaſant and familiar; we proceed gradually from the ſimpler to the more involved caſes: and in a due courſe of diſcipline, cuſtom, which improves all our faculties, beſtows acuteneſs upon thoſe of reaſon, ſufficient to unravel all the intricacies of philoſophy.

Nor ought it to be overlooked, that the reaſonings employed upon the fine arts are of the ſame kind with thoſe which regulate our conduct. Mathematical and metaphyſical reaſonings have no tendency to improve ſocial intercourſe; nor are they applicable to the common affairs of life: but a juſt taſte in the fine arts, derived from rational principles, furniſhes elegant ſubjects for converſation, and prepares us finely for acting in the ſocial ſtate with dignity and propriety.

The ſcience of rational criticiſm tends to improve the heart not leſs than the underſtanding. It tends, in the firſt place, to moderate the ſelfiſh affections: by ſweetening and harmonizing the temper, it is a ſtrong antidote to the turbulence of paſſion and violence of purſuit: it procures to a man ſo much mental enjoyment, that in order to be occupied, he is not tempted in youth to precipitate into hunting, gaming, drinking; nor in middle-age, to deliver himſelf over to ambition; nor in old-age, to avarice. Pride and envy, two diſguſtful paſſions, find in the conſtitution no enemy more formidable than a delicate and diſcerning taſte: the man upon whom nature and culture have beſtowed this bleſſing, feels great delight in the virtuous diſpoſitions and actions of others: he loves to cheriſh them, and to publiſh them to the world: faults and failings, it is true, are to him not leſs obvious; but theſe he avoids, or removes out of ſight, becauſe they give him pain. On the other hand, a man void of taſte, upon whom the moſt ſtriking beauties make but a faint impreſſion, has no joy but in gratifying his pride or envy by the diſcovery of errors and blemiſhes. In a word, there may be other paſſions, which, for a ſeaſon, diſturb the peace of ſociety more than thoſe mentioned; but no other paſſion is ſo unwearied an antagoniſt to the ſweets of ſocial intercourſe: theſe paſſions, tending aſſiduouſly to their gratification, put a man perpetually in oppoſition to others; and diſpoſe him more to reliſh bad than good qualities, even in a companion. How different that diſpoſition of mind, where every virtue in a companion or neighbour, is, by refinement of taſte, ſet in its ſtrongeſt light; and defects or blemiſhes, natural to all, are ſuppreſſed, or kept out of view!

In the next place, delicacy of taſte tends not leſs to invigorate the ſocial affections, than to moderate thoſe that are ſelfiſh. To be convinced of this tendency, we need only reflect, that delicacy of taſte neceſſarily heightens our ſenſibility of pain and pleaſure, and of courſe our ſympathy, which is the capital branch of every ſocial paſſion. Sympathy in particular invites a communication of joys and ſorrows, hopes and fears: ſuch exerciſe, ſoothing and ſatisfactory in itſelf, is neceſſarily productive of mutual good-will and affection.

One other advantage of rational criticiſm is reſerved to the laſt place, being of all the moſt important; which is, that it is a great ſupport to morality. No occupation attaches a man more to his duty than that of cultivating a taſte in the fine arts: a juſt reliſh of what is beautiful, proper, elegant, and ornamental, in writing or painting, in architecture or gardening, is a fine preparation for the ſame juſt reliſh of theſe qualities in character and behaviour. To the man who has acquired a taſte ſo acute and accompliſhed, every action wrong or improper, muſt be highly diſguſtful: if, in any inſtance, the overbearing power of paſſion ſway him from his duty, he returns to it upon the firſt reflection, with redoubled reſolution never to be ſwayed a ſecond time: he has now an additional motive to virtue, a conviction derived from experience, that happineſs depends on regularity and order, and that a diſregard to juſtice or propriety never fails to be puniſhed with ſhame and remorſe.

For the rules of criticiſm, applicable to the fine arts, and derived from human nature, ſee ARCHITECTURE, BEAUTY, CONGRUITY, COMPARISON, GRANDEUR, *&c.*

CROATIA, a frontier province of Germany, bounded by Sclavonia on the north and eaſt, by Boſnia on the ſouth, and by Carniola on the weſt. It is ſubject to the houſe of Auſtria.

CROCCEUS, or HOAMBO, a large river of China, which, after a courſe of two thouſand miles, falls into the bay of Nankin: it is ſometimes called the Yellow river, on account of the ſlime of this colour with which its waters are tinged.

CROCINUM, among phyſicians, denotes the oil of ſaffron, ſaid to be of a heating quality, and to procure ſleep.

CROCODES, an appellation given to paſtils or troches, whereof crocus, or ſaffron, is the principal ingredient.

CROCODILE, in zoology. See LACERTA.

CROCUS, or SAFFRON, in botany, a genus of the triandria monogynia claſs. The corolla is divided into ſix equal parts; and it has three erect ſtigmata. There is but one ſpecies, a native of Britain. The antheræ, or cluves, picked off and preſſed together into cakes, goes by the name of ſaffron, which is an elegant and uſeful aromatic, and is deſervedly accounted one of the higheſt cordials.

CROCUS, in chemiſtry, denotes any metal calcined to a red or deep yellow colour. See CHEMISTRY.

CROCUS METALLORUM, an emetic preparation of antimony and nitre. See CHEMISTRY.

CROFT, a little cloſe adjoining to a dwelling-houſe, and encloſed for paſture or arable land, or any other particular uſe.

CROISADE, CRUSADE, or CRUZADO, a name given to the expeditions of the Chriſtians againſt the infidels, for the conqueſt of Paleſtine; ſo called, becauſe thoſe who engaged in the undertaking wore a croſs on their cloaths, and bore one on their ſtandard.

This expedition was alſo called the holy war, to which people flocked in great numbers out of pure devotion, the pope's bulls and the preaching of the prieſts of thoſe days making it a point of conſcience. The ſeveral nations engaged in the holy war were diſtinguiſhed by the different colours of their croſſes: the Engliſh wore white, the French red, the Flemiſh green, the Germans black, and the Italians yellow. From this enterpriſe ſeveral orders of knighthood took their riſe. They reckon eight croiſades for the conqueſt of the holy land; the firſt begun in the year 1095, at the ſolicitation of the Greek emperor and the patriarch of Jeruſalem.

CROISES, or CROIZES, in Engliſh antiquity, pilgrims bound for the holy land, or ſuch as had been there; ſo called from a badge they wore in imitation of a croſs. The knights of St John of Jeruſalem, created for the defence and protection of pilgrims, were particularly called croiſes.

CROISIERS, a religious order founded in honour of the invention or diſcovery of the croſs by the empreſs Helena.

They are diſperſed in ſeveral parts of Europe, particularly in the Low Countries, France, and Bohemia, thoſe in Italy being at preſent ſuppreſſed. Theſe religious follow the rule of St Auguſtine. They had in England the name of crouched friers.

CROMARTY, the capital of the ſhire of Cromarty, in Scotland, with an excellent and ſafe harbour capable of containing the greateſt fleets: W. long. 3° 40′, and N. lat. 57° 54′.

CRONENBURG, a fortreſs of Denmark, ſituated in the iſland of Zealand, at the entrance of the Sound, where the Danes take toll of ſhips bound for the Baltic: E. long. 12° 5′, and N. lat. 56°.

CRONSLOT, or CROWN-CASTLE, a caſtle and harbour in a little iſland of the ſame name, at the mouth of the river Neva, and entrance of the gulf of Finland, in Ruſſia, about twelve miles weſt of Peterſburgh: E. long. 30°, and N. lat. 60°. Here is a ſtation for the Ruſſian men of war, and a yard for building and refitting them.

CRONSTAT, a town of Tranſilvania, ſituated near the frontiers of Moldavia, about fifty miles north-eaſt of Hermanſtat, and ſubject to the houſe of Auſtria: E. long. 25°, and N. lat. 47′.

CROPPER, in ornithology. See COLUMBA.

CROSIER, or CROZIER, a ſhepherd's crook; a ſymbol of paſtoral authority, conſiſting of a gold or ſilver ſtaff, crooked at the top, carried occaſionally before biſhops and abbots, and held in the hand when they give the ſolemn benedictions. The cuſtom of bearing a paſtoral ſtaff before biſhops is very ancient. Regular abbots are allowed to officiate with a mitre and croſier. Among the Greeks none but a patriarch had a right to the croſier.

CROSIER, in aſtronomy, four ſtars in the ſouthern hemiſphere, in the form of a croſs, ſerving thoſe who ſail in ſouth latitudes to find the antarctic pole.

CROSLET, in heraldry, is when a croſs is croſſed again at a ſmall diſtance from each of the ends. Upton ſays it is not ſo often borne by itſelf in arms, as other croſſes are, but often in diminutives, that is, in ſmall croſſets ſcattered about the field. See Plate LXVI. fig. 7.

CROSS, in antiquity, a ſpecies of puniſhment, or rather the inſtrument wherewith it was inflicted, conſiſting of two pieces of wood croſſing each other.

This puniſhment was only inflicted on malefactors and ſlaves, and thence called *ſervile ſupplicium*. The moſt uſual method was to nail the criminal's hands and feet to this machine, in an erect poſture; though there are inſtances of criminals ſo nailed with their head downward.

Invention of the **CROSS**, a feſtival obſerved on May 3, by the Latin church, in memory of the empreſs Helena's (the mother of Conſtantine) finding the true croſs of Chriſt on mount Calvary, where ſhe cauſed erect a church for the preſervation of it.

Exaltation of the **CROSS**, a grand feſtival ſolemnized on September 14, in commemoration of Heraclius's reſtoring to mount Calvary the true croſs, that had been carried off by Coſroes king of Perſia, upon taking the city of Jeruſalem.

Order of the **CROSS**, an order of ladies inſtituted in 1668, by the empreſs Eleanora de Gonzagua, wife of the emperor Leopold, on occaſion of the miraculous recovery of a little golden croſs, wherein were incloſed two pieces of the true croſs, out of the aſhes of a part of the palace that had been burnt down: though the fire burnt the caſe wherein it was encloſed, and melted the cryſtal, it appears that the wood had not received the leaſt damage.

CROSS, in heraldry, an ordinary compoſed of fourfold lines, whereof two are perpendicular, and the other two tranſverſe; for ſo we muſt conceive of them, though they are not drawn throughout, but meet, by couples, in four right angles, near about the feſſe-point of the eſcutcheon. The content of a croſs is not always the ſame; for when it is not charged, it has only the fifth part of the field; but if it be charged, then it muſt contain the third part thereof.

This bearing was beſtowed on ſuch as had performed, or at leaſt undertaken ſome ſervice for Chriſt and the Chriſtian profeſſion; and is therefore held by ſeveral authors the moſt honourable charge in all heraldry. What brought it into ſuch frequent uſe was the ancient expeditions into the holy land, the croſs being the enſigns of that war.

In theſe wars, the Scots carried St Andrew's croſs; the French, a croſs argent; the Engliſh, a croſs or; the Germans, ſable; the Italians, azure; the Spaniards, gules.

CROSS-BAR-SHOT, a bullet with an iron-bar paſſing through it, and ſtanding ſix or eight inches out at both ſides: it is uſed at ſea, for deſtroying the enemy's rigging.

CROSS-BILL, in ornithology. See LOXIA.

CROSS-WORT, in botany. See VALANTIA.

CROSSELET, a little or diminutive croſs, uſed in heraldry, where the ſhield is frequently ſeen covered with croſſelets; alſo feſſes and other honourable ordinaries, charged or accompanied with croſſelets. Croſſes frequently terminate in croſſelets. See Plate LXVI. fig. 7.

CROTALARIA, in botany, a genus of the diadelphia decandria claſs. The pod is ſwollen, inflated, and pedicellated. There are eleven ſpecies, none of them natives of Britain.

CROTALOPHORUS, in zoology. See CROTALUS.

CROTALUS, or RATTLE-SNAKE, in zoology, a genus belonging to the order of amphibia ſerpentes, the characters of which are theſe: The belly is furniſhed with ſcuta, and the tail has both ſcuta and ſcales; but the principal characteriſtic of this genus, is the rattle at the end of the tail. The rattles conſiſt of ſeveral articulated cruſtaceous, or rather horny bags, which make a conſiderable rattling noiſe when the creature moves, and ſerves to warn people of their approach. There are five ſpecies, and the bite of every one of them is ſo highly poiſonous, that it generally kills in a ſhort time. 1. The horridus, or American rattleſnake, has 167 ſcuta, and 23 ſcutellæ. It is generally of an orange, tawny, or blackiſh colour on the back, and the belly is aſh coloured: they are from four to ſix inches in length; ſome are as thick as a man's leg: Dr Tyſon diſſected one which was four feet five inches long, and the body ſix and a half inches in diameter. They devour birds, ſquirrels, hares, *&c.* 2. The miliaris has 13 ſcuta, and 31 ſcutellæ. It is aſh-coloured, interſperſed with black ſpots, and is a native of Carolina. 3. The dryinas has 165 ſcuta, and 30 ſcutellæ. It is whitiſh, with a few yellow ſpots, and is a native of America. 4. The duriſſus has 172 ſcuta, and 21 ſcutellæ. It is variegated with white and yellow colours, and is likewiſe found in America. 5. The mutus has 217 ſcuta, and 34 ſcutellæ. It has a chain of rhomboidal black ſpots on the back, a black line behind the eyes, and is a native of Surinam.

CROTCHET, in muſic, one of the notes or characters of time, marked thus ♩, equal to half a minum, and double of a quaver.

CROTCHETS are alſo marks or characters, ſerving to incloſe a word or ſentence which is diſtinguiſhed from the reſt, being generally in this form [ ], or this ( ).

CROTON, in botany, a genus of plants of the monoecia polyandria claſs. The calix of the male is cylindrical,

drical, and has five teeth; the corolla has five petals; and the ſtamina are from 10 to 15. The calix of the female conſiſts of many leaves; it has no corolla; but has three bifid ſtyli; and the capſule has three cells, and contains one ſeed. There are 21 ſpecies, none of them natives of Britain.

CROTOY, a town of France, ſituated in the province of Picardy, at the mouth of the river Somme: E. long. 1° 30′, and N. lat. 50° 15′.

CROUP *of a horſe*, in the menage, the extremity of the reins above the hips.

CROUPADE, in the menage, a leap, in which the horſe pulls up his hind legs, as if he drew them up to his belly.

CROW, or **CARRION-CROW**, in ornithology. See CORVUS.

Royſton **CROW**. See CORVUS.

CROW, in mechanics, a kind of iron lever, with a claw at one end, and a ſharp point at the other; uſed for heaving or purchaſing great weights.

CROW's BILL, among ſurgeons, a kind of forceps, for drawing bullets and other foreign bodies out of wounds.

CROW-FLOWERS, in botany. See LYCHNIS.

CROW's FEET, in the military art, machines of iron, having four points, each about three or four inches long, ſo made, that whatever way they fall, there is ſtill a point up: they are thrown upon breaches, or in paſſes where the enemy's cavalry are to march, proving very troubleſome by running into the horſe's feet and laming them.

CROW's FEET, in a ſhip, ſmall lines or ropes, ſometimes eight or ten, reeved through the deadmens eyes; and ſcarce of any other uſe than to make a ſhew of ſmall rigging. They are uſually placed at the bottom of the back-ſtays of the fore-top-maſt, mizen-top-maſt, and gallant-top-maſt.

CROW's FOOT, in botany. See RANUNCULUS.

CROWLAND, a market-town of Lincolnſhire: W. long. 10′, and N. lat. 52° 40′.

CROWN, an ornament worn on the head by kings, ſovereign princes, and noblemen, as a mark of their dignity.

In ſcripture there is frequent mention of crowns, and the uſe of them ſeems to have been very common among the Hebrews. The high prieſt wore a crown, which was a fillet of gold placed upon the forehead, and tied with a ribbon of hyacinth colour, or azure blue. It ſeems alſo as if private prieſts, and even common Iſraelites, wore alſo a ſort of crown, ſince God commands Ezekiel not to take off his crown, nor aſſume the marks of one in mourning. This crown was no more than a ribbon or fillet, with which the Jews and ſeveral people in the eaſt girt their heads. And indeed the firſt crowns were no more than a bandelet drawn round the head, and tied behind, as we ſtill ſee it repreſented on medals round the heads of Jupiter, the Ptolemies, and kings of Syria. Afterwards they conſiſted of two bandelets: by degrees they took branches of trees of divers kinds; at length they added flowers, inſomuch that Claudius Saturninus ſays, there was not any plant whereof crowns had not been made. The woods and groves were ſearched to find different crowns for the ſeveral deities; and they were uſed not only on the ſtatues and images of the gods, by the prieſts in ſacrificing, and by kings and emperors, but alſo on altars, temples, doors of houſes, ſacred veſſels, victims, ſhips, &c.

The Roman emperors had four kinds of crowns, ſtill ſeen on medals, *viz.* a crown of laurel, a radial or radiating crown, a crown adorned with pearls and precious ſtones, and the fourth a kind of bonnet or cap, ſomething like the mortier.

The Romans had alſo various kinds of crowns, which they diſtributed as rewards of military atchievements; as, 1. The oval crown, made of myrtle, and beſtowed upon generals, who were entitled to the honours of the leſſer triumph, called ovation. 2. The naval or roſtral crown, compoſed of a circle of gold, with ornaments repreſenting beaks of ſhips, and given to the captain who firſt grappled, or the ſoldier who firſt boarded, an enemy's ſhip. 3. The crown called in Latin vallaris, or caſtrenſis, a circle of gold raiſed with jewels or paliſades; the reward of him who firſt forced the enemy's entrenchments. 4. The mural crown, a circle of cold indented and embattled; given to him who firſt mounted the wall of a beſieged place, and there lodged a ſtandard. 5. The civic crown, made of the branch of a green oak, and given him who had ſaved the life of a citizen. 6. The triumphal crown, conſiſting at firſt of wreaths of laurel, but afterwards made of gold; proper to ſuch generals as had the honour of a triumph. 7. The crown called obſidionalis, or graminea, made of graſs growing on the place; the reward of a general who had delivered a Roman army from a ſiege. 8. The crown of laurel, given by the Greeks to their athletæ; and by the Romans to thoſe who had negociated or confirmed a peace with an enemy: this was the leaſt honourable of all. We meet alſo with the corona aurea, often beſtowed on ſoldiers, without any other additional term; the radial crown, given to princes at their tranſlation among the gods; athletic crowns, and crowns of laurel, deſtined to crown victims at the public games, poets, orators, &c. All theſe crowns were marks of nobility to the wearers; and upon competitions with rivals for rank and dignities, often determined the preference in their favour. See Plate LXVI. fig. 8. n°. 1. 2. 3. &c.

The Imperial **CROWN** is a bonnet or tiara, with a ſemicircle of gold, ſupporting a globe with a croſs at top. See Plate LXVI. fig. 9. n°. 1.

The Britiſh **CROWN** is adorned with four croſſes, between which there are four fleurs de lis: it is covered with four diadems, which meet at a little globe ſupporting a croſs. *Ibid.* n°. 2.

The French **CROWN**, is a circle of eight fleurs de lis, encompaſſed with ſix diadems, bearing at top a double fleurs de lis, which is the creſt of France. *Ibid.* n°. 3.

The Spaniſh **CROWN** is adorned with large indented leaves, and covered with diadems terminating in a globe, ſurmounted with a croſs. *Ibid.* n°. 4.

The crowns of almoſt all other kings are adorned with large leaves, bordered with four, ſix, or eight diadems, with a globe and croſs at top.

The Papal Crown is compoſed of a tiara, and a triple crown encompaſſing it, with two pendants like the biſhop's mitres. Theſe crowns repreſent the pretended triple capacity of the pope, as high prieſt, ſupreme judge, and ſole legiſlator of Chriſtians. *Ibid.* n°. 5.

An electoral Crown, or coronet, is a ſcarlet cap turned up with ermine, and cloſed with a ſemicircle of gold, all covered with pearls, with a globe at top, ſurmounted with a golden croſs. *Ibid.* n°. 6.

Crowns *of Britiſh princes of the blood.* 1. The prince of Wales's crown conſiſts alternately of croſſes and fleurs de lis, with one arch, in the middle of which is a ball and croſs, as in the royal diadem. 2. That of all the younger ſons and brothers of the king, conſiſts likewiſe of croſſes and fleurs de lis alternately, but without any arch, or being ſurmounted with a globe and croſs at top. 3 That of the other princes of the blood conſiſts alternately of croſſes and leaves, like thoſe in the coronet of dukes, *&c.* *Ibid.* fig. 10. n°. 1. 2. 3.

Crowns *of noblemen* are, a duke's, compoſed of leaves of ſmallage, or parſley: that of a marquis, of flowers and pearls placed alternately: an earl's has no flowers about the circle, like the duke and marquis, but only points riſing, and a pearl on every one of them: a viſcount has neither flowers nor points raiſed above the circle, like the other ſuperior degrees, but only pearls placed on the circle itſelf without any limited number: a baron's has only ſix pearls on the golden border, not raiſed, to diſtinguiſh him from the earl's; and the number of them limited, to ſhew he is inferior to the viſcount. *Ibid.* fig. 11. n°. 1. 2. *&c.*

Crown, in commerce, a general name for coins both foreign and domeſtic, which are of, or very near, the value of five ſhillings ſterling.

Crown-office, an office belonging to the king's bench court, of which the king's coroner or attorney is commonly maſter. In this office, the attorney general and clerk of the crown ſeverally exhibit informations for crimes and miſdemeanors at common law, as in the caſe of batteries, conſpiracies, libelling, *&c.* on which the offender is liable to pay a fine to the king.

Crown-glass, denotes the fineſt ſort of window-glaſs. See Glass.

Crown-wheel *of a watch*, the upper wheel next the balance, which by its motion drives the balance, and in royal pendulums is called the ſwing-wheel

Crown imperial, in botany. See Fritillaria.

CROYDON, a market-town in Surrey, about ten miles ſouth of London.

CRUCIAL incision, in ſurgery, an inciſion made in form of a croſs.

CRUCIANELLA, in botany, a genus of the tetrandria monogynia claſs. The corolla conſiſts of one turnnelſhaped petal, with a filiform tube; the calix has three leaves; and the ſeeds are two, ſituate between the calix and corolla. The ſpecies are five, none of them natives of Britain.

CRUCIATA, in botany. See Valentia.

CRUCIBLE, a chemical veſſel made of earth, and ſo tempered and backed as to endure the greateſt fire. They are uſed to melt metals, and to flux minerals, ores, *&c.*

The figure of a crucible is commonly that of an obtuſe conoid, with its baſe at the top, and obtuſe apex at the bottom; whence this conical figure may be varied, till it comes to the hollow ſegment of a ſphere.

The crucibles moſt generally uſed are thoſe of Heſſe and Auſtria.

CRUCIFIX, a croſs upon which the body of Chriſt is faſtened in effigy, uſed by the Roman-catholics to excite in their minds a ſtrong idea of our Saviour's paſſion.

They eſteem it an eſſential circumſtance of the religious worſhip performed at the altar; and on Good Friday they perform the ceremony of adoring it, which is done in theſe words, *O crux ave, ſpes unica*; *Hail, thou croſs, our only hope.* The officiating prieſt uncovers the crucifix, elevates it with both his hands, and ſays, *Ecce lignum crucis; Behold the wood of the croſs.* The people anſwer, *in quo ſalus mundi pependit*; *on which the Saviour of the world ſuffered death.* Then the whole congregation bow with great reverence, and devoutly kiſs the holy wood.

CRUCIFIXION, a capital puniſhment by nailing the criminal to a croſs. See Cross.

CRUCIFORM, in general, ſomething diſpoſed croſswiſe; but more eſpecially uſed by botaniſts, for flowers conſiſting of four petals diſpoſed in the form of a croſs.

CRUDE, an epithet given to ſomething that has not paſſed the fire, or had a proper degree of coction.

CRUDITY, among phyſicians, is applied to undigeſted ſubſtances in the ſtomach; to humours in the body which are unconcocted, and not prepared for expulſion; and to the excrements.

CRUISE. in the ſea-language, ſignifies to ſail back and fore within a certain ſpace of the ſea, as well to annoy the enemy, as to protect our own trading veſſels.

CRUMENTATA, among zoologiſts, animals furniſhed with a pouch, or bag, wherein to receive their young in time of danger.

CRUOR, ſometimes ſignifies the blood in general; ſometimes only the venous blood; and ſometimes extravaſated, or coagulated blood.

CRUPPER, in the menage, the buttocks of a horſe, the rump; alſo a thong of leather put under a horſe's tail, and drawn up by thongs to the buckle behind the ſaddle, ſo as to keep him from caſting the ſaddle forwards on his neck.

CRURA clitoridis, in anatomy. See Vol. I. p. 276.

Crura medullæ oblongatæ. See Vol. I. p. 287.

CRURÆUS, or Crureus musculus, in anatomy. See Vol. I. p. 207.

CRURAL, in anatomy, an epithet given to the artery which conveys the blood to the crura, or legs, and to the vein by which this blood returns towards the heart. See ANATOMY, Part III. IV.

CRUS, in anatomy, all that part of the body contained between the buttocks and the toes. See ANATOMY, Part I.

CRUSCA, an Italian term ſignifying bran, is in uſe amongſt us to denote that celebrated academy called *della cruſca*, eſtabliſhed at Florence, for purifying and perfecting the Tuſcan language.

CRUSTA VILLOSA, in anatomy. See Vol. I. p. 258.

CRUSTA LACTEA, in medicine, the ſame with achor, being ſcabby eruptions with which the heads of children are often troubled. See MEDICINE.

CRUSTACEOUS, an appellation given to animals covered with ſhells made up of ſeveral pieces, in contradiſtinction to thoſe conſiſting of a ſingle piece.

CRUX, or ST CROIX, one of the Caribbee-iſlands, ſituated about ſixty miles ſouth-eaſt of Porto-Rico, and ſubject to France: W. long. 64°, and N. lat. 17° 30'.

CRUSADO, in commerce, a Portugueſe coin, ſtruck under Alphonſus V. about the year 1457, at the time when pope Calixtus ſent thither the bull for a croiſade againſt the infidels.

This coin has a croſs on one ſide, and the arms of Portugal on the other.

CRYMODES, among phyſicians, a kind of fever attended with a ſhivering cold and inflammation of the internal parts of the body.

CRYPTOGAMIA, in botany. See the *Scheme*, p. 635. and Plate LIII. fig. 24. alſo p. 636.

CRYPTOGRAPHY, the art of writing in cipher, or with ſympathetic ink. See CIPHER and INK.

CRYSTAL, the name of a very large claſs of foſſils; hard, pellucid, and naturally colourleſs; of regularly angular figures, compoſed of ſimple, not filamentous plates; not flexible nor elaſtic, giving fire with ſteel; not fermenting in acid menſtrua, and calcining in a ſtrong fire.

The orders of pure cryſtal are three; the firſt is perfect columnar cryſtals, with double pyramids, compoſed of eighteen planes, in an hexangular column, terminated by an hexangular pyramid at each end: the ſecond order is that of perfect cryſtals, with double pyramids, without a column, compoſed either of twelve or of ſixteen planes, in two hexangular pyramids, joined cloſely, baſe to baſe, without the intervention of any column: the third order is that of imperfect cryſtals, with ſingle pyramids, compoſed either of twelve or ten planes, in an hexangular or pentangular column, affixed irregularly, at one end, to ſome ſolid body, and terminated, at the other, by an hexangular or pentangular pyramid.

Theſe are all the general forms into which cryſtal, when pure, is found concreted: but under theſe there are almoſt infinite varieties in the number of angles, and the length, thickneſs, and other accidents of the columns and pyramids.

When cryſtal is blended with metalline particles at the time of its formation, it aſſumes a variety of figures wholly different from theſe, conſtituting a fourth order, under the name of metalline cryſtals: when that metal is lead, the cryſtal aſſumes the form of a cube; when it is tin, of a quadrilateral pyramid, with a broad baſe; when iron, the cryſtal is found concreted in rhomboidal cryſtals: theſe cryſtals are very common about mines; but the common ſpars, which are liable to be influenced in the ſame manner by the metals, and to appear in the very ſame form, are to be carefully diſtinguiſhed from them. There is one very eaſy teſt for this purpoſe, which is, that all ſpars are ſubject to be diſſolved by aqua fortis, and efferveſce violently only on its touching it: but it has no ſuch effects on cryſtal.

The pebble cryſtal is common enough in all parts of the world; but that which is formed of hexangular columns, affixed to a ſolid baſe at one end, and terminated by a hexangular column at the other, is infinitely more ſo: this is what we call ſprig or rock cryſtal, and is the ſpecies deſcribed by moſt authors under the name of cryſtal of the ſhops, or that kept for medicinal uſe.

It is to be choſen the cleareſt, pureſt, and moſt tranſparent that can be had: it ſhould be proved to be no ſpar, by means of aquafortis, or by drawing a point of it along a pane of glaſs, which it cuts in the manner of a diamond. It is found in vaſt abundance in many parts of England and Ireland; and in Germany it is yet more frequent. It is found about Briſtol of amethyſtine tinge; in Sileſia and Bohemia it is ſtained to the colour of the ruby, ſapphire, emerald, and topaz, in which caſe jewellers make great advantage of it, ſelling it under the name of accidental ſapphire, *&c.*

CRYSTAL is alſo uſed for a factitious body, caſt in glaſs-houſes, called cryſtal glaſs; being, in fact, no more than glaſs carried, in the compoſition and manufacture, to a greater perfection than the common glaſs.

The beſt kind of glaſs-cryſtal is that called Venice cryſtal, made at Moran, near Venice. See GLASS.

CRYSTALS, in chemiſtry, ſalts or other matters ſhot, or congealed, in the manner of cryſtal. See CHEMISTRY.

CRYSTALLINE HUMOUR, in anatomy. See Vol. I. p. 289.

CRYSTALLIZATION, in chemiſtry. See CHEMISTRY.

CRYSTALLOMANCY, in antiquity, a kind of divination, performed by means of a mirror, wherein the figures of the things required are ſaid to have been repreſented.

CUB, a bear's whelp. Among hunters, a fox and martern of the firſt year, are called cubs. See URSUS.

CUBA, an iſland of North America, ſituated in the Atlantic ocean, between 74° and 87° of W. long. and between 20° and 23° N. lat. being eight hundred miles and upwards in length from eaſt to weſt, and generally about ſeventy miles broad. It lies about fifty miles weſt of Hiſpaniola, and ſeventy-five north of Jamaica.

CUBAGUA, an American iſland, ſituated between the iſland of Margaretta and Terra Firma, and ſubject to Spain: W. long. 64°, and N. lat. 10° 15'.

CUBE, in geometry, a ſolid body, conſiſting of ſix equal ſquare ſides. See Geometry.

CUBEBS, in the materia medica, a ſmall dried fruit, reſembling a grain of pepper, but often ſomewhat longer, brought into Europe from the iſland of Java. In aromatic warmth and pungency, they are far inferior to pepper.

CUBIC, or Cubical equation, in algebra. See Algebra.

CUBIT, in the menſuration of the ancients, a long meaſure, equal to the length of a man's arm, from the elbow to the tip of the fingers.

Dr Arbuthnot makes the Engliſh cubit equal to 18 inches; the Roman cubit equal to 1 foot 5, 406 inches; and the cubit of the ſcripture equal to 1 foot, 9, 888 inches.

CUCKOW, in ornithology. See Cuculus.

Cuckow-spit, the ſame with froth-ſpit. See Froth-spit.

Cuckow-spit-insect. See Cicada.

CUCUBALUS, in botany, a genus of the decandria trigynia claſs. The calix is inflated; the corolla has five petals with ungues; and the capſule has three cells. There are 13 ſpecies, five of which are natives of Britain, *viz.* the bacciferus, or berry-bearing chickweed; the beken, or white corn campion; the viſcoſus, or Dover campion; the olites, or Spaniſh catchfly; and the acaulis, or moſs campion.

CUCULUS, the Cuckow, in ornithology, a genus belonging to the order of picæ. The bill is ſomewhat cylindrical; the edges of the noſtrils are a little prominent; the tongue is arrow-ſhaped, plain, and not divided, and the toes are of the climbing kind, *i. e.* two before and two behind. It is about the ſize of a pigeon. The cuckow is a migrating bird; it comes to Britain about the end of April, hatches its young, and diſappears about St John's day. The cuckow neither builds a neſt, nor ſits upon its eggs; but takes poſſeſſion of a neſt built by ſmall birds of the ſparrow kind, in which it generally lays but one egg, which is hatched by the ſmall bird along with its own eggs; during the time of hatching, the cuckow ſits upon hedges or trees, and almoſt conſtantly ſings. If the cuckow's egg be firſt hatched, ſhe immediately throws out and deſtroys the eggs of the ſmall bird; but if the ſmall bird's eggs be firſt hatched, the cuckow allows the young to live till its own egg is hatched, and then deſtroys the young belonging to the ſmall bird. The ſmall bird feeds and brings up the young cuckow with as much care and attention as if it were its own, till it be able to procure its own food, when, ſome ſay, it ungratefully kills and eats its nurſe. The cuckow feeds upon caterpillars and ſmall birds; but is never tranſformed into a hawk, as is vulgarly ſuppoſed. It is a native of Europe. Linnæus enumerates no leſs than 22 ſpecies, which inhabit different parts of the globe, and are chiefly diſtinguiſhed by the ſhape of the tail and variations in colour.

CUCUMBER, in botany. See Cucumis.

CUCUMIS, or Cucumber, in botany, a genus of the monoecia ſyngeneſia claſs. The calix of the male has five teeth; the corolla is divided into five ſegments; and the filaments are three: The calix and corolla of the female are the ſame with thoſe of the male; the piſtillum is trifid; and the ſeeds of the apple are ſhort and ſlender. There are 11 ſpecies, none of them natives of Britain.

CUCURBIT, in chemiſtry. See Chemistry, Vol. II. p. 109.

CUCURBITA, the gourd, in botany, a genus of the monoecia ſyngeneſia claſs. The calix has five teeth; the corolla is divided into five ſegments; and the filaments are three: The calix and corolla of the female are the ſame with thoſe of the male; the piſtillum is quinqueſid; and the ſeeds of the apple are turned at the edges. The ſpecies are five, none of them natives of Britain.

CUD ſometimes means the inſide of the throat in beaſts, and ſometimes the food that they keep there and chew over again: from whence, *to chew the cud*, ſignifies, to ponder, think, or ruminate upon a thing.

CUDWEED, in botany. See Gnaphalium.

CUENCA, a city and biſhop's ſee of New Caſtile, in Spain, about eighty-five miles eaſt of Madrid: W. long. 2° 40′, and N. lat. 40° 12′.

CUIRASSE, a piece of defenſive armour, made of iron plate, well hammered, ſerving to cover the body, from the neck to the girdle, both before and behind. Whence,

CUIRASSIERS, cavalry armed with cuiraſſes, as moſt of the Germans are: the French have a regiment of cuiraſſiers; but we have had none in the Britiſh army ſince the revolution.

CULDEES, in church-hiſtory, a ſort of monkiſh prieſts, formerly inhabiting Scotland and Ireland. Being remarkable for the religious exerciſes of preaching and praying, they were called, by way of eminence, *cultores Dei*; from whence is derived the word culdees. They made choice of one of their own fraternity to be their ſpiritual head, who was afterwards called the Scots biſhop.

CULEUS, in Roman antiquity, the largeſt meaſure of capacity for things liquid, containing twenty amphoræ, or forty urnæ. It contained one hundred forty-three gallons, three pints, Engliſh wine-meaſure; and was 11.095 ſolid inches.

CULEX, in zoology, a genus of inſects belonging to the order of diptera: The mouth is armed with ſetaceous prickles incloſed in a flexile ſheath. There are ſeven ſpecies, principally diſtinguiſhed by their colour.

CULIACAN, the capital of a province of the ſame name in Mexico, oppoſite to the ſouthern end of California: W. long. 113°, and N. lat. 24°.

CULLIAGE, a barbarous and immoral practice, whereby the lords of manors anciently aſſumed a right to the firſt night of their vaſſals brides.

CULLEN, a parliament town in Scotland, ſituated on the ſea-coaſt of Banffſhire: W. long. 2° 12′, and N. lat. 57° 38′.

CULM, or Culmus, among botaniſts. See Vol. I. p. 641.

CULMINATION, in aſtronomy, the paſſage of any heavenly body over the meridian, or its greateſt altitude for that day.

CULMORE, a town of Ireland, in the county of Londonderry, and province of Ulſter, about five miles north of Londonderry: W. long. 7° 40′, and N. lat 55°.

CULMUS. See Culm.

CULPRIT, a formal reply of a proper officer in court, in behalf of the king, after a criminal has pleaded not guilty, affirming him to be guilty, without which the iſſue to be tried is not joined.

The term culprit is a contraction of the Latin *culpabilis*, and the French *priſt*; importing that he is ready to prove the criminal guilty.

CULROSS, a parliament town of Scotland, ſituated on the river Forth, about twenty-three miles north-weſt of Edinburgh: W. long. 3° 34′, and N. lat. 56° 8′.

CULVERIN, in the military art, a large cannon, or piece of artillery; for the kinds, weight, and proportions of which, ſee Cannon.

CULVERTAILED, among ſhip-wrights, ſignifies the faſtening, or letting, of one timber into another, ſo that they cannot ſlip out, as the carlings into the beams of a ſhip.

CUMBERLAND, one of the moſt northerly counties of England, ſeparated from Scotland by the frith and river of Solway. It gives the title of duke to his royal highneſs William duke of Cumberland, *&c.*

CUMINOIDES, in botany. See Lagoecia.

CUMINUM, in botany, a genus of the pentandria digynia claſs. The fruit is oval and ſtriated; it has four umbellulæ, and the involucrum conſiſts of four ſegments. There is but one ſpecies, a native of Egypt. The ſeeds are carminative and ſtomachic.

CUNEIFORM, in general, an appellation given to whatever reſembles a wedge.

Cuneiform bone, in anatomy. See Vol. I. p. 180.

CUNEUS, the wedge, in mechanics. See Mechanics.

CUNICULUS, in zoology. See Lepus.

CUNILA, in botany, a genus of the diandria monogynia claſs; of which there are three ſpecies, none of them natives of Britain.

CUNNINGHAM, one of the four bailiwicks of Scotland, and one of the three into which the ſhire of Aire is ſubdivided. It lies north-eaſt of Kyle. Its chief town is Irwin.

CUP, among botaniſts, the ſame with calyx. See Calyx.

CUPANIA, in botany, a genus of the pentandria monogynia claſs. The calix conſiſts of three leaves; the ſtylus is trifid; the capſule has three valves; and the ſeeds are ſix. There is but one ſpecies, a native of America.

CUPOLA, in architecture, a ſpherical vault; or the round top of the dome of a church, in form of a cup inverted.

CUPPEL, or Coppel, in chemiſtry. See Coppel.

CUPPING, in ſurgery, the operation of applying cupping-glaſſes for the diſcharge of blood, and other humours, by the ſkin. See Surgery.

CUPRESSUS, the Cypress-tree, a genus of the monoecia monodelphia claſs. The calix of the male is a ſcale of the amentum; it has no corolla; and the antheræ have no filaments: The calix of the female is a ſtrobilus, and the ſquama contains a ſingle flower; it has no corolla; the ſtylus is a concave point; and the nut is angular. The ſpecies are four, none of them natives of Britain.

CUPRUM, or Copper. See Chemistry, Vol. II. p. 80.

CURASSOW, or Curacao, one of the leſſer Antille-iſlands, ſubject to the Dutch, and ſituated in 68° 30′ W. long. and 12° 30′ N. lat.

CURATE, properly ſignifies the parſon or vicar of a pariſh, who has the charge or cure of the pariſhoners ſouls. See Cure.

Curate, alſo ſignifies a perſon ſubſtituted by the incumbent, to ſerve his cure in his ſtead.

CURATOR, among civilians, a perſon regularly appointed to manage the affairs of minors, or perſons mad, deaf, dumb, *&c.* See Law.

CURB, in the menage, a chain of iron, made faſt to the upper part of the branches of the bridle, in a hole called the eye, and running over the horſe's beard. It conſiſts of theſe three parts; the hook, fixed to the eye of the branch; the chain of SS's, or links; and the two rings, or mailes. Large curbs, provided they be round, are always moſt gentle: but care is to be taken, that it reſt in its proper place, a little above the beard, otherwiſe the bit-mouth will no have the effect that may be expected from it.

Engliſh watering bits have no curbs; the Turkiſh bits, called genettes, have a ring that ſerves inſtead of a curb. See Genettes.

CURCULIO, in zoology, a genus of inſects belonging to the order of coleoptera. The feelers are ſubclavated, and reſt upon the ſnout, which is prominent and horny. There are no leſs than ninety-five ſpecies, principally diſtinguiſhed by their colour.

CURCUMA, or Turmeric, in botany, a genus of the monandria monogynia claſs. It has four barren ſtamina, and only the fifth is fertile. There are two ſpecies, both natives of India. See Vol. I. p. 633.

CURDISTAN, a province of Perſia, having Turcomania, or Armenia, on the north, and Eyraca-Arabic, or Chaldea, on the ſouth.

CURDLING, the coagulating any fluid body, eſpecially milk.

It is ſaid, that at Florence they curdle their milk for the making of cheeſe with artichoke-flowers, inſtead of the rennet uſed among us for that purpoſe.

CURFEW, or Courfew, a ſignal given in cities taken in war, *&c.* to the inhabitants to go to bed. Paſquin ſays, it was ſo called, as being intended to advertiſe the people to ſecure themſelves from the robberies and debaucheries of the night.

The moſt eminent curfew in England was that eſtabliſhed by William the Conqueror, who appointed, under ſevere penalties, that, at the ringing of a bell at eight o'clock in the evening, every one ſhould put out their lights and fires, and go to bed: whence, to this day, a bell rung about that time is called a curfew-bell.

CURIA, in Roman antiquity, a certain diviſion, or portion of a tribe. Romulus divided the people into thirty curiæ, or wards, whereof there were ten in every tribe, that each might keep the ceremonies of their feaſts and ſacrifices in the temple, or holy place, appointed for every curia. The prieſt of the curia was called curio.

Curia, in the Engliſh law, generally ſignifies a court; and has been taken for the cuſtomary tenants, who do their ſuit and ſervice at the court of the lord. See Court.

CURING, a term uſed for the preſerving fiſh, fleſh, and other animal ſubſtances, by means of certain additions of things, to prevent putrefaction. One great method of doing this, is by ſmoking the bodies with the ſmoke of wood, or rubbing them with ſalt, nitre, *&c.*

CURLEW, in ornithology. See Scolopax.

CURNOCK, a meaſure of corn, containing four buſhels, or half a quarter.

CURRANS, or Currants, the fruit of a ſpecies of groſſularia. See Grossularia.

The white and red ſort are moſtly uſed; for the black, and chiefly the leaves, upon firſt coming out, are in uſe to flavour Engliſh ſpirits, and counterfeit French brandy. Currants greatly aſſuage drought, cool and fortify the ſtomach, and help digeſtion.

Currants alſo ſignify a ſmaller kind of grapes brought principally from Zant and Cephalonia. They are gathered off the buſhes, and laid to dry in the ſun, and ſo put up in large butts. They are opening and pectoral, but are more uſed in the kitchen, than in medicine.

Currants, the hundred weight pay on exportation 1 l. 2s. $1\frac{35}{100}$d. and draw back on exportation 1 l. 0s. $7\frac{35}{100}$d. If imported in Venetian ſhips, they pay the 112 lb. 1 l. 3s. $7\frac{35}{100}$d and draw back 1 l. 1 s. $8\frac{85}{100}$d. In other foreign bottoms they pay 1 l. 7s. $4\frac{95}{100}$d. and draw back 1 l. 5 s. $6\frac{45}{100}$d.

CURRENT, in hydrography, a ſtream or flux of water in any direction. In the ſea, they are either natural, occaſioned by the diurnal motion of the earth round its axis, or accidental, cauſed by the waters being driven againſt promontories, or into gulfs and ſtreights, where, wanting room to ſpread, they are driven back, and thus diſturb the ordinary flux of the ſea. Dr Halley makes it highly probable that in the Downs, there are under-currents, by which as much water is carried out as is brought in by the upper-currents.

Currents, in navigation, are certain ſettings of the ſtream, by which ſhips are compelled to alter their courſe or velocity, or both, and ſubmit to the motion impreſſed upon them by the current. See Navigation.

CURRIERS, thoſe who dreſs and colour leather after it comes from the tan yard. See Tanning.

CURRUCU, in ornithology. See Motacilla.

CURRYING, the method of preparing leather with oil, tallow, *&c.* See Tanning.

CURTATE *diſtance*, in aſtronomy, the diſtance of a planet from the ſun to that point where a perpendicular let fall from the planet meets with the ecliptic.

CURTATION, in aſtronomy, is the interval between a planet's diſtance from the ſun, and the curtate diſtance.

CURTIN, Curtain, or Courtin, in fortification, is that part of the rampart of a place which is betwixt the flanks of two baſtions, bordered with a parapet five feet high, behind which the ſoldiers ſtand to fire upon the covered way and into the moat.

CURVATOR *coccygis*, in anatomy. See Vol. I. p. 220.

CURVATURE *of a line*, is the peculiar manner of its bending or flexure by which it becomes a curve of ſuch and ſuch peculiar properties.

CURVE, in geometry, a line which running on continually in all directions, may be cut by one right line in more points than one. See Conic Sections, and Fluctions.

CURVET, or Corvet, in the menage, an air in which the horſe's legs are raiſed higher than in the demi-volt; being a kind of leap up, and a little forwards, wherein the horſe raiſes both his fore-legs at once, equally advanced, (when he is going ſtraight forward, and not in a circle), and as his fore-legs are falling, he immediately raiſes his hind-legs, equally advanced, and not one before the other: ſo that all his four legs are in the air at once; and as he ſets them down, he marks but twice with them.

CURVILINEAR, or Curvilineal, is ſaid of figures bounded by curves, or crooked lines.

CURVIROSTRA, in ornithology. See Loxia.

CURULE *chair*, in Roman antiquity, a chair adorned with ivory, wherein the great magiſtrates of Rome had a right to ſit and be carried.

The curule magiſtrates were the ædiles, the prætors, cenſors, and conſuls. This chair was fitted in a kind of chariot, whence it had its name. The ſenators who had borne the offices of ædiles, prætors, *&c.* were carried to the ſenate-houſe in this chair, as were alſo thoſe who triumphed, and ſuch as went to adminiſter juſtice, *&c.* See Ædile, *&c.*

CURZOLA, an iſland in the gulf of Venice, upon the coaſt of Dalmatia, about twelve miles from the iſland of Leſſina.

CUSCO, the capital city of Peru, during the reigns of the Incas: it is ſtill a fine city, and the ſee of a biſhop, and ſtands about 350 miles eaſt of Lima, in 70° W. long. and 13° S. lat.

CUSCUTA, or Dodder, a genus of the tetrandria digynia claſs. The calix conſiſts of four ſegments; the corolla has but one petal; and the capſule is bilocular. The are two ſpecies, one of which is a native of Britain, *viz.* the Europæa, dodder, hell-weed, or devil's-guts.

CUSPIDATED, in botany, are ſuch plants whoſe leaves are pointed like a ſpear.

CUSTOM, a very comprehenſive term, denoting the manners, ceremonies and faſhions of a people, which having turned into a habit, and paſſed into uſe, obtains the force of laws; in which ſenſe it implies ſuch uſages, as, though voluntary at firſt, are yet, by practice, become neceſſary.

Cuſtom is hence, both by lawyers and civilians, defined *lex non ſcripta*, a law, or right, not written, eſtabliſhed by long uſage, and the conſent of our anceſtors: in which ſenſe it ſtands oppoſed to the *lex ſcripta*, or the written law.

Customs, in commerce, the tribute or toll, paid by merchants to the king, for goods exported or imported: they are otherwiſe called duties. See Duty.

Custom house, an office eſtabliſhed by the king's authority in the maritime cities, or port-towns, for the receipt and management of the cuſtoms and duties of importation and exportation, impoſed on merchandiſes, and regulated by books of rates.

CUSTOS *brevium*, the principal clerk belonging to the court of common pleas, whoſe buſineſs it is to receive and keep all the writs made returnable in that court, filing every return by itſelf; and, at the end of each term, to receive of the prothonotaries all the records of the niſi prius, called the poſteas.

Custos *rotulorum*, an officer who has the cnſtody of the rolls and records of the ſeſſions of peace, and alſo of the commiſſion of the peace itſelf.

He uſually is ſome perſon of quality, and always a juſtice of the peace, of the quorum, in the county where he is appointed.

Custos *ſpiritualium*, he that exerciſes the ſpiritual juriſdiction of a dioceſe, during the vacancy of any ſee, which, by the canon law, belongs to the dean and chapter; but at preſent, in England, to the archbiſhop of the province, by preſcription.

Custos *temporalium* was the perſon to whom a vacant ſee or abbey was given by the king, as ſupreme lord. His office was, as ſteward of the goods and profits, to give an account to the eſcheator, who did the like to the exchequer.

CUTAMBULI, certain worms, either under the ſkin, or upon it, which, by their creeping, cauſe an uneaſy ſenſation. It is alſo applied to wandering ſcorbutic pains.

CUT-A-FEATHER, in the ſea-language. If a ſhip has too broad a bow, it is common to ſay, *ſhe will not cut a feather*; that is, ſhe will not paſs through the water ſo ſwift, as to make it foam or froth.

CUTANEOUS, in general, an appellation given to whatever belongs to the cutis or ſkin.

CUTICLE, in anatomy. See Vol. I. p. 285.

CUTICULAR, the ſame with cutaneous.

CUTIS, the Skin, in anatomy. See Vol. I. p. 254.

CUTTER *of the tallies*, an officer of the exchequer, whoſe buſineſs is to provide wood for the tallies, to cut or notch the ſum paid upon them; and then to caſt them into court, to be written upon. See Tally.

CUTTLE-FISH. See Sepia.

CUZT, the moſt eaſtern province of the kingdom of Fez, in Africa.

CYANUS, in botany. See Centauria.

CYATHUS, in Roman antiquity, a liquid meaſure, containing four ligulas, or half a pint Engliſh wine-meaſure, being $469\frac{2}{3}$ ſolid inches.

CYCLAMEN, or Sow-bread, in botany, a genus of the pentandria monogynia claſs. The corolla is rotated and reflected; the tube is very ſhort, with a prominent faux; and the berry is covered with a capſule. There are two ſpecies, none of them natives of Britain. The root is a powerful aperient and abſtergent.

CYCLE. See Vol. I. p. 491.

Cycle *of the moon*. See Vol. I. p. 491.

Cycle *of the Roman indiction*. See Vol. I. p. 491.

CYCLISCUS, in ſurgery, an inſtrument in the form of a half moon, uſed in ſcraping the ſkull, in caſe of fractures of that part.

CYCLOID, a curve on which the doctrine of pendulums and time-meaſuring inſtruments in a great meaſure depend; Mr Huygens demonſtrated, that from whatever point or height a heavy body, oſcillating on a fixed centre, begins to deſcend, while it continues to move in a cycloid, the time of its falls or oſcillations will be equal to each other. It is likewiſe demonſtrable, that it is the curve of quickeſt deſcent, *i. e.* a body falling in it, from any given point above, to another not exactly under it, will come to this point in a leſs time than in any other curve paſſing through thoſe two points.

CYCLOMETRY, a term ſometimes uſed for the menſuration of circles.

CYCLOPÆDIA, or Encyclopædia, denotes the circle or compaſs of arts and ſciences. A cyclopædia, ſay the authors of the French Encyclopædia, ought to explain, as much as poſſible, the order and connection of human knowledge. See Dictionary.

CYCLOPTERUS, the Lump-fish, in ichthyology, a genus belonging to the order of amphibia nantes. The head is obtuſe, and furniſhed with ſaw-teeth; there are four rays in the gills; and the belly-fins are connected together in an orbicular form. There are three ſpecies.

CYDER, an excellent drink made of the juice of apples. It conduces greatly to the goodneſs of the cyder, to let the apples lie a week or two in heaps, before they are preſſed. After ſtraining the liquor through a ſieve, let it ſtand a day or two in an open tun, covered only with a cloth, or boards, to keep out the duſt, that the more groſs parts may ſubſide. Then draw it off in pails into veſſels, wherein it is intended to be kept, obſerving to leave an eighth part of them empty. Set theſe veſſels in your coldeſt cellars, with the bung open, or covered only with a looſe cover, both that the volatile ſteams may have free vent, and that the muſt may be kept cool, otherwiſe it is apt to ferment too much. Having fermentad in this manner for fifteen or twenty days, the veſſel may be ſtopped up cloſe; and, in two or three months time, the cyder will be fit for drinking. But if you expect cyder in perfection, ſo as to flower in the glaſs, it muſt be glued as they call it, and drawn off into bottles, after it has been a ſhort time in the caſk: this is done by pouring into each veſſel a pint of the infuſion of ſixty or ſeventy grains of the moſt tranſparent iſing-glaſs, or fiſh-glue, in a little white-wine and river or rain water, ſtirred well together, after being ſtrained through a linen cloth. When this viſcous ſubſtance is put into the caſk, it ſpreads itſelf over the ſurface like a net, and carries all the dregs to the bottom with it.

Ginger added to cyder, not only corrects its windineſs, but makes it more briſk; and a few drops of currant-juice, beſides tinging, adds a pleaſant quickneſs to it. Honey, or ſugar, mixed with ſome ſpices, and added to flat cyder, will very much revive it.

Some commend boiling of cyder-juice, which ſhould be done as ſoon as it is preſſed, ſcumming it continually, and obſerving to let it boil no longer than till it acquires the colour of ſmall beer: when cold, put it into a caſk, leaving a ſmall vent; and when it begins to bubble up out of the vent, bottle it for uſe.

CYDONIA, in botany. See CRATEVA.

CYGNUS, in ornithology. See ANAS.

CYGNUS, in aſtronomy. See Vol. I. p. 486.

CYLINDER, in geometry, a ſolid body, ſuppoſed to be generated by the rotation of a parallelogram.

Rolling, or *loaded* CYLINDER. See MECHANICS.

CYLINDROID, in geometry, a ſolid body, approaching to the figure of a cylinder, but differing from it in ſome reſpect, as having the baſes elliptical, but parallel and equal.

CYLINDRUS, in natural hiſtory. See VOLUTA.

CYMA, in botany, the tender ſtalks which herbs ſend forth in the beginning of the ſpring, particularly thoſe of the cabbage-kind.

CYMATIUM, in architecture, a member or moulding, of the corniche, the profile of which is waved, that is, concave at top, and convex at bottom. See ARCHITECTURE.

CYMBAL, a muſical inſtrument in uſe among the ancients. The cymbal was round, made of braſs, like our kettle-drums, and, as ſome think, in their form, but ſmaller, and of different uſe.

CYMBALARIA, in botany. See ANTIRRHINUM.

CYMBARIA, in botany, a genus of the didynamia angioſpermia claſs of plants The calix is divided into many parts; and the capſule is unilocular. There is but one ſpecies.

CYNÆDUS, in ichthyology. See SPARUS.

CYNANCHE, among phyſicians, denotes an inflammation of the larynx.

CYNANCHUM, in botany, a genus of the pentandria digynia claſs. The nectarium is cylindrical, and has five teeth. There are five ſpecies, none of them natives of Britain.

CYNANTHROPIA, in medicine, the diſtemper occaſioned by the bite of a mad dog. See MEDICINE.

CYNAPIUM, in botany. See ETHUSA.

CYNARA, the ARTICHOAK, in botany, a genus of the ſyngeneſia polygamia æqualis claſs. The calix is dilated and imbricated, with fleſhy ſcales ſharp at the points. There are four ſpecies, none of them natives of Britain. The uſe of the artichoke as a food is well known.

CYNICS, a ſect of ancient philoſophers, who valued themſelves upon their contempt of riches and ſtate, arts and ſciences, and every thing, in ſhort, except virtue or morality.

The cynic philoſophers owe their origin and inſtitution to Antiſthenes of Athens, a diſciple of Socrates, who, being aſked of what uſe his philoſophy had been to him, replied, "It enables me to live with myſelf." Diogenes was the moſt famous of his diſciples, in whoſe life the ſyſtem of this philoſophy appears in its greateſt perfection: he led a moſt wretched life, a tub having ſerved him for a lodging, which he rolled before him where-ever he went; yet he was, nevertheleſs, not the more humble on account of his ragged cloak, bag, and tub; for, one day, entering Plato's houſe, at a time that there was a ſplendid entertainment there for ſeveral perſons of diſtinction, he jumped up upon a very rich couch, in all his dirt, ſaying, "I trample on the pride of Plato." "Yes (replied Plato,) but with great pride, Diogenes." He had the utmoſt contempt for all the human race, for he walked the ſtreets of Athens, at noon-day, with a lighted lantern in his hand, telling the people, "He was in ſearch of a man." Amongſt many excellent maxims of morality, he held ſome very pernicious opinions; for he uſed to ſay, that the uninterrupted good fortune of Harpalus, who generally paſſed for a thief and a robber, was a teſtimony againſt the gods. He regarded chaſtity and modeſty as weakneſſes; hence Laertius obſerves of him, that he did every thing openly, whether it belonged to Ceres or Venus, though he adds that Diogenes only ran to an exceſs of impudence to put others out of conceit with it: but impudence was the characteriſtic of theſe philoſophers, who argued, that what was right to be done, might be done at all times, and in all places. The chief principle of this ſect, in common with the ſtoics, was, that we ſhould follow nature; but they differed from the ſtoics in their explanation of that maxim, the cynics being of opinion that a man followed nature, that gratified his natural motions and appetites; while the ſtoics underſtood right reaſon, by the word nature.

CYNIC SPASM, a kind of convulſion, wherein the patient imitates the howlings of dogs.

CYNIPS, in zoology, a genus of inſects belonging to the order of hymenoptera. The mouth conſiſts of two jaws, without any proboſcis; and the ſting in the tail is ſpiral, and generally hid. There are nineteen ſpecies, diſtinguiſhed by their colour, and the plants they inhabit.

CYNOCEPHALUS, in zoology, the trivial name of a ſpecies of ſimia. See SIMIA.

CYNOGLOSSUM, in botany, a genus of the pentandria monogynia claſs. The corolla is tunnel-ſhaped; the ſeeds are depreſſed, and the ſtylus is fixed to the interior ſide of them. There are eight ſpecies, only one of which is a native of Britain, *viz.* the officinale, or hound's-tongue; the root is ſaid to be pectoral and narcotic.

CYNOMETRA, in botany, a genus of the decandria monogynia claſs. The calix conſiſts of four ſegments, the oppoſite ones being broader; and the legumen is fleſhy, lunated, and contains but one ſeed. There are two ſpecies, both natives of India.

CYNOMORIUM, in botany, a genus of the monoecia monandria claſs. The calix of the female is an imbricated amentum, and neither male nor female has a corolla; the female has one ſtylus, and one round ſeed. There is but one ſpecies, a native of Jamaica.

CYNOSURUS, in botany, a genus of the triandria dyginia claſs. The calix is a double valve, and includes many flowers. There are ten ſpecies, four of which are natives of Britain, *viz.* the criſtatus, or creſted dog-tail graſs; the echinatus, or rough dog-tail graſs; the cæruleus, or blue dog-tail graſs; and the paniceus, or bearded dog-tail graſs.

CYPERUS, in botany, a genus of the triandria monogynia claſs. The gluma is paleaceous and imbricated; it has no corolla, and but one naked ſeed. There are twenty ſpecies, only one of which is a native of Britain, *viz.* the longus, ſweet cyperus, or Engliſh galingale; the root is carminative and attenuant.

CYPHOMA, CYPHOS, or CYPHOSIS, an incurvation of the ſpine, forming a crookedneſs in the back.

CYPRÆA, in zoology, a genus of inſects belonging to the order of vermes teſtacea. It is an animal of the limax or ſnail-kind; the ſhell is one involated, ſubovated, obtuſe, ſmooth valve. The aperture on each ſide is linear, longitudinal, and teethed. There are forty-four ſpecies, diſtinguiſhed by the form of their ſhells.

CYPRESS. See CUPRESSUS.

CYPRINUS, in ichthyology, a genus of fiſhes belonging to the order of abdominales. The mouth is toothleſs; there are three rays in the gills; the body is ſmooth, and white; and the belly-fins have frequently nine rays. There are thirty-one ſpecies, principally diſtinguiſhed by the number of rays in the vent-fin.

CYPRIPEDIUM, in botany, a genus of the gynandria diandria claſs. The nectarium is ventricoſe, inflated, and hollow. There are two ſpecies, one of them, *viz.* the calceolus, or ladies-ſlipper, a native of Britain.

CYPRUS, an iſland ſituated in the moſt eaſterly part of the Levant, or Mediterranean ſea, between 33° and 36° E. long. and between 34° and 30° N. lat.

Knights of CYPRUS, an order inſtituted by Guy de Luſignan, titular king of Jeruſalem, to whom Richard I. of England, after conquering this iſland, made over his right.

CYRENAICS, a ſect of ancient philoſophers, ſo called from their founder, Ariſtippus of Cyrene, a diſciple of Socrates.

The great principle of their doctrine was, that the ſupreme good of man in this life is pleaſure; whereby they not only meant a privation of pain, and a tranquillity of mind, but an aſſemblage of all mental and ſenſual pleaſures, particularly the laſt.

CYST, the bag, or tunic, including all incyſted tumors, as the ſcirrhus, atheroma, ſteotoma, meliceres, *&c.*

CYSTIC, a name given to two arteries and two veins. See Vol. I. p. 245.

CYSTIC DUCT. See Vol. I. p. 265.

CYTISUS, in botany, a genus of the diadelphia decandria claſs. The calix is bilabiated; and the legumen is attenuated at the baſe. There are eleven ſpecies, none of them natives of Britain.

CZACKATHURN, a town of Germany, in the dutchy of Stiria, and circle of Auſtria, ſituated near the conflux of the rivers Muer and Save, about fifty miles ſouth-eaſt of Gratz: E. long. 17°, and N. lat. 46° 50′.

CZAR, a title of honour aſſumed by the great dukes, or, as they are now ſtyled, emperors of Ruſſia.

Beckman makes no doubt but they took this title, by corruption, from Cæſar, emperor; and accordingly they bear an eagle, as the ſymbol of their empire, and the word CÆSAR in their arms.

CZASLAW, a town of Bohemia, about thirty-five miles ſouth-eaſt of Prague: E. long. 15° 8′, and N. lat. 49° 50′.

CZERNIGOF, the capital of the province of Czernigof, in Ruſſia, near the frontiers of Poland: E. long. 31°, 30′, and N. lat. 52° 30′.

CZONGRODT, a town of Hungary, ſituated on the river Thieſſe, about thirty miles north of Segedin: E. long. 20° 45′, and N. lat. 46° 36′.

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DAB, in ichthyology, the Engliſh name of a ſpecies of pleuronectes. See PLEURONECTES.

DACA, a city of the province of Bengal, in the Eaſt-Indies, ſituated on a branch of the river Ganges: E. long. 89° and N. lat. 23° 30′.

DA CAPO, in muſic, ſignifies from the head or beginning; intimating, that the air is to be begun again, and ended with the firſt part.

DACE, the Engliſh name of a ſpecies of cyprinus. See CYPRINUS.

DACOLITHUS, in ichthyology. See COBITIS.

DACTYL, in poetry, a metrical foot conſiſting of a long and two ſhort ſyllables, as *carmina, evident, excellence.*

The dactyl and ſpondee are the only feet or meaſures uſed in hexameter verſes. See HEXAMETER.

DACTYLIS, in botany, a genus of the triandria digynia claſs of plants. The calix conſiſts of two obtuſe valves, the one being ſomewhat larger than the other. The ſpecies are two, *viz.* the cynoſuroides, or ſmooth cock's-foot graſs; and the glomeratus, or rough cock's-foot graſs; both natives of Britain.

DACTYLUS, in zoology. See PHOLAS.

DADUCHI, in antiquity, prieſts of the goddeſs Ceres, ſo called, becauſe at the feaſts and ſacrifices of that goddeſs, they ran about the temple, carrying a lighted torch, which they delivered from hand to hand, till it had paſſed through them all. This they did in memory of Ceres's ſearching for her daughter Proſerpine, by the light of a torch, which ſhe kindled in mount Ætna.

DÆMON, a name given by the ancients to certain ſpirits, or genii, which appeared to men, either to do them ſervice, or to hurt them. The Platoniſts diſtinguiſh between gods, dæmons, and heroes. The gods are thoſe whom Cicero calls *Dii majorum gentium*. The dæmons are thoſe whom we call angels. Chriſtians, by the word dæmon, underſtand only evil ſpirits, or devils.

DÆMONIAC, a word applied to a perſon ſuppoſed to be poſſeſſed with an evil ſpirit, or dæmon. See DÆMON.

DÆMONIACS, in church-hiſtory, a branch of the anabaptiſts, whoſe diſtinguiſhing tenet is, that the devils ſhall be ſaved at the end of the world.

DAGO, or DAGERWORT, the capital of an iſland of the ſame name in the Baltic, near the coaſt of Livonia, ſubject to Ruſſia: E. long. 21° 30′, and N. lat. 58° 45′.

DAHGESTAN, a country of Aſia, bounded by Circaſſia on the north, by the Caſpian ſea on the Eaſt, by Chirvein a province of Perſia on the ſouth, and by Georgia on the weſt. Its chief towns are Tarku and Derbent, both ſituated on the Caſpian ſea.

DAHOME, a kingdom of Africa, on the Guinea coaſt.

DAISY. See BELLIS.

Great DAISY. See LEUCANTHEMUM.

Ox-eye DAISY. See BUPHTHALMUM.

DALEA, in botany. See PSORALEA.

DALEBURGH, the capital of the province of Dalia, in Sweden, ſituated on the weſtern ſide of the Wener-lake, fifty miles north-eaſt of Gottenburg; E. long. 13°, and N. lat. 59°.

DALECARLIA, a province of Sweden, abounding with iron and copper mines.

DALECHAMPIA, in botany, a genus of the monoecia monodelphia claſs. It has no corolla either in the male or female; and the ſeeds are roundiſh and ſolitary. There is but one ſpecies, *viz.* the ſcandens, a native of America.

DALKEITH, a town of Scotland, in the county of Lothian, ſix miles ſouth-eaſt of Edinburgh: W. long. 2° 40′, and N. lat. 55° 50′.

DALIA, a province of Sweden, bounded on the north by Dalecarlia, on the eaſt by Wermeland and the Wener-lake, on the ſouth by Gothland, and on the weſt by Norway.

DALMATIA, a frontier province of Europe, moſtly ſubject to the Turks, but ſome towns on the ſea-coaſt to the Venetians: it is bounded by Boſnia on the north, by Servia on the eaſt, by Albania on the ſouth, and by Morlachia and the gulph of Venice on the weſt.

DAMA, in zoology. See CERVUS.

DAMAGE, in law, is generally underſtood of a hurt, or hindrance attending a perſon's eſtate.

DAMALA, a ſea-port town of the Morea in Greece, at the entry of the gulf of Engea.

DAMAN, a port-town of the hither India, in the province of Guzurat or Cambay, ſituated on the weſt coaſt, about eighty miles ſouth of Surat, in 72° 20′ E. long. and 20° N. lat. It is ſubject to the Portugueſe.

DAMASCUS, or SCHAM, the capital city of the ſouth part of Syria, ſituated ninety miles north-eaſt of Jeruſalem, in a pleaſant, extenſive, and fruitful plain; E. long. 37° 20′, and N. lat. 33° 15′.

DAMASK, a ſilk-ſtuff, with a raiſed pattern, ſo as that the right ſide of the damaſk is that which hath the flowers raiſed or ſattined.

DAMASKEENING, or DAMASKING, the art or operation of beautifying iron, ſteel, *&c.* by making inciſions therein, and filling them up with gold and ſilver wire; chiefly uſed for adorning ſword-blades, guards and gripes, locks of piſtols, *&c.*

DAMASONIUM, in botany. See ALISONA.

DAMBEA, the capital of Abyſſinia, or Ethiopia, ſituated at the head of a lake, to which it gives name: E. long. 34°, and N. lat. 15°.

DAMELOPRE, a kind of bilander, uſed in Holland for conveying merchandize from one canal to another; being very commodious for paſſing under the bridges.

DAMIANISTS, in church-hiſtory, a branch of the ancient acephali-ſeveritæ. They agreed with the catholics in admitting the IVth council, but diſowned any diſtinctions of perſons in the Godhead; and profeſſed one ſingle nature, incapable of any difference; and yet they called God, the Father, Son, and Holy Ghoſt.

DAMIETTA, a port-town of Egypt, ſituated on the eaſtern mouth of the river Nile, four miles from the ſea, and 100 miles north of Grand Cairo; E. long. 32°, and N. lat. 31°.

DAMNATA TERRA, among chemiſts, the ſame with caput mortuum. See CAPUT.

DAMPS, in natural hiſtory, noxious ſteams and exhalations, frequently found in mines, pits, wells, and other ſubterraneous places. See PNEUMATICS.

DAMSEL, from the French *damoiſel*, or *damoiſeau*, an appellation anciently given to all young people of either ſex, that were of noble or genteel extraction, as the ſons and daughters of princes, knights, and barons: thus we read of Damſel Pepin, Damſel Louis le Gros, Damſel Richard prince of Wales.

From the ſons of kings this appellation firſt paſſed to thoſe of great lords and barons, and at length to thoſe of gentlemen, who were not yet knights.

At preſent, damſel is applied to all maids or girls, not yet married, provided they be not of the vulgar.

DANAE, in antiquity, a coin ſomewhat more than an obolus, uſed to be put into the mouths of the dead, to pay their paſſage over the river Acheron.

DANCE, an agreeable motion of the body, adjuſted by art to the meaſures or tune of inſtruments, or of the voice.

Athenæus concludes, that in the early ages of antiquity, they accounted dancing an exerciſe becoming perſons of honour and wiſdom; and that, as ſuch, it had been eſteemed by the greateſt men in all ages. Thus, Homer calls Merion a fine dancer; and ſays, that the graceful mein and great agility which he had acquired by that exerciſe, diſtinguiſhed him above the reſt in the armies of either Greeks or Trojans. Dancing was in very great eſteem among the Greeks, even the Lacedemonians encouraged it: but, at Rome, we find the cuſtom was quite otherwiſe; for there, to uſe the words of Cicero, no man dances unleſs he is mad or drunk: Cicero reproaches Gabinius with having danced: and we read, that Domitian excluded ſeveral members from the ſenate for having danced.

Dancing in general, was by the ancients divided into cubiſtic, ſpheriſtic, and orcheſtic: the cubiſtic dance was performed with certain wreſtlings and contorſions of the body; the ſpheriſtic with a ſort of ball, or bowl play; but the orcheſtic was moſt uſual, and what indeed was dancing properly ſo called.

Dancing is uſually an effect and indication of joy; though Mr Palleprat aſſures us, that there are nations in South America, who dance to ſhew their ſorrow. It has been in uſe among all nations, civilized and barbarous; though held in eſteem among ſome, and in contempt among others. It has often been, and ſtill is, ſometimes made an act of religion. Thus David danced before the ark to honour God, and expreſs his exceſs of joy for its return into Sion. Among the pagans it made a part of the worſhip paid to the gods, it being uſual to dance round the altars and ſtatues; and at Rome, the ſalii, who were prieſts of Mars, danced through the ſtreets in honour of that God. The poets made the gods themſelves dance. The Chriſtians are not free from this ſuperſtition; for in popiſh countries certain feſtivals, particularly thoſe of the ſacrament, and paſſion of our Lord, are celebrated with dancing.

DANCETTE, in heraldry, is when the outline of any bordure, or ordinary, is indented very largely, the largeneſs of the indentures being the only thing that diſtinguiſhes it from indented.

DANDELION, in botany. See Leontodon.

DANEGELT, a tax or tribute on every hide of land, impoſed on our anceſtors the Saxons by the Danes, on their frequent invaſions, as the arbitrary terms of peace and departure.

DARNAMAS, the name of the beſt ſort of cotton that comes from Smyrna, ſo called from a plain near that city.

DANTELLE, in heraldry. See Dancette.

DANTIA, in botany. See Isnardia.

DANTZICK, the capital of regal Pruſſia, in the kingdom of Poland, ſituated on the weſtern ſhore of the river Weſel, or Viſtula, which a little below falls into the Baltic ſea: E. long. 19°, and N. lat. 54°. It is an excellent harbour, and has the beſt foreign trade within the Baltic.

DANUBE, one of the largeſt rivers in Europe, which, taking its riſe in the Black Foreſt in Swabia, runs eaſtward through Bavaria, Auſtria, Hungary, and Turky in Europe; diſcharging itſelf by ſeveral channels into the Pontus Euxinus, or Black Sea.

DAPHNE, in botany, a genus of the octandria monogynia claſs. It has no calix; the corolla conſiſts of four ſegments; and the berry contains but one ſeed. There are 11 ſpecies, two of which are natives of Britain, *viz.* the laureola, or ſpurge laurel; and the mezereum, or ſpurge olive. The laureola is a ſtrong cathartic.

DAPPLE BAY, in the menage: when bay horſes have marks of a dark bay, they are called dapple-bays.

Dapple-black; when a black horſe has got ſpots or marks, more black or ſhining than the reſt of his ſkin, he is called a dapple-black.

DARAPTI, among logicians, one of the modes of ſyllogiſms of the third figure, whoſe premiſes are univerſal affirmatives, and the concluſion is a particular affirmative: thus,

Dar- Every body is diviſible;
ap- Every body is a ſubſtance;
ti, Therefore, ſome ſubſtance is diviſible.

DARBY, the capital of Darbyſhire, ſituated on the river Darwent: W. long. 1° 25′, and N. lat. 53°.

DARDANELLS, two caſtles at the entrance of the Helleſpont, where all ſhips going to Conſtantinople are examined: E. long. 27°, and N. lat. 40° 5′.

DARIEN, a province of Terra Firma, in South America, being the narrow iſthmus which joins North and South America.

DARII, in logic, one of the modes of ſyllogiſm of the firſt figure, wherein the major propoſition is an univerſal affirmative, and the minor and concluſion particular affirmatives: thus,

Da- Every thing that is moved, is moved by another;
ri- Some body is moved;
i. Therefore, ſome body is moved by another.

DARKING, a market-town of Surrey, ſituated ten miles eaſt of Guilford: W. long. 20′, and N. lat. 51° 18′.

DARLINGTON, a market-town of the county of Durham, ſituated twenty miles ſouth of the city of Durham: W. long. 1° 15′, and N. lat. 54° 30′.

DARMSTAT, the capital of Heſſe-Darmſtat, in the circle of the upper Rhine in Germany, ſituated on a river of the ſame name, fourteen miles ſouth of Francfort, and thirteen ſouth-eaſt of Mentz: E. long. 8° 25′, and N. lat. 49° 45′.

DARNEL, in botany. See Lolium.

DARTFORD, a market-town of Kent, in the Dover road, fourteen miles ſouth-eaſt of London: E. long. 16′, and N. lat. 51° 25′.

DARTMOUTH, a borough and port-town of Devonſhire, ſituated on the Engliſh channel, twenty-ſix miles ſouth of Exeter, which ſends two members to parliament: W. long. 4°, and N. lat. 50° 25′.

DARWENT, a river, which, riſing in the Peak of Darbyſhire, runs from north to ſouth through that county, and falls into the Trent.

DASYPUS, the ARMADILLO, in zoology, a genus of quadrupeds belonging to the order of bruta. The daſypus has neither fore-teeth nor dog-teeth; it is covered with a hard boney ſhell, interſected with diſtinct moveable zones or belts: This ſhell covers the head, the neck, the back, the flanks, and extends even to the extremity of the tail; the only parts to which it does not extend, are the throat, the breaſt, and the belly, which are covered with a whitiſh ſkin of a coarſe grain, reſembling that of a hen after the feathers are pulled off. The ſhell does not conſiſt of one entire piece, like that of the tortoiſe, but is divided into ſeparate belts connected to each other by membranes, which enable the animal to move it, and even to roll itſelf up like a hedge-hog. The number of theſe belts does not depend on the age of the animal, as ſome have imagined, but is uniformly the ſame at all times, and ſerves to diſtinguiſh the different ſpecies. All the ſpecies of this animal were originally natives of America: they were entirely unknown to the ancients; and modern travellers mention them as peculiar to Mexico, Braſil, and the ſouthern parts of America; though ſome indeed have confounded them with two ſpecies of manis, or ſhell-lizard, which are found in the Eaſt Indies: Others report that they are natives of Africa, becauſe ſome of them have been tranſported from Braſil to the coaſt of Guinea, where a few have ſince been propagated: but they were never heard of in Europe, Aſia, or Africa, till after the diſcovery of America.—They are all endowed with the faculty of extending and contracting their bodies, and of rolling themſelves up like a ball, but not into ſo compleat a ſphere as the hedge-hog. They are very inoffenſive animals, excepting when they get into gardens, where they devour the melons, potatoes, and other roots. They walk quickly; but can hardly be ſaid to run or leap; ſo that they ſeldom eſcape the purſuit either of men or dogs. But nature has not left them altogether defenceleſs. They dig deep holes in the earth; and ſeldom go very far from their ſubterraneous habitations: Upon any alarm, they immediately go into their holes; but, when at too great a diſtance, they require but a few moments to make one. The hunters can hardly catch them by the tail before they ſink their body in the ground, where they ſtick ſo cloſe, that the tail frequently comes away and leaves the body in the earth; which obliges the hunters, when they want to take them alive and immutilated, to dilate the ſides of the hole. When they are taken, and find that there is no reſource, they inſtantly roll themſelves up, and will not extend their bodies, unleſs they are held near a fire. When in deep holes, there is no other method of making them come out, but by forcing in ſmoke or water. They keep in their holes through the day, and ſeldom go abroad in queſt of ſubſiſtence but in the night. The hunters uſually chaſe them with ſmall dogs, which eaſily come up with them. When the dogs are near, the creatures inſtantly roll themſelves up, and in this condition the hunters carry them off. However, if they be near a precipice, they often eſcape both the dogs and hunters: they roll themſelves up, and tumble down like a ball, without breaking their ſhell, or receiving any injury. The daſypus is a very fruitful animal; the female generally brings forth four young ones every month; which is the reaſon why the ſpecies is ſo numerous, notwithſtanding they are ſo much ſought after on account of the ſweetneſs of their fleſh. The Indians likewiſe make baſkets, boxes, *&c.* of the ſhells which cover their heads.

Linnæus enumerates ſix ſpecies of daſypus, principally diſtinguiſhed by the number of their moveable belts.

1. The novemcinctus, or daſypus, with nine moveable belts, (ſee Plate LXVIII. fig. 1.) The head is long and narrow; the muzzle extends a good way beyond the under lip; the mouth is large; the eyes are ſmall, and placed on the ſides of the head; the ears are long, and placed near each other; the tail is long and conical, and terminates in a ſharp point. It has five toes on the hind-feet, and only four on the fore-feet; the claws are long, and of a yellowiſh colour. The length of the body, from the point of the muzzle, to the origin of the tail, is about eleven inches; and the length of the tail, about nine and a half.

2. The unicinctus, or daſypus, with eighteen moveable belts: the other ſpecies have two large immoveable pieces of ſhell, one on the ſhoulders, and another on the buttocks: this ſpecies has but one, which is on the ſhoulders, from that to the tail conſiſting entirely of moveable belts. The length of the body, from the point of the muzzle, to the origin of the tail, is about nine inches, and the tail about five.

3. The tricinctus, or daſypus, with three moveable belts. The head is oblong, and covered with an entire piece of ſhell; the ears are ſhort and roundiſh; it has five toes on all the feet, and the two middle claws of the fore-feet are remarkably larger than the reſt; the tail is ſhort, being about two inches in length; and the body is about one foot long.

4. The quadricinctus, or daſypus, with four moveable belts: Linnæus is miſtaken with regard to the trivial name and ſpecific character of this animal; it ought to be called the ſexcinctus, or daſypus, with ſix moveable belts; for, according to Briſſonius, Bouffon, and moſt other natural hiſtorians, none of the ſpecies of this genus have four moveable belts. It has five toes on every foot.

5. The ſeptemcinctus, or daſypus, with ſeven moveable belts: Here Linnæus is in another error of the ſame kind; for this animal has eight moveable belts. It has four toes on the fore-feet, and five on the hind-feet.

6. The daſypus with 12 moveable belts. This is the largeſt ſpecies, being about two feet in length.

DATA, among mathematicians, a term for ſuch things or quantities as are given or known, in order to find other things thereby that are unknown. Euclid uſes the word data (of which he hath a particular tract) for ſuch ſpaces, lines, and angles as are given in magnitude, or to which we can aſſign others equal.

DATE, in law, is the deſcription of the day, month, year of our Lord, and year of the reign of the king, in which a deed or other writing was made.

Date, the fruit of the phœnix, or great palm-tree. See Phoenix.

DATISI, in logic, a mode of ſyllogiſms in the third figure, wherein the major is an univerſal affirmative, and the minor and concluſion particular affirmative propoſitions. For example,

Da- All who ſerve God are kings;
ti- Some who ſerve God are poor;
si. Therefore, ſome who are poor are kings.

DATIVE, among grammarians, the third caſe in the declenſion of nouns, expreſſing the relation of a thing to whoſe profit or loſs ſome other thing is referred. It is called dative, becauſe uſually governed by a verb, implying ſomething to be given to ſome perſon. In Engliſh, the dative is expreſſed by the ſigns *to* or *for*.

DATURA, the Thorn-apple, in botany, a genus of the pentandria monogynia claſs. The corolla is plaited and tunnel-ſhaped; the calix is tubulous, angular, and deciduous; and the capſule conſiſts of four valves. There are ſix ſpecies, all natives of warm climates. The thorn-apple is a narcotic poiſon: It has lately been recommended in caſes of madneſs by Dr Stork, but without anſwering any uſeful purpoſe.

DAUCUS, the Carrot, in botany, a genus of plants belonging to the pentandria digynia claſs. The corollæ are ſubradiated, and all hermaphrodite; and the ſeeds are rough and hairy. There are five ſpecies, only one of which, *viz.* the carota, wild-carrot, or bird's-neſt, is a native of Britain. The ſeeds are ſaid to be diuretic and carminative.

DAVENTRY, a market-town of Northamptonſhire, ſituated about ten miles north of Northampton: W. long. 1° 15′, and N. lat. 52° 12′.

DAVIDISTS, in church-hiſtory, a ſect of Chriſtian heretics in the XVIth century; ſo called from David George, their leader, who began by giving out that he was the Meſſiah, and was ſent into the world in order to people the kingdom of heaven, which was quite empty of inhabitants, for want of virtuous and good men: he rejected marriage, and denied the reſurrection.

DAVIDS, or St David's, a city and biſhop's ſee of Pembrokeſhire, ſituated near the Iriſh channel, about twenty miles north-weſt of Pembroke: W. long. 5° 20′, and N. lat. 52°.

St David's is alſo the name of a town and fort ſituated on the coaſt of Coromandel, in the hither India, about eighty miles ſouth of Fort St George: E. long. 79° 40′, and N. lat. 11° 45′.

DAVIS's STRAITS run north-weſt from Cape Farewell, in 60° N. lat. to Baffin's bay, in 80° N. lat. ſeparating Greenland from North America.

DAVIT, in a ſhip, that ſhort piece of timber with a notch at one end, wherein, by a ſtrap, hangs the fiſh-block.

The uſe of this block is to help up the fluke of the anchor, and to faſten it at the ſhip's bow or loof. The davit is ſhiftable from one ſide of the ſhip to the other, as there is occaſion.

DAUPHIN, a title given to the eldeſt ſon of France, and heir preſumptive of the crown, on account of the province of Dauphiny, which, in 1343, was given to Philip of Valois, on this condition, by Humbert dauphin of the Viennois.

Dauphin-fort, a fort built by the French, on the eaſtern coaſt of the iſland of Madagaſcar, E. long. 48°, and S. lat. 24°.

DAUPHINE, or Dauphiny, a province of France, bounded by Burgundy on the north, by Piedmont on the eaſt, by Provence on the ſouth, and by the river Rhone, which ſeparates it from Languedoc and the Lyonois, on the weſt.

DAY. See Vol. I. p. 491.

Days *of grace*, are thoſe granted by the court at the prayer of the defendant, or plaintiff, in whoſe delay it is.

Days *of grace*, in commerce, are a cuſtomary number of days allowed for the payment of a bill of exchange, *&c.* after the ſame becomes due.

Three days of grace are allowed in Britain; ten in France and Dantzic; eight at Naples; ſix at Venice, Amſterdam, Rotterdam, and Antwerp; four at Francfort; five at Leipſic; twelve at Hamburg; ſix in Portugal; fourteen in Spain; thirty in Genoa, *&c.*

Day's-man, in the north of England, an arbitrator or perſon choſen to determine an affair in diſpute.

Intercalary Days. See Vol. I. p. 489.

DEACON, one of the three ſacred orders of the Chriſtian church.

As to the office of deacons, the moſt common and ordinary was to be attendant on the biſhops and preſbyters in the ſervice of the altar, to take care of the holy table and all the ornaments and utenſils belonging to it; and, in the next place, to receive the offerings of the people, and to preſent them to the prieſt; at the ſame time reciting the names of thoſe that offered. In ſome churches, though not in all, the deacons read the goſpel both before and at the communion-ſervice; but their moſt peculiar office was to aſſiſt the biſhop and preſbyters in the adminiſtration of the euchariſt, at which their buſineſs was to diſtribute the elements to the people who were preſent, and carry them to thoſe who were abſent. That they were never allowed to conſecrate them at the altar, appears from the teſtimonies of Hilary, Jerom, and the author of the conſtitutions. They were permitted, however, to adminiſter ſolely the ſacrament of baptiſm in ſome caſes. Another part of the office of deacons, was to be a ſort of monitors and directors to the people in the exerciſe of their public devotions in the church; for which purpoſe they made uſe of certain known forms of words, to give notice when each part of the ſervice began. Whence they are ſometimes called [*eirokerukes*,] the the holy cryers of the church.

Deacons had, by licence and authority from the biſhop, a power to preach, to reconcile penitents and grant them abſolution, and to repreſent their biſhops in general councils. Their office out of the church was to take care of the neceſſitous, ſuch as orphans, widows, priſoners, and all the poor and ſick who had any title to be maintained out of the public revenues of the church; to inquire into the morals and converſation of the people, and to make their report thereof to the biſhop. Whence, on account of the variety of buſineſs, it was uſual to have ſeveral deacons in the ſame church.

In the Romiſh church, it is the deacons office to incenſe the officiating prieſt or prelate; to lay the corporal on the altar; to receive the paten or cup from the ſubdeacon, and preſent them to the perſon officiating; to incenſe the choir; to receive the pax from the officiating prelate, and carry it to the ſubdeacon; and at the pontifical maſs, when the biſhop gives the bleſſing, to put the mitre on his head, and to take off the archbiſhop's pall, and lay it on the altar. In England, the form of ordaining deacons, declares that it is their office to aſſiſt the prieſt in the diſtribution of the holy communion; in which, agreeably to the practice of the ancient church, they are confined to the adminiſtering the wine to the communicants. A deacon, with us, is not capable of any eccleſiaſtical promotion, yet he may be a chaplain to a family, curate to a beneficed clergyman, or lecturer to a pariſh church. He may be ordained at twenty-three years of age, *anno currente;* but it is expreſsly provided, that the biſhop ſhall not ordain the ſame perſon a prieſt and deacon in the ſame day. Deacons, according to St Paul, ſhould be chaſte, ſincere, and blameleſs; neither great drinkers, nor given to filthy lucre; they ſhould hold the myſtery of the faith in a pure conſcience, and ſhould be well approved before they are admitted to the miniſtry.

DEACONESS, *a female deacon*, an order of women, who had their diſtinct offices and ſervices in the primitive church. This office appears as ancient as the apoſtolical age; for St Paul calls Phebe a ſervant of the church of Cenchrea. The original word is [*diakonos*], anſwerable to the Latin word *miniſtra*. Tertullian calls them *viduæ*, widows, becauſe they were commonly choſen out of the widows of the church; and, for the ſame reaſon, Epiphanius, when the council of Laodicea, calls them [*preſbutidas*], elderly women, becauſe none but ſuch were ordinarily taken into this office. For, indeed, by ſome ancient laws, theſe four qualifications were required in every one that was to be admitted into this order. 1. That ſhe ſhould be a widow. 2. That ſhe ſhould be a widow that had born children. 3. A widow that was but once married. 4. One of a conſiderable age, forty, fifty, or ſixty years old. Though all theſe rules admitted of exceptions. Concerning their ordination, whether it was always performed by impoſition of hands, the learned are much divided in their ſentiments. Baronius and Valeſius think they were not, and make no other account of them than as mere lay-perſons. But the author of the conſtitutions, ſpeaking of their ordination, requires the biſhop to uſe impoſition of hands, with a form of prayer which is there recited. We are not, however, to imagine, that this ordination gave them any power to execute any part of the ſacerdotal office. They were only to perform ſome inferior ſervices of the church, and thoſe chiefly relating to the women for whoſe ſakes they were ordained. One part of their office was to aſſiſt the miniſter at the baptizing of women, to undreſs them for immerſion, and to dreſs them again, that the whole ceremony might be performed with all the decency becoming ſo ſacred an action. Another part of their office was to be private catechiſts to the women-catechumens who were preparing for baptiſm. They were likewiſe to viſit and attend women that were ſick and in diſtreſs; to miniſter to the martyrs and confeſſors in priſon; to attend the womens gate in the church; and, laſtly, to aſſign all women their places in the church, regulate their behaviour, and preſide over the reſt of the widows, whence in ſome canons they are ſtyled [*prokathemenai*] governeſſes. This order, which ſince the tenth or twelfth century has been wholly laid aſide, was not aboliſhed every where at once, but continued in the Greek church longer than in the Latin, and in ſome of the Latin churches longer than in others.

DEAD-MAN's HEAD, in geography, a cape or promontory near Tregony in Cornwall, between St Mawes and Fowey.

Dead-mens-eyes, in the ſea-language, a kind of blocks with many holes in them, but no ſheevers, whereby the ſhrowds are faſtened to the chains: the crow-feet reeve alſo through theſe holes; and, in ſome ſhips, the main-ſtays are ſet tight in them; but then they have only one hole, through which the lanyards are paſſed ſeveral times.

Dead-nettle. See Lamium.

Dead-reckoning, in navigation, the calculation made of a ſhip's place by means of the compaſs and log; the firſt ſerving to point out the courſe ſhe ſails on, and the other the diſtance run. See Navigation.

Dead's part, in Scots law, that proportion of the funds of a marriage, which, upon the diſſolution of it, goes to the executor of the deceaſed huſband or wife, as the defunct or dead's part. See Scots Law, title 28.

Dead-sea, in geography, a lake of Judea, into which the river Jordan diſcharges itſelf; being about ſeventy miles long, and twenty broad.

Dead-tops, a diſeaſe incident to young trees, and cured by cutting off the dead parts cloſe to the next good twig or ſhoot, and claying them over as in grafting.

Dead-water, at ſea, the eddy-water juſt aſtern of a ſhip, ſo called, becauſe it does not paſs away ſo ſwift as the water running by her ſides does. They ſay that a ſhip makes much dead-water, when ſhe has a great eddy following her ſtern.

DEADLY carrot. See Thapsia.

Deadly nightshade. See Atropa.

DEADS, among miners, denotes the earth or other foſſile ſubſtances which incloſe the ore on every ſide. Hence, *breaking up the deads*, is the removing theſe ſubſtances for the conveniency of carrying on their work.

DEAFNESS, the ſtate of a perſon who either wants the ſenſe of hearing, or has it greatly impaired. See DUMB.

DEAL, a thin kind of fir-planks, of great uſe in carpentry: they are formed by ſawing the trunk of a tree into a great many longitudinal divisions, of more or leſs thickneſs, according to the purpoſes they are intended to ſerve.

Deals are rendered much harder, by throwing them into ſalt water as ſoon as they are ſawed, keeping them there three or four days, and afterwards drying them in the air or ſun; but neither this nor any other method yet known, will preſerve them from ſhrinking.

Deals called Burgendorp deals, the hundred containing ſix ſcore, pay on importation 3 l. 8 s. 8$\frac{40}{100}$ d. and draw back 3 l. 3 s. the rate 12 l. Meabro deals, ſix ſcore, pay 1 l. 2 s. 10$\frac{80}{100}$ d. and draw back 1 l. 1 s. the rate 4 l. Norway deals, ſix ſcore, pay 1 l. 8 s. 7½ d. and draw back 1 l. 6 s. 3 d. the rate 5 l. Spruce deals, ſix ſcore, pay 4 l. 5 s. 10½ d. and draw back 3 l. 18 s. 9 d. the rate 15 l. Deals from Ruſſia, and all other countries not particularly rated, exceeding twenty foot in length, pay 4 l. 5 s. 10$\frac{50}{100}$ d. and draw dack 3 l. 18 s. 9 d. the rate 15 l. Deals from Sweden, or any other country, of twenty feet in length or under, not otherwiſe rated, the 120, pay 1 l. 8 s. 7½ d. and draw back 1 l. 6 s. 3 d. the rate 5 l.

DEAL, in geography, a port-town of the county of Kent, between which and the Goodwin-ſands, the ſhipping uſually rides in the Downs, in going out or coming home: it is about ſixty-ſeven miles eaſtward of London: E. long. 1° 30′, and N. lat. 51° 16′.

DEAN, an eccleſiaſtical dignitary in cathedral and collegiate churches, and head of the chapter.

DEAN *and* CHAPTER, are the biſhop's council to aſſiſt him in the affairs of religion, and to aſſent to every grant which the biſhop ſhall make to bind his ſucceſſors. As a deanry is a ſpiritual dignity, a man cannot be a dean and prebendary of the ſame church.

DEAN *of guild*, in Scots law, a magiſtrate of a royal borough, who has the cognizance of mercantile cauſes, and the inſpection of buildings within borough. See SCOTS LAW, title 4.

DEATH is generally conſidered as the ſeparation of the ſoul and body; in which ſenſe it ſtands oppoſed to life, which conſiſts in the union thereof.

***The law of* DEATH-BED**, in Scots law, the privilege which that law allows to an heir of reducing all deeds reſpecting the heretable eſtate of his predeceſſor, granted by him while on death bed, in prejudice of the lawful heir. All deeds are liable to reduction *ex capite lecti*, that are granted by a perſon within ſixty days of his death, if he had then contracted the diſeaſe of which he died, and had not afterwards recovered, ſo as to have gone to kirk or market unſupported. See SCOTS LAW, title 27.

DEBENHAM, a market-town of Suffolk, about twenty miles eaſt of Bury: E. long. 1° 20′, and N. lat. 52° 20′.

DEBENTURE, a term of trade uſed at the cuſtom-houſe for a kind of certificate ſigned by the officers of the cuſtoms, which intitles a merchant exporting goods to the receipt of a bounty or draw-back. All merchandiſes that are deſigned to be taken on board for that voyage being entered and ſhipped, and the ſhip being regularly cleared out, and ſailed out of port on her intended voyage, debentures may be made out from the exporter's entries, in order to obtain the drawbacks, allowances, bounties, or premiums; which debentures for foreign goods are to be paid within one month after demand. And in making out theſe debentures, it muſt be obſerved, that every piece of vellum, parchment, or paper, containing any debenture for drawing back cuſtoms or duties, muſt, before writing, be ſtamped, and pay a duty of 8 d.

The forms of debentures vary, according to the merchandiſe exported. In the execution of debentures for tobacco, it muſt be particularly obſerved, 1. That debentures for the ſame quantity, may be made in one or more parchments. 2. That the exporter's oath muſt be printed, ſpecifying whether he acts for himſelf or by commiſſion. If exported to any other foreign ports than Ireland, the word *Ireland* muſt be added to the oath after Great Britain. 4. That as no tobacco may be conſumed on board ſhips of war in Europe, but what has paid full duties, and been manufactured in Great Britain, no drawback is to be allowed for tobacco exported in any man of war. 5. That the eight pounds *per* hogſhead of 350 pounds, or more, allowed for draught at importation, muſt not be deducted on exportation. 6. That debentures for tobacco exported to Ireland, muſt not be paid till a certificate be produced, teſtifying the landing thereof. 7. That no perſons may ſwear to the exportation, but ſuch as are permitted to ſwear to debentures for other goods. In debentures for all other foreign goods, no perſon may be admitted to ſwear to the exportation, but the true exporter, either as a proprietor, or who being employed by commiſſion, is concerned in the direction of the voyage. All kinds of debentures before delivered or paid to the exporters, are entered into a ſeparate book kept for that purpoſe by the collector and comptroller of the cuſtoms.

DEBITA *fundi*, in Scots Law. A debt is ſaid to be a *debitum fundi*, when it is recoverable either by a perſonal action againſt the debtor himſelf, or by a real action againſt his lands.

DEBITA *fructuum*, in Scots law. Funds are *debita fructuum* not *fundi*; ſo are not recoverable out of the lands themſelves, but out of the fruits of the lands out of which they are payable. See SCOTS LAW, title 17.

DEBILITY, among phyſicians, a relaxation of the ſolids, occaſioning oftentimes weakneſſes and faintings.

DEBRECHEN, a town of Upper Hungary, about ſeventy-ſeven miles eaſt of Buda: E. long. 21° 10′ N. lat. 47° 45′.

DEBRUIZED, in heraldry, a term peculiar to the Engliſh, by which is intimated the grievous reſtraint of any animal, debarred of its natural freedom, by any of the ordinaries being laid over it.

DEBT, in law, any thing due to another, whether it be money, goods, or ſervices; or the action brought for recovering the ſame.

DEBTOR, a perſon who owes any thing to another; in conſtradiſtinction to creditor, which is he to whom the debt is owing.

DEBTOR, in merchants accounts. See BOOK-KEEPING.

DECAGON, in geometry, a plane figure with ten ſides and ten angles.

DECALOGUE, the ten precepts or commandments delivered by God to Moſes, after engraving them on two tables of ſtone.

The Jews, by way of excellence, call theſe commandments the *ten words*, from whence they had afterwards the name of decalogue: but it is to be obſerved, that they joined the firſt and ſecond into one, and divided the laſt into two: they underſtand that againſt ſtealing, to relate to the ſtealing of men, or kidnapping; alledging, that the ſtealing one anothers goods or property, is forbidden in the laſt commandment.

The emperor Julian objected to the decalogue, that the precepts it contained (thoſe only excepted which concern the worſhip of falſe gods, and the obſervation of the ſabbath) were already ſo familiar to all nations, and ſo univerſally received, that they were unworthy, for that very reaſon, to be delivered, by ſo great a legiſlator, to ſo peculiar a people. The church of Rome has ſtruck the ſecond commandment quite out of the decalogue, and to make their number complete, hath ſplit the tenth into two. The reaſon of which may be eaſily conceived.

DECAN, a province of the Hither India, bounded by the province of Cambaya, or Guzurat, on the north; by Golcónda and Berar, on the eaſt; by Viſapour, on the ſouth; and by the Indian ocean on the weſt.

DECANDRIA, in the Linnæan ſyſtem of botany. See BOTANY, the *Scheme*, p. 635. and Plate LIII. fig. 10.

DECANTATION, among chemiſts, *&c.* the gently pouring off a liquor from its fæces, by inclining the lip or canthus of the veſſel; whence the name.

DECANUS, in Roman antiquity, an officer who preſided over other ten officers, and was head of the contuberinum, or ſerjeant of a file of ſoldiers.

DECAPROTI, *decemprimi*, in Roman antiquity, officers for gathering the tributes and taxes.

The decaproti were alſo obliged to pay for the dead, or to anſwer to the emperor for the quota parts of ſuch as died, out of their own eſtates.

DECASTYLE, in the ancient architecture, a building with an ordnance of ten columns in front, as the temple of Jupiter Olympius was.

DECEIT, in law, a ſubtle trick, or device, to which may be added all manner of craft and colluſion, or underhand practice, uſed to defraud another, by any means whatever.

DECEMBER, the laſt month of the year, conſiſting of thirty-one days, and ſo called as being the tenth month in the Roman year, which commenced with March.

DECEMPEDA, in antiquity, a rule or rod divided into ten feet, each of which was ſubdivided into inches, and thoſe into digits, uſed in meaſuring of land. and, by architects, in giving the proper dimenſions and proportions to the parts of their buildings.

DECEMVIRI, in Roman antiquity, ten magiſtrates choſen annually at Rome, to govern the commonwealth inſtead of conſuls, with an abſolute power to draw up and make laws for the people.

One of the decemviri had all the enſigns and honours of the function, and the reſt had the like in their turn, during the year of their decemvirate. In them was veſted all the legiſlative authority ever enjoyed by the kings, or, after them, by the conſuls. It was the decemviri drew up the laws of the Twelve Tables, thence called *leges decemvirales*, which were the whole of the Roman law, for a conſiderable time.

DECENNALIA, ancient Roman feſtivals celebrated by the emperors, every tenth year of their reign, with ſacrifices, games, and largeſſes for the people. The emperor Auguſtus firſt inſtituted theſe ſolemnities, in which he was imitated by his ſucceſſors.

DECIDUOUS, an appellation chiefly uſed in reſpect of plants: thus, the calix or cup of a flower is ſaid to be deciduous, when it falls along with the flower-petals; and, on the contrary, it is called permanent, when it remains after they are fallen. Again, deciduous leaves are thoſe which fall in autumn, in contradiſtinction to thoſe of the ever-greens, which remain all the winter.

DECIL, in aſtronomy, an aſpect or poſition of two planets, when they are diſtant from each other a tenth part of the zodiac.

DECIMAL ARITHMETIC, the art of computing by decimal fractions.

DECIMAL FRACTION, in arithmetic. See Vol. I. p. 395.

DECIMATION, a puniſhment inflicted by the Romans, on ſuch ſoldiers as quitted their poſt, or behaved themſelves cowardly in the field. The names of all the guilty were put into an urn or helmet, and as many were drawn out as made the tenth part of the whole number, and theſe were put to the ſword, and the others ſaved.

DECIPHERING, the art of finding the alphabet of a cypher. See CYPHER.

Every language has, beſides the form of its characters, ſomething peculiar in the place, order, combination, frequency, and number of the letters; to all which particular regard is to be had in deciphering. In all languages, however, the following rules ought to be obſerved: 1. One word is to be compared with another, that their reſemblance and difference may be known. 2. No word can be without a vowel. 3. A word of one letter is always a vowel, or a conſonant with an apoſtrophe. 4. The vowels recur much more frequently than the conſonants. 5. Double vowels may be at the beginning of a word, but not double conſonants. 6. Double characters at the beginning of a word are always vowels. 7. Short words of two or three letters have two or three, or one or two conſonants. 8. The vowels are therefore moſt eaſily learned from the ſhort words which are to be firſt conſidered by the decipherer. 9. If double characters are preceded by a ſingle letter, the letter is a vowel. 10. In languages abounding with diphthongs one vowel is of ten joined with another. 11. The letter that precedes or follows double conſonants is, if a conſonant, always one of the liquids, *l*, *m*, *n*, *r*, 12. If two different characters occur, of which the latter is often conjoined with various letters, and the former is never found either by itſelf, or followed by any other letter, thoſe two are *qu*. 13. Theſe letters *qu* are always followed by a vowel. 14. One vowel recurs more frequently than another, as do the conſonants, according to the language, *&c*.

DECISE, a town of the Orleanois, in France, ſituated on the river Loire, about fifteen miles ſouth-eaſt of Nevers: E. lon. 3° 32′, and N. lat. 46° 40′

DECK *of a ſhip* is a planked floor from ſtem to ſtern, upon which the guns lie, and where the men walk to and fro.

Great ſhips have three decks, firſt, ſecond, and third, beginning to count from the lowermoſt.

Half deck reaches from the main-maſt to the ſtem of the ſhip.

Quarter-deck is that aloft the ſteerage, reaching to the round-houſe.

Fluſh-deck is that which lies even in a right-line fore and aft, from ſtem to ſtern. A rope-deck is that made of cordages, interwoven and ſtretched over a veſſel, through which it is eaſy to annoy an enemy who comes to board her. They are little uſed but by ſmall veſſels, to defend them againſt privateers.

DECKENDORF, a town of Bavaria, in Germany, ſituated on the Danube, about thirty-ſeven miles ſouth-eaſt of Ratiſbon: E. long. 13°, and N. lat. 48° 45′.

DECLAMATION, a ſpeech made in public, in the tone and manner of an oration, uniting the expreſſion of action to the propriety of pronunciation, in order to give the ſentiment its full impreſſion upon the mind.

DECLARATORY *action*, in Scots law, is that by which a purſuer only craves, that ſome right or privilege ſhall be declared to belong to him, without demanding the payment or performance of any thing from the defender. See Scots Law, title, 30.

DECLENSION, in grammar, an inflexion of nouns according to their divers caſes, as nominative, genitive, dative, *&c*. It is a different thing in the modern languages, which have not properly any caſes, from what it is in the ancient Greek and Latin. With reſpect to languages, when the nouns admit of changes, either in the beginning, the middle, or ending; declenſion is properly the expreſſion of all thoſe changes in a certain order, and by certain degrees called caſes. With regard to languages, where the nouns do not admit of changes in the ſame number, declenſion is the expreſſion of the different ſtates a noun is in, and the different relations it has; which difference of relations is marked by particles, and called articles, as *a*, *the*, *of*, *to*, *from*, *by*, &c.

DECLINATION, in aſtronomy, the diſtance of any celeſtial object from the equinoctial, either northward or ſouthward. It is either true or apparent, according as the real or apparent place of the object is conſidered. See Artronomy.

Declination *of a wall or plane for dials*. See Dialling.

DECLINATOR, or **Declinatory**, an inſtrument contrived for taking the declinations, inclinations, and reclinations of planes.

DECLINATURE *of judges*, in Scots law, declining the juriſdiction of a judge, or refuſing to acquieſce in his judgment from any legal obligation to the judge himſelf, the incompetency of his juriſdiction to the nature of the action, or upon the privilege of the objector or decliner. See Scots Law, title 2.

DECLIVITY denotes the reverſe of acclivity. See Acclivity.

DECOCTION, in pharmacy, the boiling ſimples, or other drugs, in order to extract their virtues for ſome medicinal purpoſe. The general ſubjects of decoction are animals and vegetables, and ſometimes minerals, as antimony and quickſilver. The liquors which ſerve to boil them, are water, wine, vinegar, milk, and whey.

DECOMPOSITION, in chemiſtry, the reduction of a body into its principles or component parts. See Chemistry.

DECORATION, in architecture, is uſed for whatever adorns a building, either withoutſide or within.

DECORUM, in architecture, is the ſuitableneſs of a building, and the ſeveral parts and ornaments thereof, to the ſtation and occaſion.

DECOUPLE′, in heraldry, the ſame as uncoupled: thus a chevron decouplé, is a chevron wanting ſo much of it towards the point, that the two ends ſtand at a diſtance from one another, being parted and uncoupled.

DECOURS, in heraldry. See Decrement.

DECOY, a place made for catching wild-fowl. Hence,

Decoy-duck is a duck that flies abroad, and lights into company with wild ones, which by her allurements ſhe draws into the decoy.

DECREE, an order made by a ſuperior power, for the regulation of an inferior.

Decree, in the civil law, is a determination that the emperor pronounces upon hearing a particular cauſe between plaintiff and defendant.

Decree, or **Decreet**, in Scots law, the deciſive ſentence or judgment of a court of law.

Decreet-arbitral, in Scots law, the ſentence or judgment of one to whom parties voluntarily ſubmit the determination of any queſtion betwixt them. See Scots Law, title 32.

DECREMENT, in heraldry, ſignifies the wane of the moon from the full to the new. The moon in this ſtate is called moon decreſcent, or in decours; and when borne in coat-armour, faces to the left ſide of the eſcutcheon, as ſhe does to the right ſide when in the increment. See Crescent.

DECREPITATION, in chemiſtry, the act of calcining ſalt over the fire, till it ceaſe to crackle. See Chemistry.

It is alſo applied to the crackling of the ſalts during the operation.

DECRETAL, in the canon-law, a letter of a pope, determining ſome point or queſtion in the eccleſiaſtical law. The decretals compoſe the ſecond part of canon law. The firſt genuine one acknowledged by all the learned as ſuch, is the letter of pope Siricius, written in the year 385, to Himerus biſhop of Tarragona in Spain, concerning ſome diſorders which had crept into the churches of Spain.

DECUMANI DENTES, in heraldry. See DANCETTE.

DECUPLE PROPORTION, that of ten to one.

DECURIO, in Roman antiquity, a commander of ten men in the army, or the chief of a decury.

DECURRENT LEAF. See BOTANY, p. 641.

DECURY, ten perſons ranged under one chief, or leader, called the decurio.

The Roman cavalry was divided into decuries, which were ſubdiviſions of a century, each century containing ten decuries.

DECUSSATION, a term in geometry, optics, and anatomy, ſignifying the croſſing of any two lines, rays, or nerves, when they meet in a point, and then go on ſeparately from one another.

DECUSSORIUM, a ſurgeon's inſtrument, which, by preſſing gently on the dura mater, cauſes an evacuation of the pus collected between the cranium and the before mentioned membrane, through the perforation made by the trepan.

DEDDINGTON, a market town of Oxfordſhire, about fifteen miles north of Oxford: W. long. 1° 20′, and N. lat. 51° 55′.

DEDHAM, a market-town in Eſſex, about thirty five miles north-eaſt of Chelmsford: E. long. 1° 10′, and N. lat. 52° 5′.

DEDICATION, a ſolemn devoting or ſetting apart any perſon or thing to the ſervice of God and the purpoſes of religion.

Feaſt of DEDICATION, an anniverſary feſtival among the Jews, in memory of Judas Maccabæus, who repaired and dedicated anew the temple and altar, which had been plundered and profaned by Antiochus Epiphanes. It was obſerved on the twenty fifth of Ciſleu, and continued eight days.

DEE, the name of ſeveral rivers, as that on which Cheſter ſtands, that whereon Aberdeen ſtands, *&c.*

DEED, in Scots laws, any ſettlement, diſpoſition, contract, or other legal writing.

DEED, an inſtrument written on paper or parchment, comprehending ſome contract, bargain or agreement between the parties thereto, in relation to the matter therein contained.

DEEMSTERS, or DEMSTERS. All controverſies in the Iſle of Man are decided without proceſs, writings, or any charges, by certain judges, choſen yearly from among themſelves, called deemſters; there being two of them for each diviſion of the iſland: they ſit judges in all courts, either for life or property; and with the advice of twenty-four keys, declare what is law, in uncommon emergencies.

DEEPING, a market-town of Lincolnſhire, about thirty-five miles ſouth of Lincoln: W. long. 20°, and N. lat. 52° 35′.

DEER, in zoology. See CERVUS.

DEFAMATION, the ſpeaking ſlanderous words of another; for which the ſlanderer is puniſhable, according to the nature of his offence, either by action upon the caſe at common law, or by ſtatute, or in the eccleſiaſtical court.

DEFAULT, in law, is generally taken for non-appearance in court, at a day aſſigned; but imports any omiſſion of that which we ought to do, for which judgment may be given againſt the defaulter.

DEFEASANCE. See DEFEISANCE.

DEFECATE, or DEFÆCATE, in chemiſtry, a term applied to a body freed and purged from fæces and impurities,

DEFEISANCE, in law, a condition relating to ſome certain deed, which being performed, the deed is defeated and rendered void, as if it had never been made.

DEFENCE, in fortification, all ſorts of works that cover and defend the oppoſite poſts, as flanks, caſements, parapets, and fauſſebrays. See FORTIFICATION.

Line of DEFENCE, a ſuppoſed line drawn from the angle of the curtin, or from any other part in the curtin, to the flanked angle of the oppoſite baſtion. See FORTIFICATION.

DEFENDER *of the faith*, a peculiar title, belonging to the king of Great Britain, as Catholic does to the king of Spain, Chriſtian to the king of France, *&c.*

This title was firſt given by pope Leo X. to king Henry VIII. for writing againſt Luther.

DEFERENT, in anatomy, a term applied to certain veſſels in the body, that ſerve for the conveyance of humours from one part to another. See ANATOMY.

DEFERENT, in the Ptolemaic aſtronomy, a circle invented to account for the eccentricity, perigee, and apogee of the planets.

DEFERENTIA VASA. See Vol. I. p. 273.

DEFILE, in fortification, a ſtrait narrow paſſage, thro' which a company of horſe or foot can paſs only in file, by making a ſmall front.

DEFINITE, in grammar, is applied to an article that has a preciſe determinate ſignification; ſuch as the article *the* in Engliſh, *le* and *la* in French, *&c.* which fix and aſcertain the noun they belong to, to ſome particular, as *the king*, *le roy*; whereas in the quality *of king*, *de roy*, the articles *of* and *de* mark nothing preciſe, and are therefore indefinite

DEFINITION, an idea of any ſcience, ſubject, *&c.* conveyed in a few words.

DEFINITIVE, a term applied to whatever terminates a proceſs, queſtion, *&c.* in oppoſition to proviſional and interlocutory.

DEFLAGRATION, in chemiſtry, the kindling or ſetting fire to a ſalt or mineral, *&c.* either alone, or mixed for that purpoſe with a ſulphureous one in order to purify it. See CHEMISTRY.

DEFLECTION *of the rays of light*. See OPTICS.

DEFLUXION, in medicine, the falling of humours from a ſuperior to an inferior part of the body.

DEFORCEMENT, in Scots law, the oppoſing or reſiſting the officers of the law in the execution of their office. See Scots Law, titles 25 and 33.

DEFORMITY, the want of that uniformity neceſſary to conſtitute the beauty of an object. See Beauty.

DEGENERATION, or Degenerating, in general, denotes the growing worſe, or loſing ſome valuable qualities whereof a thing was formerly poſſeſſed.

DEGLUTITION, in medicine, the act of ſwallowing the food, performed by means of the tongue driving the aliment into the œſophagus, which, by the contraction of the ſphincter, protrudes the contents downwards.

DEGRADATION, the act of depriving a perſon for ever of a dignity or degree of honour, and taking away the title, badge, and privileges of it.

Degradation, in painting, expreſſes the leſſening the appearance of diſtant objects in a landſkip, in the ſame manner as they would appear to an eye placed at that diſtance from them.

DEGRADED CROSS, in heraldry, a croſs divided into ſteps at each end, diminiſhing as they aſcend towards the centre, called by the French *perronnée*. See Plate LXVIII. fig. 6.

DEGREE, in geometry, a diviſion of a circle, including a three hundred and ſixtieth part of its circumference. See Astronomy, and Geography.

Degree *of latitude*. See Geography.

Degree *of longitude*. See Geography.

Degrees, in muſic, are the little intervals whereof the concords or harmonical intervals are compoſed.

Degree, in univerſities, denotes a quality conferred on the ſtudents or members thereof as a teſtimony of their proficiency in the arts or ſciences, and intitling them to certain privileges.

DEJECTION, in medicine, the act of ejecting or evacuating the excrements. It is alſo applied to the excrements themſelves thus evacuated, in which ſenſe it is of the ſame import with ſtool.

DEIFICATION, in antiquity. See Apotheosis.

DEISM, the ſyſtem of religion acknowledged by the deiſts.

DEISTS, in the modern ſenſe of the word, are thoſe perſons in Chriſtian countries, who, acknowledging all the obligations and duties of natural religion, diſbelieve the Chriſtian ſcheme, or revealed religion. They are ſo called from their belief in God alone, in oppoſition to Chriſtians. The learned Dr Clarke taking the denomination in the moſt extenſive ſignification, diſtinguiſhes deiſts into four ſorts. 1. Such as pretend to believe the exiſtence of an eternal, infinite, independent, intelligent Being; and who teach, that this ſupreme Being made the world, though they fancy he does not at all concern himſelf in the management of it. 2. Thoſe who believe not only the being, but alſo the providence of God with reſpect to the natural world; but who, not allowing any difference between moral good and evil, deny that God takes any notice of the morally good or evil actions of men; theſe things depending, as they imagine, on the arbitrary conſtitutions of human laws. 3. Thoſe who having right apprehenſions concerning the natural attributes of God, and his all governing providence, and ſome notion of his moral perfections alſo; yet, being prejudiced againſt the notion of the immortality of the human ſoul, believe that men periſh entirely at death, and that one generation ſhall perpetually ſucceed another, without any future reſtoration or renovation of things. 4. Such as believe the exiſtence of a ſupreme Being, together with his providence in the government of the world, as alſo the obligations of natural religion; but ſo far only as theſe things are diſcoverable by the light of nature alone, without believing any divine revelation. Theſe laſt are the only true deiſts; but as the principles of theſe men would naturally lead them to embrace the Chriſtian revelation, the learned author concludes there is now no conſiſtent ſcheme of deiſm in the world.

DEITY, a term frequently uſed in a ſynonymous ſenſe with God.

DELEGATES, commiſſioners appointed by the king under the great ſeal to hear and determine appeals from the eccleſiaſtical court.

DELEGATION, a commiſſion extraordinary given by a judge to take cognizance of and determine ſome cauſe which ordinarily does not come before him.

DELEGATION, in Scots law, a method of extinguiſhing obligations by the creditor's diſcharging his former debitor upon another becoming bound in his place.

DELETERIOUS, an appellation given to things of a deſtructive or poiſonous nature. See Poison.

DELF, in heraldry, is by ſome ſuppoſed to repreſent a ſquare rod or turf, and to be ſo called from delving, or digging. A delf tenne is due to him that revokes his own challenge, or any way goes from his word; and to ſuch this is given as an abatement to the honour of their arms, and is always placed in the middle of the eſcutcheon. However, if two or more delfs are found in an eſcutcheon, they are not then to be looked upon as ſigns of an abatement, but of honour. Alſo, if it be of metal, or charged upon, it then becomes a charge of perfect bearing.

DELFT, a city of the United Netherlands, in the province of Holland, eight miles north-eaſt of Rotterdam, and thirty ſouth-weſt of Amſterdam: E. long. 4° 5′, and N. lat. 52° 6′.

DELIA, in antiquity, feaſts celebrated by the Athenians in honour of Apollo, ſurnamed Delius.

Delia was alſo a quinquennial feſtival in the iſland of Delos, inſtituted by Theſeus at his return from Crete, in honour of Venus, whoſe ſtatue, given him by Ariadne, he erected on that place, having by her aſſiſtance met with ſucceſs in his expedition.

DELIBAMENTA, in antiquity, a libation to the infernal gods, always offered by pouring downwards. See Libation.

Jus DELIBERANDI, in Scots law, an apparent heir is allowed a year after his predeceſſor's death, called *annus deliberandi*, to deliberate whether he will enter and repreſent him or not, during which time he cannot be purſued for the debts of his predeceſſor. See Scots Law, title 27.

DENTALIUM, in natural hiſtory, a ſhell-fiſh belonging to the order of vermes teſtacea. The ſhell conſiſts of one tubulous ſtrait valve, open at both ends. There are eight ſpecies, diſtinguiſhed by the angles, ſtriæ, &c. of their ſhells.

DENTARIA, or TOOTHWORT, in botany, a genus of the tetradynamia ſiliquoſa claſs. The ſiliqua or pod burſts open by elaſtic valves; the ſtigma is emarginated; and the calix is connivent. There are three ſpecies, only one of which, *viz.* the bulbifera, or coralwort, is a native of Britain.

DENTATED LEAF. See botany, p. 640.

DENTEX, in ichthyology. See SPARUS.

DENTILES, or DENTILS, in architecture, an ornament in corniches bearing ſome reſemblance to teeth, particularly uſed in the Ionic and Corinthian orders. See ARCHITECTURE, p. 352.

DENTIFRICE, in medicine, a remedy for rubbing the teeth, and purging them from ſordes; and for cleanſing and abſterging the gums, when replete with humours. There are dentifrices of various kinds and forms; ſome in form of a powder compoſed of corals, pumice-ſtone, ſalt, allum, egg-ſhells, crabs-claws, hartſhorn, &c. others in form of an electuary, conſiſting of the ſame powders mixt up with honey; others are in form of a liquor drawn by diſtillations from drying herbs, and aſtringent medicines, &c.

DENTILLARIA. See PLUMBAGO.

DENTISCALPRA, in ſurgery, an inſtrument for ſcouring yellow, livid, or black teeth; to which being applied, near the gums, it ſcrapes off the foul morbid cruſt.

DENTITION, the breeding or cutting the teeth in children. See MEDICINE.

DENUNCIATION, a ſolemn publication or promulgation of any thing.

All veſſels of enemies are lawful prizes, after denunciation or proclamation of war. The deſign of the denunciation of excommunicated perſons, is that the ſentence may be the more fully executed by the perſon's being more known.

DENUNCIATION at the horn, in Scots law, is that form by which a debtor, after the expiry of a charge to make payment upon letters of horning, is denounced rebel to the king for diſobedience. No caption for apprehending and impriſoning the debtor can be obtained upon an expired charge of horning till he is firſt denounced rebel, and the horning with the executions of charge and denunciation regiſtered. As to the other legal effects of denunciation, ſee SCOTS LAW, title 12.

DEOBSTRUENTS, in pharmacy, ſuch medicines as open obſtructions. See DETERGENT.

DEODAND, in our cuſtoms, implies a thing devoted or conſecrated to God, for the pacification of his wrath, in caſe of any misfortune; as a perſon's coming to a violent end, without the fault of any reaſonable creature; as if a horſe ſhould ſtrike his keeper, and ſo kill him. In this caſe, the horſe is to be a deodand; that is, he is to be ſold, and the price diſtributed to the poor, as an expiation of that dreadful event.

DEPONENT, in Latin grammar, a term applied to verbs which have active ſignifications, but paſſive terminations or conjugations, and want one of their participles paſſive.

DEPONENT, in the law of Scotland, a perſon who makes a depoſition. See DEPOSITION.

DEPOPULATION, the act of diminiſhing the number of people in any country, whether by war or bad politics.

DEPORTATION, a ſort of baniſhment uſed by the Romans, whereby ſome iſland or other place was allotted to a criminal for the place of his abode, with a prohibition not to ſtir out of the ſame on pain of death.

DEPOSIT, among civilians, ſomething that is committed to the cuſtody of a perſon, to be kept without any reward, and to be returned again on demand.

DEPOSITARY, in law, a perſon intruſted as keeper or guardian of a depoſit.

DEPOSITATION, in Scots law, is a contract by which one commits the cuſtody or poſſeſſion of any thing to another, to be kept for behoof of the owner, and returned on demand, or at any period ſpecified in the contract. The owner is called the depoſitor, and the perſon to whoſe cuſtody the thing is committed the depoſitary. See SCOTS LAW, title 20.

DEPOSITION, in law, the teſtimony given in court by a witneſs upon oath.

DEPRECATION, in rhetoric, a figure whereby the orator invokes the aid and aſſiſtance of ſome one; or prays for ſome great evil or puniſhment to befal him who ſpeaks falſely, either himſelf or his adverſary.

DEPRECATORY, or DEPRECATIVE, in theology, a term applied to the manner of performing ſome ceremonies in the form of prayer.

The form of abſolution is deprecative in the Greek church, being conceived in theſe terms, *May God abſolve you:* whereas it is in the declarative form in the Latin church, and in ſome of the reformed churches, *I abſolve you.*

DEPRESSION *of the pole.* See ASTRONOMY, and GEOGRAPHY.

DEPRESSOR, or DEPRIMENS, in anatomy, a name applied to ſeveral muſcles, becauſe they depreſs the parts they are faſtened to.

DEPRIVATION, in the canon-law, the depoſing a biſhop, parſon, vicar, &c. from his office and preferment.

DEPTFORD, a town three miles eaſt of London, on the ſouthern banks of the Thames; chiefly conſiderable for its fine docks for building ſhips, and the king's yard.

DEPURATION. See CLARIFICATION.

DEPURATORY FEVER, a name given by Sydenham to a fever which prevailed much in the years 1661, 1662, 1663, and 1664. He called it depuratory, becauſe he obſerved, that nature regulated all the ſymptoms in ſuch a manner, as to fit the febrile matter, prepared by proper concoction, for expulſion in a certain time, either by a copious ſweat, or a freer perſpiration.

DEPUTATION, a miſſion of ſelect perſons out of a company or body, to a prince or aſſembly, to treat of matters in their name.

DEPUTY, a perſon ſent upon ſome buſineſs, by ſome community.

Deputy is alſo one that exerciſes an office in another's right; and the forfeiture or miſdemeanor of ſuch deputy ſhall cauſe the perſon whom he repreſents to loſe his office.

DEPUTATUS, among the ancients, a name applied to perſons employed in making of armour: and likewiſe to briſk active people, whoſe buſineſs was to take care of the wounded in engagements, and carry them off the field.

DERBENT, a city of Dagiſtan, on the weſtern coaſt of the Caſpian ſea: E. long. 51°, and 41° 15′ N. lat.

DEREHAM, a market-town of Norfolk, about fifteen miles weſt of Norwich: E. long. 1°, and N. lat. 52° 40′.

DERIVATIVE, in grammar, a word which is derived from another called its primitive. See Primitive.

Thus, *manhood* is derived from *man*, *deity* from *Deus*, and *lawyer* from *law*.

DERMESTES, in zoology, a genus of inſects belonging to the order of coleoptera. The antennæ are clavated, with three of the joints thicker than the reſt; the breaſt is convex; and the head is inflected below the breaſt. There are thirty ſpecies, diſtinguiſhed by their colour, *&c*.

DERNIER ressort. See Ressort.

DEROGATORY, a clauſe importing derogation. A derogatory clauſe in a teſtament, is a certain ſentence, cipher, or ſecret character, which the teſtator inſerts in his will, and of which he reſerves the knowledge to himſelf alone, adding a condition, that no will he may make hereafter is to be reckoned valid, if this derogatory clauſe is not inſerted expreſsly, and word for word. It is a precaution invented by lawyers againſt latter-wills extorted by violence, or obtained by ſuggeſtion.

DERPT, a town of Livonia, ſituated on the river Eimbec: E. long. 28° 10′, and N. lat. 58° 10′.

DERVIS, a name given to all Mahommedan monks, though of various orders. The moſt noted among them are the Bektaſhi, the Mevelevi, the Kadri, and the Seyah. The Bektaſhi, who are allowed to marry and live in cities and towns, are obliged, by the rules of their order, to viſit remote lands, and to ſalute every one they meet with *gazel*, or love-ſongs, and with *eſma*, or the invocation of the names of God, and humbly to wiſh him proſperity, which they do by repeating the word *eivallah*, a ſolemn exclamation of the wreſtlers, by which the conquered yields the palm to the conqueror. The Mevelevi, ſo called from Mevelava their founder, are uſed to turn round for two or three hours together, with ſuch ſwiftneſs that you cannot ſee their faces; they are great lovers of muſic: in their monaſteries they profeſs great humility and poverty, and when viſited make no diſtinction of perſons; they firſt bring their gueſts coffee to drink; and if the ways have been dirty, they waſh their feet and ſandals. The Kadri, with a peculiar ſuperſtition, emaciate their bodies; they go quite naked, except their thighs, and often join hands and dance, ſometimes a whole day, repeating with great vehemence, *hu! hu! hu!* (one of the names of God) till, like madmen, they fall on the ground, foaming at the mouth, and running down with ſweat: the prime vizir Kupruli Achmed Paſha, thinking this ſect unbecoming the Mahommedan religion, ordered it to be ſuppreſſed; but, after his death, it revived, and is at preſent more numerous than ever, eſpecially at Conſtantinople. The Seyah are wanderers, and though they have monaſteries, yet they often ſpend their whole life in travelling; when they are ſent out, their ſuperiors impoſe upon them ſuch a quantity of money or proviſions, forbidding them to come back till they have procured it, and ſent it to the monaſtery; wherefore when a Seyah comes into a town, he cries aloud in the market-place, *Ya allah ſenden*, &c. *O God! give me, I pray, five thouſand crowns*, or *a thouſand meaſures of rice*. Many of theſe derviſes travel over the whole Mahommedan world, entertaining the people where-ever they come, with agreeable relations of all the curioſities they have met with. There are derviſes in Egypt, who live with their families, and exerciſe their trades, of which kind are the dancing derviſes at Damaſcus. They are all diſtinguiſhed among themſelves by the different forms and colours of their habits; thoſe of Perſia wear blue; the ſolitaries and wanderers wear only rags of different colours; others carry on their heads a plume made of the feathers of a cock; and thoſe of Egypt wear an octagonal badge of a greeniſh white alabaſter at their girdles, and a high ſtiff cap, without any thing round it.

DERWENT, a river, which, taking its riſe in the north riding of Yorkſhire, runs ſouth, and falls into the Ouſe.

Derwent-water, a river of Cumberland, which falls into the Iriſh ſea below Cockermouth.

DESART, a large extent of country entirely barren, and producing nothing. In this ſenſe ſome are ſandy deſarts, as thoſe of Lop, Xamo, Arabia, and ſeveral others in Aſia; in Africa, thoſe of Lybia and Zara: others are ſtony, as the deſart of Pharan in Arabia Petrea.

The Desart, abſolutely ſo called, is that part of Arabia, ſouth of the Holy Land, where the children of Iſrael wandered forty years.

DESCANT, in muſic, the art of compoſing in ſeveral parts. See Music.

DESCENDENTS, in Scots law. The iſſue of a common parent *in infinitum* are called his deſcendents.

DESCENSION, in aſtronomy, is either right or oblique.

Right Descension is an arch of the equinoctial, intercepted between the next equinoctial point and the interſection of the meridian, paſſing through the centre of the object, at its ſetting, in a right ſphere.

Oblique Descension, an arch of the equinoctial, intercepted between the next equinoctial point and the horizon, paſſing through the centre of the object, at its ſetting, in an oblique ſphere.

DESCENT, in general, is the tendency of a body from a higher to a lower place; thus all bodies, unleſs otherwiſe determined by a force ſuperior to their gravity, deſcend towards the centre of the earth. See MECHANICS.

DESCENT, or **DISCENT**, in law, an order or method whereby lands or tenements are derived to any man from his anceſtors.

DESCENT, in genealogy, the order or ſucceſſion of deſcendants in a line or family; or their diſtance from a common progenitor: thus we ſay, one deſcent, two deſcents, *&c*.

DESCENT, in heraldy, is uſed to expreſs the coming down of any thing from above; as, a lion en deſcent, is a lion with his head towards the baſe points, and his heels towards one of the corners of the chief, as if he were leaping down from ſome high place.

DESCRIPTION, is ſuch a ſtrong and beautiful repreſentation of a thing, as gives the reader a diſtinct view and ſatisfactory notion of it. See NARRATION *and Deſcription*.

DESEADA, or DESIDERADA, one of the Caribbee-iſlands, ſubject to France, lying eaſtward of Guardaloupe. See CARIBBEE.

DESERTER, in a military ſenſe, a ſoldier who, by running away from his regiment or company, abandons the ſervice.

A deſerter is, by the articles of war, puniſhable by death, and, after conviction, is hanged at the head of the regiment he formerly belonged to, with his crime writ on his breaſt.

DESERTION, in Scots Law, when one of the married perſons deſerts or forſakes the other. Wilful deſertion for four years together is a ground of divorce. See SCOTS LAW, title 6.

DESHACHE', in heraldry, is where a beaſt has its limbs ſeparated from its body, ſo that they ſtill remain on the eſcutcheon, with only a ſmall ſeparation from their natural places.

DESIDERATUM is uſed to ſignify the deſirable perfections in any art or ſcience: thus, it is a deſideratum with the blackſmith, to render iron fuſible by a gentle heat, and yet preſerve it hard enough for ordinary uſes; with the glaſsman, and looking-glaſs maker, to render glaſs malleable; with the clock-maker, to bring pendulums to be uſeful where there are irregular motions, *&c*.

DESIGN, in a general ſenſe, the plan, order, repreſentation, or conſtruction of a building, book, painting, *&c*.

DESIGN, in the manufactories, expreſſes the figures wherewith the workman enriches his ſtuff, or ſilk, and which he copies after ſome painter, or eminent draughts-man, as in diaper, damaſk, and other flowered ſilk and tapeſtry, and the like.

In undertaking of ſuch kinds of figured ſtuffs, it is neceſſary, ſays Monſ. Savary, that, before the firſt ſtroke of the ſhuttle, the whole deſign be repreſented on the threads of the warp; we do not mean in colours, but with an infinite number of little packthreads, which, being diſpoſed ſo as to raiſe the threads of the warp, let the workmen ſee, from time to time, what kind of ſilk is to be put in the eye of the ſhuttle for woof. This method of preparing the work is called reading the deſign, and reading the figure, which is performed in the following manner: a paper is provided, conſiderably broader than the ſtuff, and of a length proportionate to what is intended to be repreſented thereon. This they divide lengthwiſe, by as many black lines as there are intended threads in the warp; and croſs theſe lines, by others drawn breadthwiſe, which, with the former, make little equal ſquares: on the paper thus ſquared, the draughtsman deſigns his figures, and heightens them with colours, as he ſees fit. When the deſign is finiſhed, a workman reads it, while another lays it on the ſimblot.

To read the deſign, is to tell the perſon who manages the loom, the number of ſquares, or threads, compriſed in the ſpace he is reading, intimating at the ſame time, whether it is ground or figure. To put what is read on the ſimblot, is to faſten little ſtrings to the ſeveral packthreads, which are to raiſe the threads named; and thus they continue to do till the whole deſign is read.

Every piece being compoſed of ſeveral repetitions of the ſame deſign, when the whole deſign is drawn, the drawer, to re-begin the deſign afreſh, has nothing to do but to raiſe the little ſtrings, with ſlip-knots, to the top of the ſimblot, which he had let down to the bottom: this he is to repeat as often as is neceſſary till the whole be manufactured.

The ribbon-weavers have likewiſe a deſign, but far more ſimple than that now deſcribed. It is drawn on paper with lines and ſquares, repreſenting the threads of the warp and woof. But inſtead of lines, whereof the figures of the former conſiſt, theſe are conſtituted of points only, or dots, placed in certain of the little ſquares, formed by the interſection of the lines. Theſe points mark the threads of the warp that are to be raiſed, and the ſpaces left blank denote the threads that are to keep their ſituation: the reſt is managed as in the former.

DESIGN is alſo uſed, in painting, for the firſt idea of a large work, drawn roughly, and in little, with an intention to be executed and finiſhed in large.

Deſign, in painting, is the ſimple contour, or outlines of the figures intended to be repreſented, or the lines that terminate and circumſcribe them: ſuch deſign is ſometimes drawn in crayons, or ink, without any ſhadows at all; ſometimes it is hatched, that is, the ſhadows are expreſſed by ſenſible outlines, uſually drawn acroſs each other with the pen, crayon, or graver. Sometimes, again, the ſhadows are done with the crayon rubbed ſo as that there do not appear any lines: at other times, the grains or ſtrokes of the crayon appear, as not being rubbed: ſometimes the deſign is waſhed, that is, the ſhadows are done with a pencil in Indian ink, or ſome other liquor; and ſometimes

times the deſign is coloured, that is, colours are laid on much like thoſe intended for the grand work.

The eſſential requiſites of a deſign are correctneſs, good taſte, elegance, character, diverſity, expreſſion, and perſpective. Correctneſs depends on the juſtneſs of the proportions, and knowledge of anatomy. Taſte is a certain manner of correctneſs peculiar to one's ſelf, derived either from nature, maſters, or ſtudies, or all of them united. Elegance gives a delicacy that not only ſtrikes perſons of judgment, but communicates an agreeableneſs that pleaſes univerſally. The character is what is peculiar to each thing, wherein there muſt be diverſity, inſomuch that every thing has its peculiar character to diſtinguiſh it. The expreſſion is the repreſentation of an object, according to the circumſtances it is ſuppoſed to be in. Perſpective is the repreſentation of the parts of a painting or a figure, according to the ſituation they are in with regard to the point of ſight. The deſign or draught, is a part of the greateſt import and extent in painting. It is acquired chiefly by genius and application, rules being of leſs avail here than in any other branches of the art, as colouring, *&c.* The principal rules that regard deſign are, that novices accuſtom themſelves to copy good originals at firſt ſight; not to uſe ſquares in drawing, leſt they ſtint and confine their judgment; to deſign well from life, before they practiſe perſpective; to learn to adjuſt the ſize of their figures to the viſual angle, and the diſtance of the eye from the model or object; to mark out all the parts of their deſign before they begin to ſhade; to make their contours in great pieces, without taking notice of the little muſcles, and other breaks; to make themſelves maſters of the rules of perſpective; to obſerve the perpendicular, parallel, and diſtance of every ſtroke; to compare and oppoſe the parts that meet and traverſe the perpendicular, ſo as to form a kind of ſquare in the mind, which is the great and almoſt the only rule of deſigning juſtly; to have a regard not only to the model, but to the parts already deſigned, there being no ſuch thing as deſigning with ſtrict juſtneſs, but by comparing and proportioning every part to the firſt. All the other rules relate to perſpective. See PERSPECTIVE.

DESION, the Macedonian name of the month called by the Athenians antheſterion.

DESISE, a town of France, ſituated on the river Loire, fifteen miles ſouth-eaſt of Nevers: E. long. 3° 32′, N. lat. 46° 48′.

DESPOTICAL, in general, denotes any thing that is uncontrouled and abſolute; but is particularly uſed for an arbitrary government, where the power of the prince is unlimited, and his will a law to his ſubjects: ſuch are thoſe of Turky, Perſia, and moſt of the eaſtern governments; and even thoſe of Europe, if we except the republics, our own, and the Swediſh government.

DESPOUILLE′, in heraldry, the whole caſe, ſkin, or ſlough of a beaſt, with the head, feet, tail, and all appurtenances, ſo that being filled and ſtuffed it looks like the entire creature.

DESSAW, a city of upper Saxony, in Germany, ſituated on the river Elbe, ſixty miles north-weſt of Dreſden, and ſubject to the prince of Anhalt Deſſaw: E. long. 12° 40′, N. lat. 51° 50′.

DESSERT, or DESART, a ſervice of fruits and ſweetmeats, uſually ſerved up laſt to table.

DESSICCATIVE, or DESICCATIVE, in pharmacy, an epithet applied to ſuch topical medicines as dry up the humours flowing to a wound or ulcer.

DESTINIES, in mythology. See PARCÆ.

DESTINY, among philoſophers and divines. See FATE.

DESTRUCTION, in general, an alteration of any thing from its natural ſtate to one contrary to nature; whereby it is deemed the ſame with corruption. See CORRUPTION.

A chemical deſtruction, or corruption, is nothing but a reſolution of the whole naturally mixt body into its parts.

DESUDATION, in medicine, a profuſe and inordinate ſweat, ſucceeded by an eruption of puſtules, called ſudamina, or heat pimples.

DETACHMENT, in military affairs, a certain number of ſoldiers drawn out from ſeveral regiments or companies equally, to be employed as the general thinks proper, whether on an attack, at a ſiege, or in parties to ſcower the country.

DETERGENTS, in pharmacy, ſuch medicines as are not only ſoftening and adheſive, but alſo, by a peculiar activity, conjoined with a ſuitable configuration of parts, are apt to abrade and carry along with them ſuch particles as they lay hold on in their paſſage.

DETERIORATION, the impairing or rendering a thing worſe: it is juſt the reverſe of melioration. See MELIORATION.

DETERMINATION, in mechanics, ſignifies much the ſame with the tendency or direction of a body in motion. See MECHANICS.

DETERMINATION, among ſchool-divines, is an act of divine power, limiting the agency of ſecond cauſes, in every inſtance, to what the Deity predeſtinated concerning them. See PREDESTINATION.

DETERSIVES, in pharmacy. See DETERGENTS.

DETHMOLD, a town of Weſtphalia, in Germany, fifteen miles north of Paderborn: E. long. 8° 35′, N. lat. 52°.

DETINUE, in law, a writ or action that lies againſt one who has got goods or other things delivered to him to keep, and afterwards refuſes to deliver them.

DETONATION, in chemiſtry, the noiſe and exploſion which any ſubſtance makes upon the application of fire to it. It is alſo called fulmination. See CHEMISTRY.

DETRANCHE′, in heraldry, a line bendwiſe, proceeding always from the dexter ſide, but not from the very angle, diagonally athwart the ſhield.

DETTINGEN, a village of Germany, about nine miles eaſt of Hanau, in the circle of the upper Rhine: E. long. 8° 45, and N. lat. 50° 8′.

DEVA, a port-town of Spain, ſituated on the bay of Biſcay, forty miles eaſt of Bilboa: W. long. 2° 10′, and N. lat. 43° 20′.

DEVENTER, a city of the united Provinces, and province of Overyſſel, about eight miles north of Zutphen: E. long. 6°, and N. lat. 52° 20′.

DEVICE, among painters. See DEVISE.

DEVIL, an evil angel, one of thoſe celeſtial ſpirits caſt down from heaven for pretending to equal himſelf with God. The Ethiopians paint the devil white, to be even with the Europeans who paint him black. There is no mention of the word devil in the Old Teſtament, but only of the word Satan and Belial: nor do we meet with it in any heathen authors, in the ſenſe it is taken among Chriſtians, that is, as a creature revolted from God. Their theology went no farther than to evil genii, or dæmons.

Some of the American idolaters have a notion of two collateral independent beings, one of whom is good, and the other evil; which laſt they imagine has the direction and ſuperintendance of this earth, for which reaſon they chiefly worſhip him: whence thoſe that give us an account of the religion of theſe ſavages give out, with ſome impropriety, that they worſhip the devil. The Chaldeans, in like manner, believed both a good principle and an evil one, which laſt they imagined was an enemy to mankind.

Iſaiah, ſpeaking, according to ſome commentators, of the fall of the devil, calls him Lucifer, from his former elevation and ſtate of glory: but others explain this paſſage of Iſaiah in reference to the king of Babylon, who had been precipitated from his throne and glory. The Arabians call Lucifer, Eblis, which ſome think is only a diminutive or corruption of the word Diabolus.

DEVIL-IN-A-BUSH, in botany. See NIGELLA.

DEVIL'S BIT. See SCABIOSA.

DEVINCTION, in antiquity, a kind of love-charm, deſcribed by Virgil in his eighth eclogue: it conſiſted in tying certain knots, and repeating a formula of words.

DEVISE, or DEVICE, in heraldry, painting, and ſculpture, any emblem uſed to repreſent a certain family, perſon, action, or quality; with a ſuitable motto, applied in a figurative ſenſe. See MOTTO.

DEVISE, in law, the act whereby a perſon bequeaths his lands or tenements to another by his laſt will and teſtament.

DEVISES, a borough town in Wiltſhire, eighteen miles north-weſt of Saliſbury: W. long. 2° 6′, and N. lat. 51° 25′. It ſends two members to parliament.

DEUNX, in Roman antiquity, eleven ounces, or $\frac{11}{12}$ parts of the libra. See LIBRA.

DEVOLUTION, in law, a right acquired by ſucceſſion from one to another.

DEVONSHIRE, a county in the weſt of England, bounded by the Briſtol channel, on the north; by Somerſetſhire and Dorſetſhire, on the eaſt; by the Engliſh channel, on the ſouth; and by Cornwal, on the weſt. From this county the noble family of Cavendiſh take the title of duke.

DEVOTION, a ſincere ardent worſhip of the deity. See PRAYER, ADORATION, WORSHIP, &c.

DEUTERONOMY, a canonical book of the Old Teſtament, and the laſt of the pentateuch of Moſes. See BIBLE.

DEUTEROPOTMI, in Grecian antiquity, a deſignation given to ſuch of the Athenians as had been thought dead, and, after the celebration of the funeral rites, unexpectedly recovered. It was unlawful for the deuteropotmi to enter into the temple of the Eumenides, or to be admitted to the holy rites, till after they were purified, by being let through the lap of a woman's gown, that they might ſeem to be new born.

DEUTEROSIS, the Greek name by which the Jews called their Miſchnah, or ſecond law. See MISCHNAH.

DEUX PONTS, a city of Germany, in the palatinate of the Rhine, ſixty miles north-eaſt of Nancy: E. long. 7° 15′, and N. lat. 49° 25′.

DEW, a denſe moiſt vapour, falling on the earth in form of a miſling rain, while the ſun is below the horizon. See PNEUMATICS.

DEW-BORN, in country affairs, a diſtemper in cattle, being a ſwelling in the body, as much as the ſkin can hold, ſo that ſome beaſts are in danger of burſting. This diſtemper proceeds from the greedineſs of a beaſt to feed, when put into a rank paſture: but commonly when the graſs is full of water. In this caſe the beaſt ſhould be ſtirred up and down, and made to purge well: but the proper cure is bleeding in the tail; then take a grated nutmeg, with an egg, and breaking the top of the ſhell, put out ſo much of the white as you may have room to ſlip the nutmeg into the ſhell; mix them together, and then let ſhell and all be put down the beaſt's throat; that done, walk him up and down, and he will ſoon mend.

DEXTANS, in Roman antiquity, ten ounces, or $\frac{10}{12}$ of their libra. See LIBRA.

DEXTER, in heraldry, an appellation given to whatever belongs to the right ſide of a ſhield, or coat of arms: thus we ſay, bend-dexter, dexter-point, *&c.* See BEND, POINT, *&c.*

DEXTROCHERE, or DESTROCHERE, in heraldry, is applied to the right arm painted in a ſhield, ſometimes naked, ſometimes cloathed, or adorned with a bracelet; and ſometimes armed, or holding ſome moveable, or member uſed in the arms.

DEY, in matters of government, the ſovereign prince of Algiers, anſwering to the bay of Tunis. See BEY.

DEYNSE, a town of Flanders, nine miles ſouth weſt of Ghent: E. long. 3° 30′, N. lat. 51°.

DIABETES, in phyſic, an exceſſive diſcharge of urine, which comes away crude, and exceeds the quantity of liquids drank. See MEDICINE.

DIABOLUS. See DEVIL.

DIABOLUS MARINUS. See RAIA.

DIABOLUS METELLORUM, a title given by chemiſts to jupiter or tin, becauſe, when incorporated with other metals, it renders them uncapable of reduction, or at leaſt very difficult to undergo that operation.

DIABROSIS, in medicine. See ANABROSIS.

DIACARYON, in pharmacy. See DIANUCUM.

DIACAUSTIC CURVE, a ſpecies of the cauſtic curves formed by refraction.

DIACHYLON, in pharmacy, an emollient digeſtive plaiſter, compoſed of mucilages or viſcid juices drawn from certain plants.

DIACODIUM, in pharmacy, a ſyrup prepared from poppy heads. It is alſo called the ſyrupus de meconio. As it is of conſequence that all the circumſtances in the directions for compounding this medicine, be exactly followed, we here give the method of preparing it from the London Diſpenſatory. Take of the heads of dried white poppies without their ſeeds, three pounds and a half; of water, ſix gallons. Slice the heads, and boil them in the water, often ſtirring them that they may not burn, till about a third only of the liquor is left, which will be almoſt all imbibed by the poppy heads: then take all from the fire, and preſs the liquor ſtrongly out from the heads; in the next place, boil the liquor by itſelf, to about two quarts, and ſtrain it while hot, firſt through a ſieve, and then through a thin flannel: ſet it by for a night, that what fæces have paſſed the ſtrainers, may ſubſide; next morning pour off the clear liquor, and boil it with ſix pounds of double refined ſugar, till the whole comes to the weight of nine pounds, or a little more, that it may become a ſyrup of a juſt conſiſtence. This ſyrup partakes of all the virtues of the poppy.

DIACOUSTICS, called alſo DIAPHONICS, the conſideration of the properties of refracted ſound, as it paſſes through different mediums.

DIADELPHIA, in the Linnæan ſyſtem of botany. See Vol. I. p. 635.

DIADEM, in antiquity, a head-band, or fillet, worn by kings as a badge of their royalty. It was made of ſilk, thread, or wool, and tied round the temples and forehead, the ends being tied behind, and let fall on the neck. It was uſually white, and quite plain, though ſometimes embroidered with gold, and ſet with pearls and precious ſtones. In latter times, it came to be twiſted round crowns, laurels, *&c.* and even appears to have been worn on divers parts of the body. See CROWN.

DIADEM, in heraldry, is applied to certain circles, or rims, ſerving to incloſe the crowns of ſovereign princes, and to bear the globe and croſs, or the flower de luces for their creſt. The crowns of ſovereigns are bound, ſome with a greater, and ſome with a leſs number of diadems. The bandage about the heads of moors on ſhields is alſo called diadem, in blazoning.

DIÆRESIS, in ſurgery, an operation ſerving to divide and ſeparate the part when the continuity is a hindrance to the cure.

DIÆRESIS, in medicine, is the conſuming of the veſſels of an animal body, when from ſome corroding cauſe certain paſſages are made, which naturally ought not to have been; or certain natural paſſages are dilated beyond their ordinary dimenſions, ſo that the humours which ought to have been contained in the veſſels extravaſate or run out.

DIÆRESIS, in grammar, the diviſion of one ſyllable into two, which is uſually noted by two points over a letter, as aulaï inſtead of aulæ, diſſolüenda for diſſolvenda.

DIÆTETÆ, in Grecian antiquity, a kind of judges, of which there were two ſorts, the cleroti and diallacterii. The former were public arbitrators, choſen by lot to determine all cauſes exceeding ten drachms, within their own tribe, and from their ſentence an appeal lay to the ſuperior courts.

The diallacterii, on the contrary, were private arbitrators from whoſe ſentence there lay no appeal, and accordingly they always took an oath to adminiſter juſtice without partiality.

DIAGLYPHICE, the art of cutting or engraving figures on metals, ſuch as ſeals, intaglias, matrices of letters, *&c.* or coins for medals.

DIAGNOSTIC, in medicine, a term given to thoſe ſigns which indicate the preſent ſtate of a diſeaſe, its nature and cauſe.

DIAGONAL, in geometry, a right line drawn acroſs a quadrilateral figure, from one angle to another, by ſome called the diameter, and by others the diametral of the figure. See GEOMETRY.

DIAGRAM, in geometry, a ſcheme for explaining and demonſtrating the properties of any figure, whether triangle, ſquare, circle, *&c.* See GEOMETRY.

DIAGRAM, among ancient muſicians. See SCALE.

DIAHEXAPLA, or DIAHEXAPTE, among farriers, a compound medicine, ſo called from its containing ſix ingredients, *viz.* birthwort and gentian roots, juniper-berries, bay-berries, myrrh, and ivory ſhavings. It is commended for colds, conſumptions, purſineſs, and many other diſorders in horſes.

DIAL. A dial is a plane, upon which lines are deſcribed in ſuch a manner, that the ſhadow of a wire, or of the upper edge of another plane, erected perpendicularly on the former, may ſhew the true time of the day.

The edge of the plane by which the time of the day is found, is called the ſtile of the dial, which muſt be parallel to the earth's axis; and the line on which the ſaid plane is erected, is called the ſubſtile.

The angle included between the ſubſtile and ſtile, is called the elevation, or height of the ſtile.

Thoſe dials whoſe planes are parallel to the plane of the horizon, are called horizontal dials; and thoſe dials whoſe planes are perpendicular to the plane of the horizon, are called vertical, or erect dials.

Thoſe erect dials, whoſe planes directly front the north or ſouth, are called direct north or ſouth dials; and all other erect dials are called decliners, becauſe their planes are turned away from the north or ſouth.

Thoſe dials whoſe planes are neither parallel nor perpendicular to the plane of the horizon, are called inclining, or reclining dials, according as their planes make acute or obtuſe angles with the horizon; and if their planes are alſo turned aſide from facing the ſouth or north, they are called declining-inclining, or declining-reclining dials.

The interſection of the plane of the dial, with that of the meridian, paſſing through the ſtile, is called the meridian of the dial, or the hour-line of XII.

Thoſe meridians, whoſe planes paſs through the ſtile, and make angles of 15, 30, 45, 60, 75, and 90 degrees with the meridian of the place (which marks the hour-line of XII.) are called hour-circles; and their interſections with the plane of the dial are called hour-lines.

In all declining dials, the ſubſtile makes an angle with the hour-line of XII; and this angle is called the diſtance of the ſubſtile from the meridian.

The declining plane's difference of longitude, is the angle formed at the interſection of the ſtile and plane of the dial, by two meridians; one of which paſſes through the hour-line of XII. and the other through the ſubſtile.

This much being premiſed concerning dials in general, we ſhall now proceed to explain the different methods of their conſtruction.

If the whole earth *aPcp*, (Plate LXIX. fig. 1.) were it tranſparent, and hollow, like a ſphere of glaſs, and had its equator divided into 24 equal parts by ſo many meridian ſemicircles, *a*, *b*, *c*, *d*, *e*, *f*, *g*, &c. one of which is the geographical meridian of any given place, as London (which is ſuppoſed to be at the point *a*;) and if the hours of XII were marked at the equator, both upon that meridian and the oppoſite one, and all the reſt of the hours in order on the reſt of the meridians, thoſe meridians would be the hour-circles of London: then, if the ſphere had an opake axis, as *PEp*, terminating in the poles *P* and *p*, the ſhadow of the axis would fall upon every particular meridian and hour, when the ſun came to the plane of the oppoſite meridian, and would conſequently ſhew the time at London, and at all other places on the meridian of London.

If this ſphere was cut through the middle by a ſolid plane *ABCD*, in the rational horizon of London, one half of the axis *EP* would be above the plane, and the other half below it; and if ſtraight lines were drawn from the centre of the plane, to thoſe points where its circumference is cut by the hour-circles of the ſphere, thoſe lines would be the hour-lines of a horizontal dial for London: for the ſhadow of the axis would fall upon each particular hour-line of the dial, when it fell upon the like hour-circle of the ſphere.

If the plane which cuts the ſphere be upright, as *AFCG*, fig. 2. touching the given place (London) at *F*, and directly facing the meridian of London, it will then become the plane of an erect direct ſouth dial: and if right lines be drawn from its center *E*, to thoſe points of its circumference where the hour-circles of the ſphere cut it, theſe will be the hour-lines of a vertical or direct ſouth dial for London, to which the hours are to be ſet as in the figure (contrary to thoſe on a horizontal dial), and the lower half *Ep* of the axis will caſt a ſhadow on the hour of the day in this dial, at the ſame time that it would fall upon the like hour-circle of the ſphere, if the dial-plane was not in the way.

If the plane (ſtill facing the meridian) be made to incline, or recline, any given number of degrees, the hour-circles of the ſphere will ſtill cut the edge of the plane in thoſe points to which the hour-lines muſt be drawn ſtraight from the center; and the axis of the ſphere will caſt a ſhadow on theſe lines at the reſpective hours The like will ſtill hold, if the plane be made to decline by any given number of degrees from the meridian toward the eaſt or weſt: provided the declination be leſs than 90 degrees, or the reclination be leſs than the co-latitude of the place: and the axis of the ſphere will be a gnomon, or ſtile, for the dial. But it cannot be a gnomon, when the declination is quite 90 degrees, nor when the reclination is equal to the co-latitude; becauſe in theſe two caſes, the axis has no elevation above the plane of the dial.

And thus it appears, that the plane of every dial repreſents the plane of ſome great circle upon the earth; and the gnomon [illegible]e earth's axis, whether it be a ſmall wire, as in the above figures, or the edge of a thin plate, as in the common horizontal dials.

The whole earth, as to its bulk, is but a point, if compared to its diſtance from the ſun: and therefore, if a ſmall ſphere of glaſs be placed upon any part of the earth's ſurface, ſo that its axis be parallel to the axis of the earth, and the ſphere have ſuch lines upon it, and ſuch planes within it, as above deſcribed; it will ſhew the hours of the day as truly as if it were placed at the earth's cen[illegible], and the ſhell of the earth were as tranſparent as glaſs.

But becauſe it is impoſſible to have a hollow ſphere of glaſs perfectly true, blown round a ſolid plane; or if it was, we could not get at the plane within the glaſs to ſet it in any given poſition; we [illegible]ke uſe of a wire-ſphere to explain the principles of dialing, by joining 24 ſemicircles together at the poles, and putting a thin flat plate of braſs within it.

A common globe, of 12 inches diameter, has generally 24 meridian ſemicircles drawn upon it. If ſuch a globe be elevated to the latitude of any given place, and turned about until one of theſe meridians cut the horizon in the north point, where the hour of XII is ſuppoſed to be marked, the reſt of the meridians will cut the horizon at the reſpective diſtances of all the other hours from XII. Then if theſe points of diſtance be marked on the horizon, and the globe be taken out of the horizon, and a flat board or plate be put into its place, even with the ſurface of the horizon; and if ſtraight lines be drawn from the center of the board, to thoſe points of diſtance on the horizon which were cut by the 24 meridian ſemicircles, theſe lines will be the hour-lines of a horizontal dial for that latitude, the edge of whoſe gnomon muſt be in the very ſame ſituation that the axis of the globe was, before it was taken out of the horizon: that is, the gnomon muſt make an angle with the plain of the dial, equal to the latitude of the place for which the dial is made.

If the pole of the globe be elevated to the co-latitude of the given place, and any meridian be brought to the north point of the horizon, the reſt of the meridians will cut the horizon in the reſpective diſtances of all the hours from XII, for a direct ſouth dial, whoſe gnomon muſt be an angle with the plane of the dial, equal to the colatitude of the place; and the hours muſt be ſet the contrary way on this dial to what they are on the horizontal.

But if your globe have more than 24 meridian ſemicircles upon it, you muſt take the following method for making *horizontal* and *ſouth dials*.

Elevate the pole to the latitude of your place, and turn the globe until any particular meridian (ſuppoſe the firſt) comes to the north point of the horizon, and the oppoſite meridian will cut the horizon in the ſouth. Then, ſet the hour-index to the uppermoſt XII on its circle;

4 AP 54

Fig. 1.

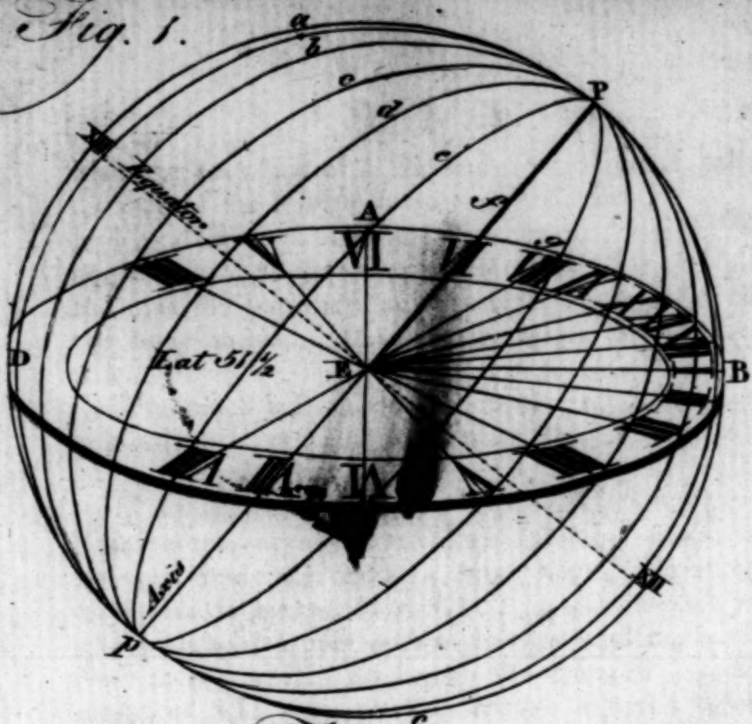
a
b
c
d
e
f
P
XII
Equator
A
VI
D
E
Lat 51½
B
Axis
p
c
XII

Fig. 2.

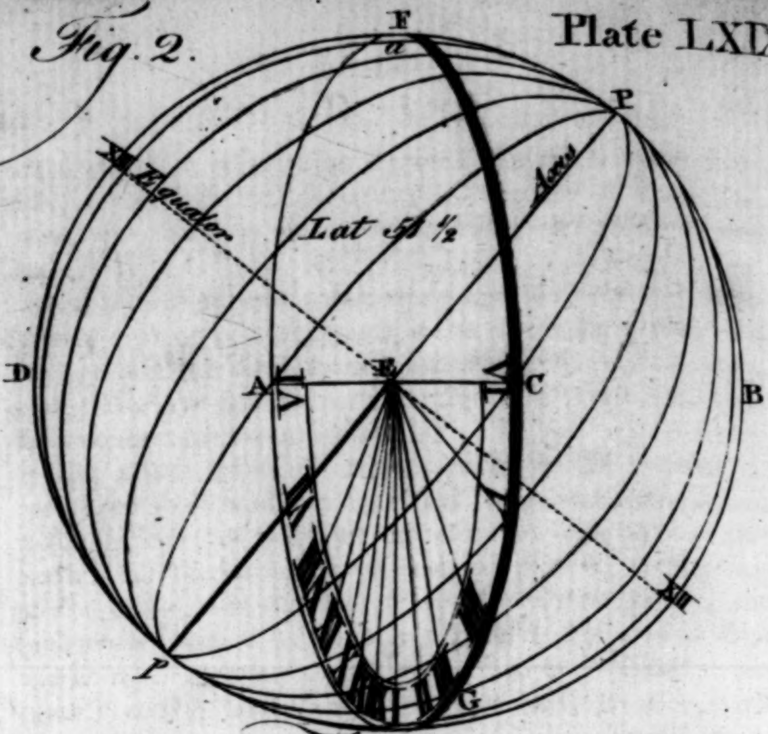
F
a
P
XII
Equator
Axis
Lat 51½
D
A
E
C
B
XII
p
G

Fig. 3.

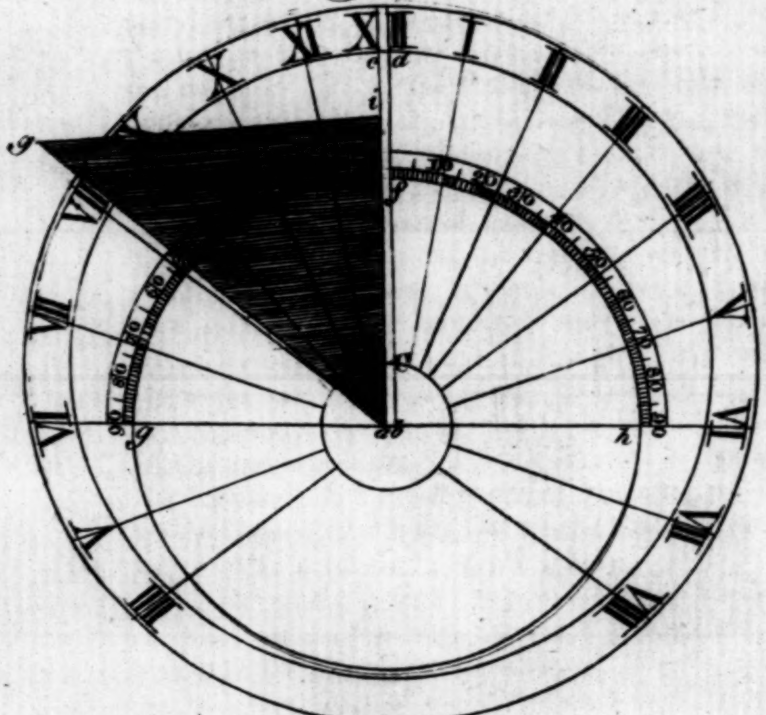
XII
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Fig. 4.

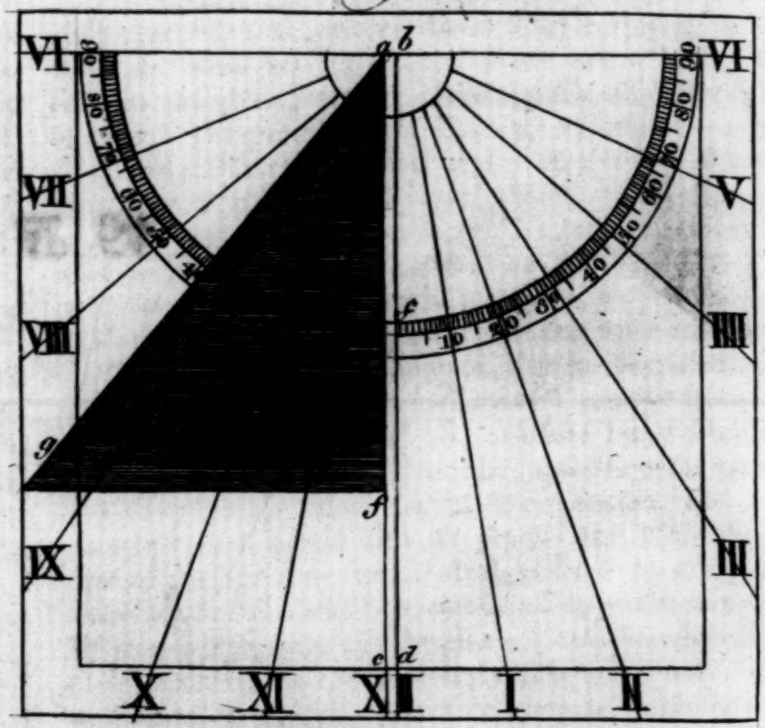
VI
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Fig. 5.

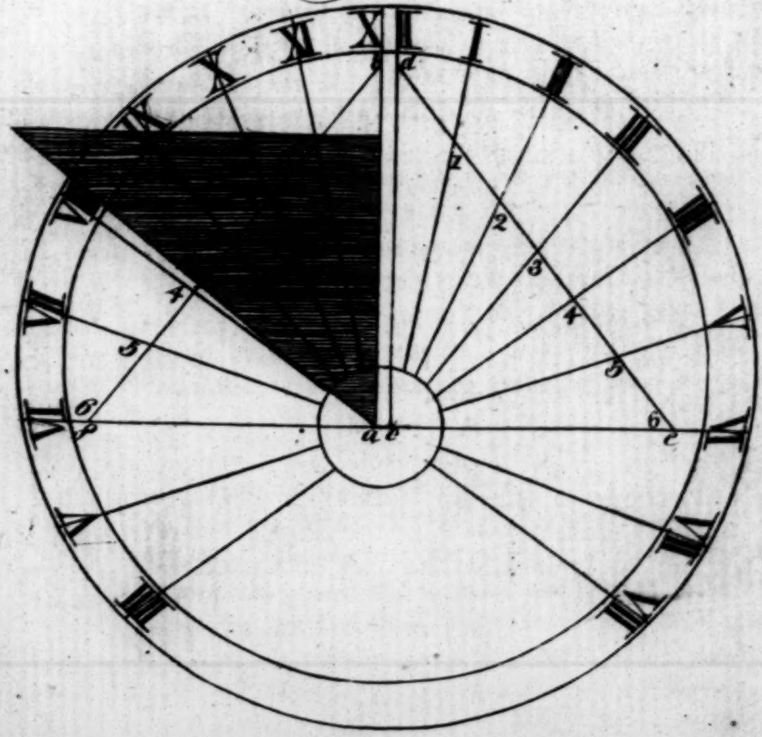
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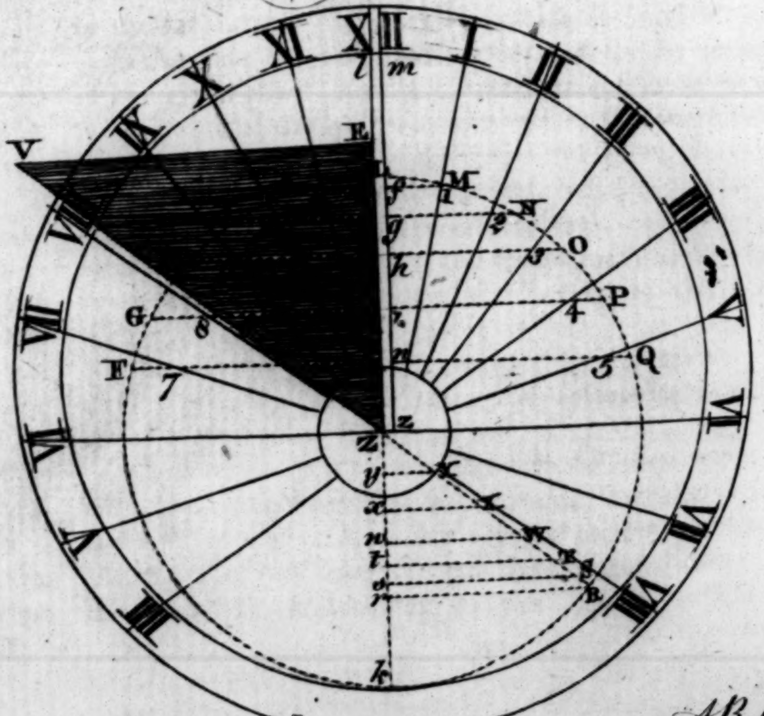
Fig. 6.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A. Bell, Sculpt.

circle; which done, turn the globe weſtward until 15 degrees of the equator paſs under the braſen meridian, and then the hour-index will be at I (for the ſun moves 15 degrees every hour) and the firſt meridian will cut the horizon in the number of degrees from the north point, that I is diſtant from XII. Turn on, until other 15 degrees of the equator paſs under the braſen meridian, and the hour-index will then be at II, and the firſt meridian will cut the horizon in the number of degrees that II is diſtant from XII: and ſo, by making 15 degrees of the equator paſs under the braſen meridian for every hour, the firſt meridian of the globe will cut the horizon in the diſtances of all the hours from XII to VI, which is diſtant juſt 90 degrees; and then you need go no farther, for the diſtances of XI, X, IX, VIII, VII, and VI, in the forenoon, are the ſame from XII, as the diſtances of I, II, III, IIII, V, and VI, in the afternoon: and theſe hour-lines continued through the center, will give the oppoſite hour-lines on the other half of the dial.

Thus, to make a horizontal dial for the latitude of London, which is 51$\frac{1}{2}$ degrees north, elevate the north pole of the globe 51$\frac{1}{2}$ degrees above the north point of the horizon, and then turn the globe, until the firſt meridian (which is that of London on the Engliſh terreſtrial globe) cuts the north point of the horizon, and ſet the hour-index to XII at noon.

Then turning the globe weſtward until the index points ſucceſſively to I, II, III, IIII, V, and VI, in the afternoon, or until 15, 30, 45, 60, 75, and 90 degrees of the equator paſs under the braſen meridian, you will find that the firſt meridian of the globe cuts the horizon in the following numbers of degrees from the north towards the eaſt, *viz.* 11$\frac{2}{3}$, 24$\frac{1}{4}$, 38$\frac{1}{12}$, 53$\frac{1}{2}$, 71 $\frac{1}{5}$, and 90; which are the reſpective diſtances of the above hours from XII upon the plane of the horizon.

To transfer theſe, and the reſt of the hours, to a horizontal plane, draw the parallel right lines *a c* and *d b*, (Plate LXIX. fig. 3.) upon that plane, as far from each other as is equal to the intended thickneſs of the gnomon or ſtile of the dial, and the ſpace included between them will be the meridian or twelve o'clock line on the dial. Croſs this meridian at right angles with the ſix o'clock line *g h*, and ſetting one foot of your compaſſes in the interſection *a*, as a center, deſcribe the quadrant *g e* with any convenient radius or opening of the compaſſes: then, ſetting one foot in the interſection *b*, as a center, with the ſame radius deſcribe the quadrant *f h*, and divide each quadrant into 90 equal parts or degrees, as in the figure.

Becauſe the hour-lines are leſs diſtant from each other about noon, than in any other part of the dial, it is beſt to have the centers of theſe quadrants at a little diſtance from the center of the dial-plane, on the ſide oppoſite to XII, in order to enlarge the hour-diſtances thereabouts, under the ſame angles on the plane. Thus, the center of the plane is at *C*, but the centers of the quadrants are at *a* and *b*.

Lay a ruler over the point *b* (and keeping it there for the center of all the afternoon hours in the quadrant *f h*) draw the hour-line of I through 11$\frac{2}{3}$degrees in the quadrant; the hour-line of II, through 24$\frac{1}{4}$ degrees; of III, through 38$\frac{1}{12}$ degrees; IIII, through 53$\frac{1}{2}$; and V, through 71$\frac{1}{15}$: and becauſe the ſun riſes about four in the morning, on the longeſt days at London, continue the hour-lines of IIII and V in the afternoon through the center *b* to the oppoſite ſide of the dial.—This done, lay the ruler to the center *a* of the quadrant *e g*, and through the like diviſions or degrees of that quadrant, *viz.* 11$\frac{2}{3}$, 24$\frac{1}{4}$, 38$\frac{1}{12}$, 53$\frac{1}{2}$, and 71$\frac{1}{15}$, draw the forenoon hour-lines of XI, X, IX, VIII, and VII; and becauſe the ſun ſets not before eight in the evening on the longeſt days, continue the hour-lines of VII and VIII in the forenoon, through the center *a*, to VII and VIII in the afternoon; and all the hour-lines will be finiſhed on this dial; to which the hours may be ſet, as in the figure.

Laſtly, through 51$\frac{1}{2}$ degrees of either quadrant, and from its center, draw the right line *a g* for the hypothenuſe or axis of the gnomon *a g i*; and from *g*, let fall the perpendicular *g i*, upon the meridian line *a i*, and there will be a triangle made, whoſe ſides are *a g*, *g i*, and *i a*. If a plate ſimilar to this triangle be made as thick as the diſtance between the lines *a c* and *b d*, and ſet upright between them, touching at *a* and *b*, its hypothenuſe *a g* will be parallel to the axis of the world, when the dial is truly ſet; and will caſt a ſhadow on the hour of the day.

N. B. The trouble of dividing the two quadrants may be ſaved, if you have a ſcale with a line of chords upon it, ſuch as that on the top of Plate LXX.: for if you extend the compaſſes from 0 to 60 degrees of the line of chords, and with that extent, as a radius, deſcribe the two quadrants upon their reſpective centers, the above diſtances may be taken with the compaſſes upon the line, and ſet off upon the quadrants.

To make an erect direct ſouth dial; Plate LXIX. fig. 4. Elevate the pole to the co-latitude of your place, and proceed in all reſpects as above taught for the horizontal dial, from VI in the morning to VI in the afternoon, only the hours muſt be reverſed, as in the figure; and the hypothenuſe *a g* of the gnomon *a g f*, muſt make an angle with the dial-plane equal to the co-latitude of the place. As the ſun can ſhine no longer on this dial than from ſix in the morning until ſix in the evening, there is no occaſion for having any more than twelve hours upon it.

To make an erect dial, declining from the ſouth towards the eaſt or weſt. Elevate the pole to the latitude of your place, and ſcrew the quadrant of altitude to the zenith. Then, if your dial declines towards the eaſt (which we ſhall ſuppoſe it to do at preſent) count in the horizon the degrees of declination, from the eaſt point towards the north, and bring the lower end of the quadrant to that degree of declination at which the reckoning ends. This done, bring any particular meridian of your globe (as ſuppoſe the firſt meridian) directly under the graduated edge of the upper part of the brazen meridian, and ſet the hour-index to XII at noon. Then, keeping the quadrant of altitude at the degree of declination in the horizon, turn the globe eaſtward on its axis, and obſerve the degrees cut by the firſt meridian in the quadrant of altitude (counted from the zenith) as the hour index comes to XI, X, IX, *&c.* in the forenoon, or as 15, 30, 45, *&c.* degrees of the equator paſs under the brazen meridian at theſe hours reſpectively; and the degrees then cut in the quadrant by the firſt meridian, are the reſpective diſtances of the forenoon hours from XII on the plane of the dial.——Then, for the afternoon hours, turn the quadrant of altitude round the zenith until it comes to the degree in the horizon oppoſite to that where it was placed before: namely, as far from the weſt point of the horizon towards the ſouth, as it was ſet at firſt from the eaſt point towards the north; and turn the globe weſtward on its axis, until the firſt meridian comes to the brazen meridian again, and the hour-index to XII: then, continue to turn the globe weſtward, and as the index points to the afternoon hours I, II, III, *&c.* or as 15, 30, 45, *&c.* degrees of the equator paſs under the brazen meridian, the firſt meridian will cut the quadrant of altitude in the reſpective number of degrees from the zenith that each of theſe hours is from XII on the dial.——And note, that when the firſt meridian goes off the quadrant at the horizon in the forenoon, the hour-index ſhews the time when the ſun will come upon this dial: and when it goes off the quadrant in the afternoon, the index will point to the time when the ſun goes off the dial.

Having thus found all the hour-diſtances from XII, lay them down upon your dial plane, either by dividing a ſemicircle into two quadrants of 90 degrees each (beginning at the hour-line of XII) or by the line of chords, as above directed.

In all declining dials, the line on which the ſtile or gnomon ſtands (commonly called the *ſubſtile-line*) makes an angle with the twelve o'clock line, and falls among the forenoon hour-lines, if the dial declines towards the eaſt; and among the afternoon hour-lines, when the dial declines towards the weſt; that is, to the left hand from the twelve o'clock line in the former caſe, and to the right hand from it in the latter.

To find the diſtance of the ſubſtile from the twelve o'clock line; if your dial declines from the ſouth toward the eaſt, count the degrees of that declination in the horizon from the eaſt point toward the north, and bring the lower end of the quadrant of altitude to that degree of declination where the reckoning ends: then, turn the globe until the firſt meridian cuts the horizon in the like number of degrees, counted from the ſouth point toward the eaſt; and the quadrant and firſt meridian will then croſs one another at right angles, and the number of degrees of the quadrant, which are intercepted between the firſt meridian and the zenith, is equal to the diſtance of the ſubſtile line from the twelve o'clock line; and the number of degrees of the firſt meridian, which are intercepted between the quadrant and the north pole, is equal to the elevation of the ſtile above the plane of the dial.

If the dial declines weſtward from the ſouth, count that declination from the eaſt point of the horizon towards the ſouth, and bring the quadrant of altitude to the degree in the horizon at which the reckoning ends; both for finding the forenoon hours, and diſtance of the ſubſtile from the meridian: and for the afternoon hours, bring the quadrant to the oppoſite degree in the horizon, namely, as far from the weſt towards the north, and then proceed in all reſpects as above.

Thus, we have finiſhed our declining dial; and in ſo doing, we made four dials, *viz.*

1. A north dial, declining eaſtward by the ſame number of degrees. 2. A north dial, declining the ſame number weſt. 3. A ſouth dial, declining eaſt. And, 4, a ſouth dial declining weſt. Only, placing the proper number of hours, and the ſtile or gnomon reſpectively, upon each plane. For (as above mentioned) in the ſouth-weſt plane, the ſubſtilar-line falls among the afternoon hours; and in the ſouth-eaſt, of the ſame declination, among the forenoon hours, at equal diſtances from XII. and ſo, in all the morning hours on the weſt decliner, will be like the afternoon-hours on the eaſt decliner: the ſouth-eaſt decliner will produce the north-weſt decliner; and the ſouth-weſt decliner, the north eaſt decliner, by only extending the hour-lines, ſtile and ſubſtile, quite through the center: the axis of the ſtile (or edge that caſts the ſhadow on the hour of the day) being in all dials whatever parallel to the axis of the world, and conſequently pointing towards the north pole of the heaven in north latitudes, and toward the ſouth pole in ſouth latitudes.

But becauſe every one who would like to make a dial, may perhaps not be provided with a globe to aſſiſt him, and may probably not underſtand the method of doing it by logarithmic calculation; we ſhall ſhew how to perform it by the plain dialling lines, or ſcale of latitudes and hours; ſuch as thoſe on the top of Plate LXX. and which may be had on ſcales commonly ſold by the mathematical inſtrument makers.

This is the eaſieſt of all mechanical methods, and by much the beſt, when the lines are truly divided: and not only the half hours and quarters may be laid down by all of them, but every fifth minute by moſt, and every ſingle minute by thoſe where the line of hours is a foot in length.

Having drawn your double meridian line *a b*, *c d*, (Plate LXIX. fig. 5.) on the plane intended for a horizontal dial, and croſſed it at right angles by the ſix o'clock line *f e* (as in fig. 31.) take the latitude of your place with the compaſſes, in the ſcale of latitudes, and ſet that extent from *c* to *e*, and from *a* to *f*, on the ſix o'clock line: then, taking the whole ſix hours between the points of the compaſſes in the ſcale of hours, with that extent ſet one foot in the point *c*, and let the other foot fall where it will upon the meridian line *c d*, as at *d*. Do the ſame from *f* to *b*, and draw the right lines *e d* and *f b*, each of which will be equal in length to the whole ſcale of hours. This done, ſetting one foot of the compaſſes in the beginning of the ſcale at XII, and extending the other to each hour on the ſcale, lay off theſe extents from *d* to *e* for the afternoon hours, and from *b* to *f* for thoſe of the forenoon: this will divide the lines *d e* and *b f* in the ſame manner as the hour-ſcale is divided at 1, 2, 3, 4, and 6; on which the quarters may alſo be laid down, if required. Then, laying a ruler on the point *c*, draw the firſt five hours in the afternoon, from that point, through the dots at the numeral figures 1, 2, 3, 4, 5, on the line *d e*; and continue the lines of IIII and V through the center *c* to the other ſide of the dial, for the like hours of the morning: which done, lay the ruler on the point *a*, and draw the laſt five hours in the forenoon through the dots 5, 4, 3, 2, 2, 1, on the line *f b*; continuing the hour-lines of VII and VIII through the center *a* to the other ſide of the dial, for the like hours of the evening; and ſet the hours to their reſpective lines, as in the figure. Laſtly, make the gnomon the ſame way as taught above for the horizontal dial, and the whole will be finiſhed.

To make an erect ſouth dial, take the co-latitude of your place from the ſcale of latitudes, and then proceed in all reſpects for the hour-lines, as in the horizontal dial; only reverſing the hours, as in fig. 4. and making the angle of the ſtile's height equal to the co-latitude.

But leſt the young dialiſt ſhould have neither globe nor wooden ſcale, we ſhall now ſhew him how he may make a dial without any of theſe helps. Only, if he has not a line of chords, he muſt divide a quadrant into 90 equal parts or degrees for taking the proper angle of the ſtile's elevation; which is eaſily done.

With any opening of the compaſſes, as *Z L*, deſcribe the two ſemicircles *L F k* and *L Q k*, upon the centers *Z* and *z*, where the ſix o'clock line croſſes the double meridian line, and divide each ſemicircle into 12 equal parts, beginning at *L* (though, ſtrictly ſpeaking, only the quadrants from *L* to the ſix o'clock line need be divided;) then connect the diviſions which are equidiſtant from *L*, by the parallel lines *KM*, *IN*, *HO*, *GP*, and *FQ*. Draw *VZ* for the hypothenuſe of the ſtile, making the angle *VZE* equal to the latitude of your place; and continue the line *VZ* to *R*. Draw the line *Rr* parallel to the ſix o'clock line, and ſet off the diffance *a K* from *Z* to *Y*, the diſtance *b I* from *Z* to *X*, *c H* from *Z* to *W*, *dG* from *Z* to *T*, and *e F* from *Z* to *S*. Then draw the lines *Ss*, *Tt*, *Ww*, *Xx*, and *Yy*, each parallel to *Rr*. Set off the diſtance *yY* from *a* to 11, and from *f* to 1; the diſtance *xX* from *b* to 10, and from *g* to 2; *wW* from *c* to 9, and from *h* to 3; *tT* from *d* to 8, and from *i* to 4; *sS* from *e* to 7, and from *n* to 5. Then laying a ruler to the center *Z*, draw the forenoon hour-lines through the points 11, 10, 9, 8, 7; and laying it to the center *z*, draw the afternoon lines through the points 1, 2, 3, 4, 5; continuing the forenoon lines of VII and VIII through the center *Z*, to the oppoſite ſide of the dial, for the like afternoon hours; and the afternoon lines IIII and V through the center *z*, to the oppoſite ſide, for the like morning hours. Set the hours to theſe lines as in the figure, and then erect the ſtile or gnomon, and the horizontal dial will be finiſhed.

To conſtruct a ſouth dial, draw the line *VZ*, making an angle with the meridian *Z L* equal to the co-latitude of your place; and proceed in all reſpects as in the above horizontal dial for the ſame latitude, reverſing the hours as in fig. 4. and making the elevation of the gnomon equal to the co-latitude.

Perhaps it may not be unacceptable to explain the method of conſtructing the dialing lines, and ſome others; which is as follows.

With any opening of the compaſſes, (Plate LXX. fig. 1.) as *E A*, according to the intended length of the ſcale, deſcribe the circle *ADCB*, and croſs it at right angles by the diameters *CE A* and *D E B*. Divide the quadrant *A B* firſt into 9 equal parts, and then each part into 10; ſo ſhall the quadrant be divided into 90 equal parts or degrees. Draw the right line *A F B* for the chord of this quadrant, and ſetting one foot of the compaſſes in the point *A*, extend the other to the ſeveral diviſions of the quadrant, and transfer theſe diviſions to the line *AFB* by the arcs 10, 10, 20, 20, *&c.* and this will be a line of chords, divided into 90 unequal parts; which, if transferred from the line back again to the quadrant, will divide it equally. It is plain by the figure, that the diſtance from *A* to 60 in the line of chords, is juſt equal to *AE*, the radius of the circle from which that line is made; for if the arc 60, 60 be continued, of which *A* is the center, it goes exactly through the center *E* of the arc *AB*.

And therefore, in laying down any number of degrees on a circle, by the line of chords, you muſt firſt open the compaſſes ſo, as to take in juſt 60 degrees upon that line, as from *A* to 60: and then, with that extent, as a radius, deſcribe a circle, which will be exactly of the ſame ſize with that from which the line was divided: which done, ſet one foot of the compaſſes in the beginning of the chord line, as at *A*, and extend the other to the number of degrees you want upon the line; which extent, applied to the circle, will include the like number of degrees upon it.

Divide the quadrant *CD* into 90 equal parts, and from each point of diviſion draw right lines, as *i*, *k*, *l*, *&c.* to the line *CE*; all perpendicular to that line, and parallel to *D E*, which will divide *E C* into a line of ſines; and although theſe are ſeldom put among the dialing lines on a ſcale, yet they aſſiſt in drawing the line of latitudes. For if a ruler be laid upon the point *D*, and over each diviſion in the line of ſines, it will divide the quadrant *C B* into 90 unequal parts, as *Ba*, *Bb*, *&c.* ſhewn by the right lines 10*a*, 20*b*, 30*c*, *&c.* drawn along the edge of the ruler. If the right line *BC* be drawn, ſubtending this quadrant, and the neareſt diſtances *Ba*, *Bb*, *Bc*. *&c.* be taken in the compaſſes from *B*, and ſet upon this line in the ſame manner as directed for the line of chords, it will make a line of latitudes *BC*, equal in length to the line of chords *AB*, and of an equal number of diviſions, but very unequal as to their lengths.

Draw the right line *D G A*, ſubtending the quadrant *DA*; and parallel to it, draw the right line *r s*, touching the quadrant *D A* at the numeral figure 3. Divide this quadrant into ſix equal parts, as 1, 2, 3, *&c.* and through theſe points of diviſion draw right lines from the centre *E* to the line *r s*, which will divide it at the points where the ſix hours are to be placed, as in the figure. If every ſixth part of the quadrant be ſubdivided into four equal parts, right lines drawn from the centre through theſe points of diviſion, and continued to the line *r s*, will divide each hour upon it into quarters.

In Fig. 2. Plate LXX. we have the repreſentation of a portable dial, which may be eaſily drawn on a card, and carried in a pocket-book. The lines *a d*, *a b*, and *b c* of the gnomon muſt be cut quite through the card; and as the end *a b* of the gnomon is raiſed occaſionally above the plane of the dial, it turns upon the uncut line *c d* as on a hinge. The line dotted *AB* muſt be ſlit quite through the card, and the thread *C* muſt be put through the ſlit, and have a knot tied behind, to keep it from being eaſily drawn out. On the other end of this thread is a ſmall plummet *D*, and on the middle of it a ſmall bead for ſhewing the hour of the day.

To rectify this dial, ſet the thread in the ſlit right againſt the day of the month, and ſtretch the thread from the day of the month over the angular point where the curve-lines meet at XII; then ſhift the bead to that point on the thread, and the dial will be rectified.

To find the hour of the day, raiſe the gnomon (no matter how much or how little) and hold the edge of the dial next the gnomon towards the ſun, ſo as the uppermoſt edge of the ſhadow of the gnomon may juſt cover the *ſhadow-line;* and the bead then playing freely on the face of the dial, by the weight of the plummet, will ſhew the time of the day among the hour-lines, as it is forenoon or afternoon.

To find the time of ſun-riſing and ſetting, move the thread among the hour-lines, until it either covers ſome one of them, or lies parallel betwixt any two; and then it will cut the time of ſun-riſing among the forenoon hours, and of ſun-ſetting among the afternoon hours, for that day of the year to which the thread is ſet in the ſcale of months.

To find the ſun's declination, ſtretch the thread from the day of the month over the angular point at XII, and it will cut the ſun's declination, as it is north or ſouth, for that day, in the proper ſcale.

To find on what days the ſun enters the ſigns: when the bead, as above rectified, moves along any of the curve-lines which have the ſigns of the zodiac marked upon them, the ſun enters thoſe ſigns on the days pointed out by the thread in the ſcale of months.

The conſtruction of this dial is very eaſy, eſpecially if the reader compares it all along with fig. 3. as he reads the following explanation of that figure.

Draw the occult line, (Plate LXX. fig. 9.) *AB* parallel to the top of the card, and croſs it at right angles with the ſix o'clock line *ECD*; then upon *C*, as a centre, with the radius *CA*, deſcribe the ſemicircle *AEL*, and divide it into 12 equal parts (beginning at *A*) as *Ar*, *As*, &c. and from theſe points of diviſion draw the hour-lines *r*, *s*, *t*, *u*, *v*, *E*, *w*, and *x*, all parallel to the ſix o'clock line *EG*. If each part of the ſemicircle be ſubdivided into four equal parts, they will give the half-hour lines and quarters, as in fig. 2. Draw the right-line *ASDo*, making the angle *SAB* equal to the latitude of your place. Upon the centre *A* deſcribe the arch *RST*, and ſet off upon it the arcs *SR* and *ST*, each equal to $23\frac{1}{2}$ degrees, for the ſun's greateſt declination; and divide them into $23\frac{1}{2}$ equal parts, as in fig. 2. Through the interſection *D* of the lines *ECD* and *ADo*, draw the right line *FDG* at right angles to *ADo*. Lay a ruler to the points *A* and *R*, and draw the line *ARF* through $23\frac{1}{2}$ degrees of ſouth declination in the arc *SR*; and then laying the ruler to the points *A* and *T*, draw the line *ATG* through $23\frac{1}{2}$ degrees of north declination in the arc *ST*: ſo ſhall the lines *ARF* and *ATG* cut the line *FDG* in the proper length for the ſcale of months. Upon the centre *D*, with the radius *DE*, deſcribe the ſemicircle *FoG*; which divide into ſix equal parts, *Fm*, *mn*, *no*, &c. and from theſe points of diviſion draw the right lines *mb*, *ni*, *pk*, and *ql*, each parallel to *oD*. Then ſetting one foot of the compaſſes in the point *F*, extend the other to *A*, and deſcribe the arc *AzH* for the tropic of ♑: with the ſame extent, ſetting one foot in *G*, deſcribe the arc *AEO* for the tropic of ♋. Next ſetting one foot in the point *b*, and extending the other to *A*, deſcribe the arc *ACI* for the beginnings of the ſigns ♒ and ♐; and with the ſame extent, ſetting one foot in the point *l*, deſcribe the arc *AN* for the beginnings of the ſigns ♊ and ♌. Set one foot in the point *i*, and having extended the other to *A*, deſcribe the arc *AK* for the beginnings of the ſigns ♓ and ♏; and with the ſame extent, ſet on foot in *k*, and deſcribe the arc *HM* for the beginnings of the ſigns ♉ and ♍. Then ſetting one foot in the point *D*, and extending the other to *A*, deſcribe the curve *AL* for the beginnings of ♈ and ♎; and the ſigns will be finiſhed. This done, lay a ruler from the point *A* over the ſun's declination in the arch *RST*; and where the ruler cuts the line *FDG*, make marks; and place the days of the months right againſt theſe marks, in the manner ſhewn by fig. 2. Laſtly, draw the ſhadow-line *PQ* parallel to the occult line *AB*; make the gnomon, and ſet the hours to their reſpective lines, as in fig. 2. and the dial will be finiſhed.

There are ſeveral kinds of dials, which are called *univerſal*, becauſe they ſerve for all latitudes. Of theſe, the beſt is Mr Pardie's, (Plate LXX. fig. 4.) which conſiſts of three principal parts; the firſt whereof is called the horizontal plane (*A*), becauſe in practice it muſt be parallel to the horizon. In this plane is fixed an upright pin, which enters into the edge of the ſecond part *BD*, called the meridional plane; which is made of two pieces, the loweſt whereof (*B*) is called the quadrant, becauſe it contains a quarter of a circle, divided into 90 degrees; and it is only into this part, near *B*, that the pin enters. The other piece is a ſemicircle (*D*) adjuſted to the quadrant, and turning in it by a groove, for raiſing or depreſſing the diameter (*EF*) of the ſemicircle, which diameter is called the axis of the inſtrument. The third piece is a circle (*G*), divided on both ſides into 24 equal parts, which are the hours. This circle is put upon the meridional plane ſo, that the axis (*EF*) may be perpendicular to the circle, and the point *C* be the common centre of the circle, ſemicircle, and quadrant. The ſtraight edge of the ſemicircle is chamfered on both ſides to a ſharp edge, which paſſes through the centre of the circle. On one ſide of the chamfered part, the firſt ſix months of the year are laid down, according to the ſun's declination for their reſpective days; and on the other other ſide the laſt ſix months. And againſt the days on which the ſun enters the ſigns, there are ſtraight lines drawn upon the ſemicircle, with the characters of the ſigns marked upon them. There is a black line drawn along the middle of the upright edge of the quadrant, over which hangs a thread (*H*), with its plummet (*I*), for levelling the inſtrument. *N. B.* From the twenty-third of September to the twentieth of March, the upper ſurface of the circle muſt touch both the centre *C* of the ſemicircle, and the line of ♈ and ♎; and from the twentieth of March to the twenty-third of September, the lower ſurface of the circle muſt touch that centre and line.

Plate. LXX.

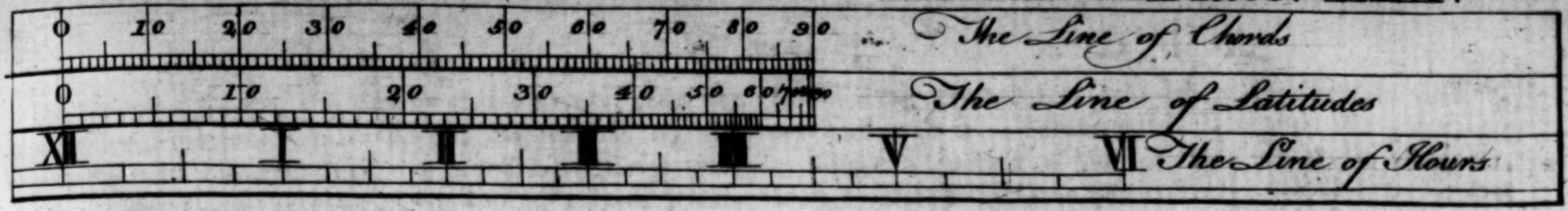

0 10 20 30 40 50 60 70 80 90
The Line of Chords
0 10 20 30 40 50 60 70 80 90
The Line of Latitudes
XII I II III IIII V VI
The Line of Hours

Fig. 2.

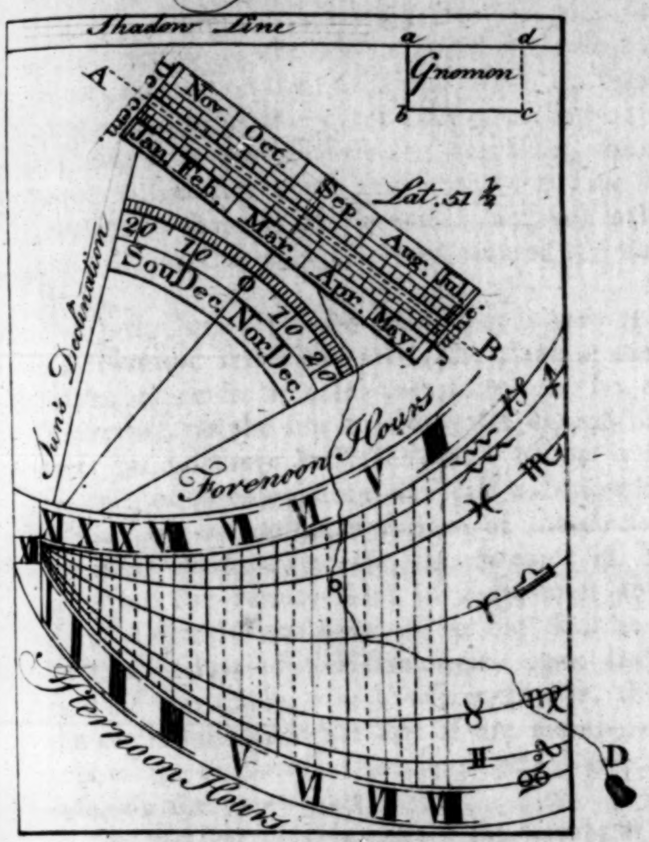

Shadow Line
a
d
Gnomon
b
c
A
Dec.
Nov.
Oct.
Sep.
Aug.
Jul.
Jan.
Feb.
Mar.
Apr.
May.
Lat. 51 ½
B
Sun's Declination
20 10 0 10 20
Sou Dec.
Nor Dec.
Forenoon Hours
Afternoon Hours
D

Fig. 1.

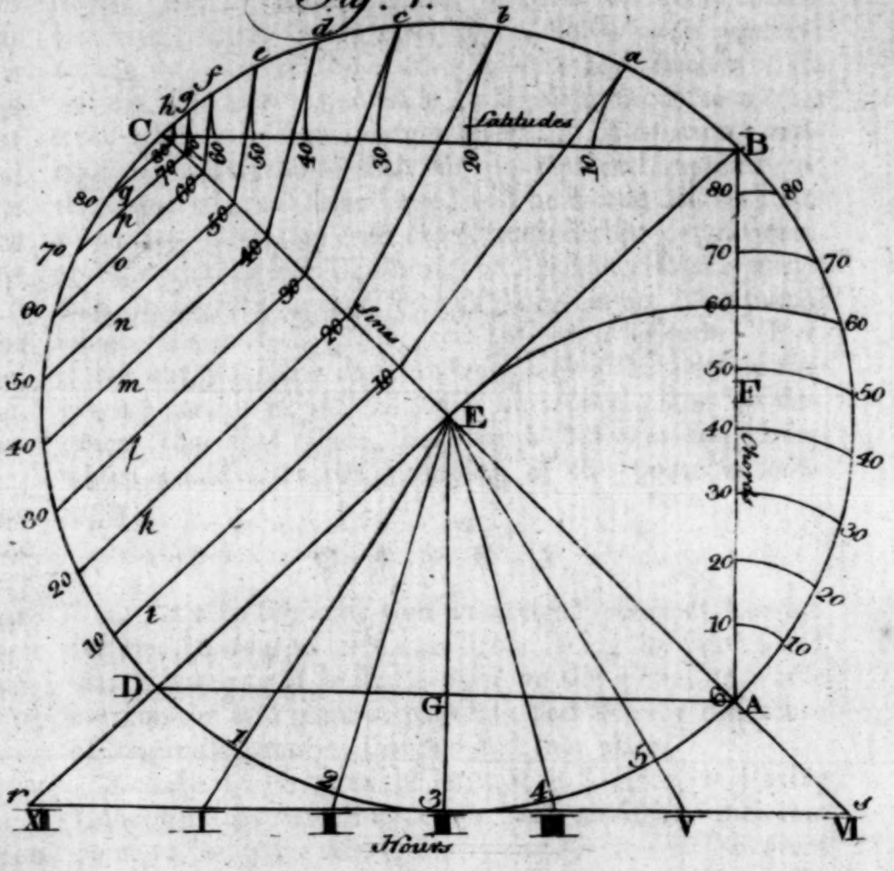

a b c d e f g h
C
B
Latitudes
10 20 30 40 50 60 70 80
Sines
E
F
Chords
D
G
A
r
s
1 2 3 4 5
XII I II III IIII V VI
Hours

Fig. 6.

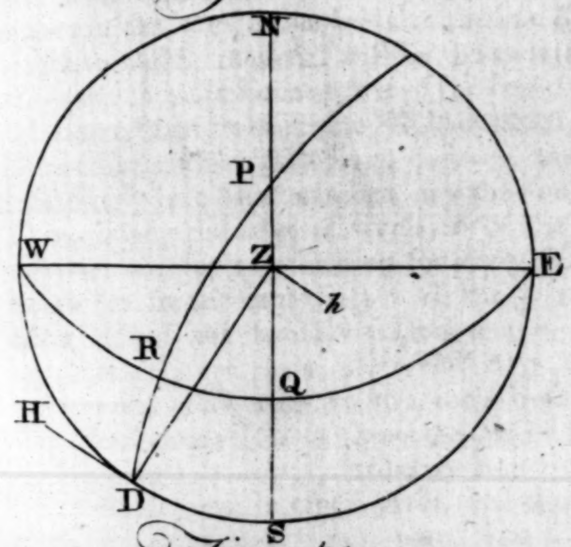

N
P
W
Z
E
h
R
Q
H
D
S

Fig. 4.

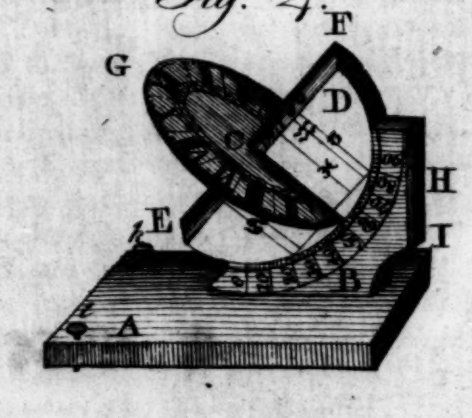


Fig. 3.

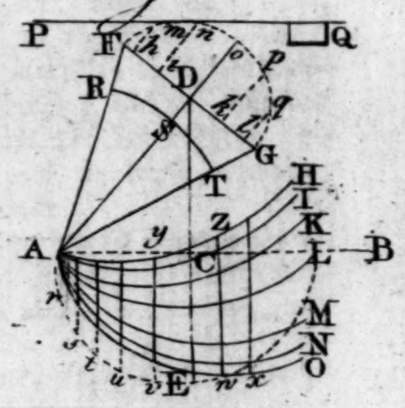

P
F
m
n
Q
R
h
D
p
q
G
H
T
I
K
Z
A
y
C
L
B
M
N
O
E

Fig. 7.

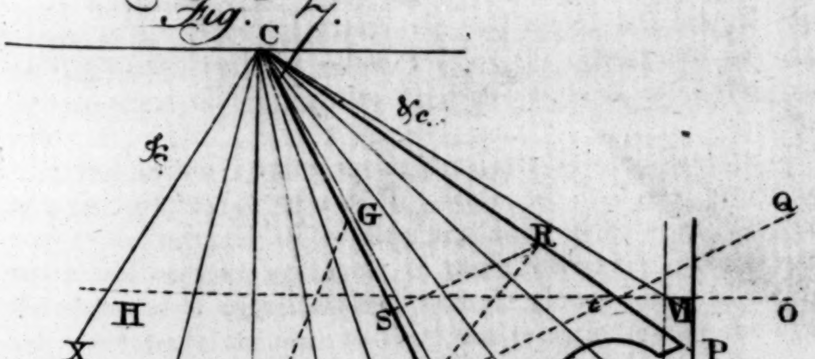
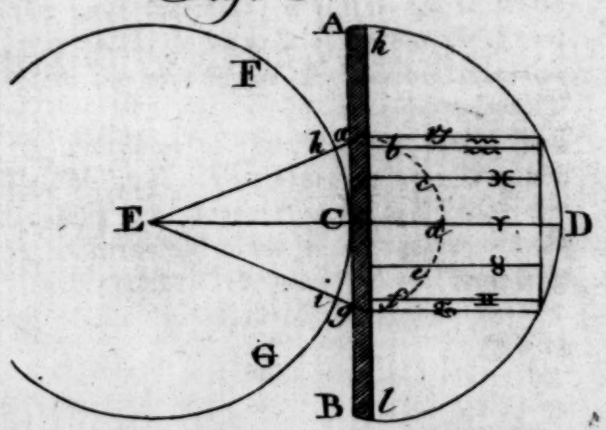

C
&c.
&c.
G
R
Q
H
X
S
t
O
P
K
N
L
V
M
h
o
E

Fig. 5.


A
h
F
a
b
c
E
C
D
d
e
i
f
g
G
B
l

A Bell Sc.

4 AP 54

To find the time of the day by this dial. Having ſet it on a level place in ſun-ſhine, and adjuſted it by the leveling ſcrews *k* and *l*, until the plumb-line hangs over the black line upon the edge of the quadrant, and parallel to the ſaid edge; move the ſemicircle in the quadrant, until the line of ♈ and ♎ (where the circle touches) comes to the latitude of your place in the quadrant: then turn the whole meridional plane *BD*, with its circle *G*, upon the horizontal plane *A*, until the edge of the ſhadow of the circle falls preciſely on the day of the month in the ſemicircle; and then, the meridional plane will be due north and ſouth, the axis *EF* will be parallel to the axis of the world, and will caſt a ſhadow upon the true time of the day, among the hours on the circle.

N. B. As, when the inſtrument is thus rectified, the quadrant and ſemicircle are in the plane of the meridian, ſo the circle is then in the plane of the equinoctial. Therefore, as the ſun is above the equinoctial in ſummer (in northern latitudes) and below it in winter; the axis of the ſemicircle will caſt a ſhadow on the hour of the day, on the upper ſurface of the circle, from the twentieth of March to the twenty-third of September: and from the twenty-third of September to the twentieth of March, the hour of the day will be determined by the ſhadow of the ſemicircle, upon the lower ſurface of the circle. In the former caſe, the ſhadow of the circle falls upon the day of the month, on the lower part of the diameter of the ſemicircle; and in the latter caſe, on the upper part.

The method of laying down the months and ſigns upon the ſemicircle is as follows. Draw the right line *ACB*, equal to the diameter of the ſemicircle *ADB*, and croſs it in the middle at right angles with the line *ECD*, equal in length to *ADB*; then *EC* will be the radius of the circle *FCG*, which is the ſame as that of the ſemicircle. Upon *E*, as a centre, deſcribe the circle *FCG*, on which ſet off the arcs *Ch* and *Ci*, each equal to 23½ degrees, and divide them accordingly into that number, for the ſun's declination. Then, laying the edge of a ruler over the centre *E*, and alſo over the ſun's declination for every fifth day of each month (as in the card-dial) mark the points on the diameter *AB* of the ſemicircle from *a* to *g*, which are cut by the ruler; and *there* place the days of the months accordingly, anſwering to the ſun's declination. This done, ſetting one foot of the compaſſes in *C*, and extending the other to *a* or *g*, deſcribe the ſemicircle *a b c d e f g*; which divide into ſix equal parts, and through the points of diviſion draw right lines, parallel to *CD*, for the beginning of the ſines (of which one half are on one ſide of the ſemicircle, and the other half on the other) and ſet the characters of the ſigns to their proper lines, as in the figure.

Having ſhewn how to make ſun-dials by the aſſiſtance of a good globe, or of a dialing-ſcale, we ſhall now proceed to the method of conſtructing dials arithmetically; which will be more agreeable to thoſe who have learned the elements of trigonometry, becauſe globes and ſcales can never be ſo accurate as the logarithms in finding the angular diſtances of the hours. Yet, as a globe may be found exact enough for ſome other requiſites in dialing, we ſhall take it in occaſionally.

The conſtruction of ſun-dials on all planes whatever, may be included in one general rule: intelligible, if that of a horizontal dial for any given latitude be well underſtood. For there is no plane, however obliquely ſituated with reſpect to any given place, but what is parallel to the horizon of ſome other place; and therefore, if we can find that other place by a problem on the terreſtrial globe, or by a trigonometrical calculation, and conſtruct a horizontal dial for it; that dial, applied to the plane where it is to ſerve, will be a true dial for that place.——Thus, an erect direct ſouth dial in 51½ degrees north latitude, would be a horizontal dial on the ſame meridian, 90 degrees ſouthward of 51½ degrees north latitude; which falls in with 38½ degrees of ſouth latitude. But if the upright plane declines from facing the ſouth at the given place, it would ſtill be a horizontal plane 90 degrees from that place, but for a different longitude, which would alter the reckoning of the hours accordingly.

CASE I.

1. Let us ſuppoſe, that an upright plane at London declines 36 degrees weſtward from facing the ſouth; and that it is required to find a place on the globe, to whoſe horizon the ſaid plane is parallel; and alſo the difference of longitude between London and that place.

Rectify the globe to the latitude of London, and bring London to the zenith under the braſs meridian, then that point of the globe which lies in the horizon at the given degree of inclination (counted weſtward from the ſouth point of the horizon) is the place at which the abovementioned plane would be horizontal.——Now, to find the latitude and longitude of that place, keep your eye upon the place, and turn the globe eaſtward, until it comes under the graduated edge of the braſs meridian; then, the degrees of the braſs meridian that ſtands directly over the place, is its latitude; and the number of degrees in the equator, which are intercepted between the meridian of London and the braſs meridian, is the place's difference of longitude.

Thus, as the latitude of London is 51½ degrees north, and the declination of the place is 36 degrees weſt; elevate the north pole 51½ degrees above the horizon, and turn the globe until London comes to the zenith, or under the graduated edge of the meridian; then count 36 degrees on the horizon weſtward from the ſouth point, and make a mark on that place of the globe over which the reckoning ends, and bringing the mark under the graduated edge of the braſs meridian, it will be found to be under 30¾ degrees in ſouth latitude: keeping it there, count in the equator the number of degrees between the meridian of London and the braſen meridian (which now becomes the meridian of the required place) and you will find it to be 42¾. Therefore an upright plane at London, declining 36 degrees weſtward from the ſouth, would be a horizontal plane at that place, whoſe latitude is 30¾ degrees ſouth of the equator, and longitude 42¾ degrees weſt of the meridian of London.

Which difference of longitude being converted into time, is 2 hours 51 minutes.

The vertical dial declining weſtward 36 degrees at London, is therefore to be drawn in all reſpects as a horizontal dial for ſouth latitude 30¼ degrees; ſave only, that the reckoning of the hours is to anticipate the reckoning on the horizontal dial, by 2 hours 51 minutes: for ſo much ſooner will the ſun come to the meridian of London, than to the meridian of any place whoſe longitude is 42¾ degrees weſt from London.

2. But to be more exact than the globe will ſhew us, we ſhall uſe a little trigonometry.

Let *NESW* (Plate LXX. fig. 6.) be the horizon of London, whoſe zenith is *Z*, and *P* the north pole of the ſphere; and let *Z b* be the poſition of a vertical plane at *Z*, declining weſtward from *S* (the ſouth) by an angle of 36 degrees; on which plane an erect dial for London at *Z* is to be deſcribed. Make the ſemidiameter *Z D* perpendicular to *Z b*, and it will cut the horizon in *D*, 36 degrees weſt of the ſouth *S*. Then a plane, in the tangent *H D*, touching the ſphere in *D*, will be parallel to the plane *Z b*; and the axis of the ſphere will be equally inclined to both theſe planes.

Let *W Q E* be the equinoctial, whoſe elevation above the horizon of *Z* (London) is 38½ degrees; and *PRD* be the meridian of the place *D*, cutting the equinoctial in *R*. Then it is evident, that the arc *R D* is the latitude of the place *D* (where the plane *Z b* would be horizontal) and the arc *R Q* is the difference of longitude of the planes *Z b* and *D H*.

In the ſpherical triangle *WDR*, the arc *WD* is given, for it is the complement of the plane's declination from *S* to ſouth; which complement is 54° (viz. 90°—36°:) the angle at *R*, in which the meridian of the place *D* cuts the equator, is a right angle; and the angle *RWD* meaſures the elevation of the equinoctial above the horizon of *Z*, namely, 38½ degrees. Say therefore, as radius is to the co-ſine of the plane's declination from the ſouth, ſo is the co-ſine of the latitude of *Z* to the ſine of *RD* the latitude of *D*: which is of a different denomination from the latitude of *Z*, becauſe *Z* and *D* are on different ſides of the equator.

As radius - - - - - - 10.00000
To co-ſine 36° 0′ = *RQ* 9.90796
So co-ſine 51° 30′ = *QZ* 9.79415

To ſine 30° 14′ = *DR* (9.70211) = the lat. of *D*, whoſe horizon is parallel to the vertical plane *Z b* at *Z*.

N. B. When radius is made the firſt term, it may be omitted, and then, by ſubtracting it mentally from the ſum of the other two, the operation will be ſhortened. Thus, in the preſent caſe,

To the logarithmic ſine of *WR* = * 54° 0′ 9.90796
Add the logarithmic ſine of *RD* = † 38° 30′ 9.79415

Their ſum — radius - - - - - - - - 9.70211

give the ſame ſolution as above. And we ſhall keep to this method in the following part of this article.

To find the difference of longitude of the places *D* and *Z*, ſay, as radius is to the co-ſine of 38½ degrees, the height of the equinoctial at *Z*, ſo is the co-tangent of 36 degrees, the plane's declination, to the co tangent of the difference of longitudes. Thus,

To the logarithmic ſine of * 51° 30′ 9.89354
Add the logarithmic tang. of † 54° 0′ 10.13874

Their ſum — radius - - - - - - - 10.013228

is the neareſt tangent of 47° 8′ = *WR*; which is the co-tangent of 42° 52′ = *RQ*. the difference of longitude ſought. Which difference, being reduced to time, is two hours 51½ minutes.

3. And thus having found the exact latitude and longitude of the place *D*, to whoſe horizon the vertical plane at *Z* is parallel, we ſhall proceed to the conſtruction of a horizontal dial for the place *D*, whoſe latitude is 30° 14′ ſouth; but anticipating the time at *D* by 2 hours 51 minutes (neglecting the ½ minute in practice) becauſe *D* is ſo far weſtward in longitude from the meridian of London; and this will be a true vertical dial at London, declining weſtward 36 degrees.

Aſſume any right line *CSL*, (Plate LXX fig. 7.) for the ſubſtile of the diale, and make the angle *KCP* equal to the latitude of the place (viz. 30° 14′) To whoſe horizon the plane of the dial is parallel; then *CRP* will be the axis of the ſtile, or edge that caſts the ſhadow on the hours of the day, in the dial. This done, draw the contingent line *EQ*, cutting the ſubſtilar line at right angles in *K*; and from *K* make *KR* perpendicular to the axis *CRP*. Then *KG* (=*KR*) being made radius, that is, equal to the chord of 60° or tangent of 45° on a good ſector, take 42° 52′ (the difference of longitude of the places *Z* and *D*) from the tangents, and having ſet it from *K* to *M*, draw *CM* for the hour-line of XII. Take *KN*, equal to the tangent of an angle leſs by 15° degrees than *KM*; that is, the tangent 27° 52′; and through the point *N* draw *CN* for the hour-line of I. The tangent of 12° 52′ (which is 15° leſs than 27° 52′) ſet off the ſame way, will give a point between *K* and *N*, through which the hour-line of II is to be drawn. The tangent of 2° 8′ (the difference between 45° and 42° 52′) placed on the other ſide of *CL*, will determine the point through which the hour-line of III is to be drawn: to which 2° 8′, if the tangent of 15° be added, it will make 17° 8′; and this ſet off from *K* towards *Q* on the line *EQ*, will give a point for the hour-line of IIII: and ſo of the reſt.—The forenoon hour lines are drawn the ſame way, by the continual addition of the tangents 15°, 30°, 45°, &c. to 42° 52′ (=the tangent of *KM*) for the hours of XI, X, IX, &c. as far as neceſſary; that is, until there be five hours on each ſide of the ſubſtile. The ſixth hour, accounted from that hour or part of the hour on which the ſubſtile falls, will be always in a line perpendicular to the ſubſtile, and drawn through the center *C*.

4.

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* The co-ſine of 36. 0. or of *RQ*.
† The co-ſine of 51. 30. or of *QZ*.

* The co-ſine of 38. 30. or of *WDR*.
† The co-tangent of 36. 0, or of *DW*.

4. In all erect dials, CM, the hour-line of XII, is perpendicular to the horizon of the place for which the dial is to ſerve: for that line is the interſection of a vertical plane with the plane of the meridian of the place, both which are perpendicular to the plane of the horizon: and any line HO, or ho, perpendicular to CM, will be a horizontal line on the plane of the dial, along which line the hours may be numbered; and CM being ſet perpendicular to the horizon, the dial will have its true poſition.

5. If the plane of the dial had declined by an equal angle toward the eaſt, its deſcription would have differed only in this, that the hour-line of XII would have fallen on the other ſide of the ſubſtile CL, and the line HO would have a ſubcontrary poſition to what it has in this figure.

6. And theſe two dials, with the upper points of their ſtiles turned toward the north pole, will ſerve for other two planes parallel to them; the one declining from the north toward the eaſt, and the other from the north toward the weſt, by the ſame quantity of angle. The like holds true of all dials in general, whatever be their declination and obliquity of their planes to the horiſon.

CASE II.

7. If the plane of the dial not only *declines*, but alſo *reclins*, or *inclines* Suppoſe its declination from fronting the ſouth S, (Plate LXXI. fig. 1.) be equal to the arc SD on the horizon; and its reclination be equal to the arc Dd of the vertical circle DZ: then it is plain, that if the quadrant of altitude ZdD on the globe cuts the point D in the horizon, and the reclination is counted upon the quadrant from D to d; the interſection of the hour circle PRd, with the equinoctial WQE, will determine Rd, the latitude of the place d, whoſe horizon is parallel to the given plane at Z; and RQ will be the difference in longitude of the planes at d and Z.

Trigonometrically thus: let a great circle paſs through the three points W, d, E; and in the triangle WDd, right-angled at D, the ſides WD and Dd are given; and thence the angle DWd is found, and ſo is the hypothenuſe Wd. Again, the difference, or the ſum, of DWd and DWR, the elevation of the equinoctial above the horizon of Z, gives the angle dWR; and the hypothenuſe of the triangle WRd was juſt now found; whence the ſides Rd and WR are found, the former being the latitude of the place d, and the latter the complement of RQ, the difference of longitude ſought.

Thus, if the latitude of the place Z be 52° 10′ north; the declination SD of the plane Zh (which would be horizontal at d) be 36°, and the reclination be 15°, or equal to the arc Dd; the ſouth latitude of the place d, that is, the arc Rd, will be 15° 9′; and RQ, the difference of longitude, 36° 2′. From theſe data, therefore, let the dial (fig. 2.) be deſcribed, as in the former example.

9. There are ſeveral other things requiſite in the practice of dialing; the chief of which ſhall be given in the form of arithmetical rules, ſimple and eaſy to thoſe who have learned the elements of trigonometry. For in practical arts of this kind, arithmetick ſhould be uſed as far as it can go; and ſcales never truſted to, except in the final conſtruction, where they are abſolutely neceſſary in laying down the calculated hour-diſtances on the plain of the dial.

RULE I. *To find the angles which the hour-lines on any dial make with the ſubſtile.*

To the logarithmic ſine of the given latitude, or of the ſtile's elevation above the plane of the dial, add the logarithmic tangent of the hour * diſtance from the meridian, or from the † ſubſtile; and the ſum *minus* radius will be the logarithmic tangent of the angle ſought.

For, in fig. 7. Plate LXX. KC is to KM in the ratio compounded of the ratio of KC to KG $(=KR)$ and of KG to KM; which, making CK the radius 10,000000, or 10,0000, or 10, or 1, are the ratio of 10,000000, or of 10,0000, or of 10, or of 1, to $KG \times KM$.

Thus, in a horizontal dial, for latitude 51° 30′, to find the angular diſtance of XI in the forenoon, or I in the afternoon, from XII.

To the logarithmic ſine of 51° 30′ 9.89354 ‡
Add the logarithmic tang. of 15° 0′ 9.42805

The ſum — radius is - - - - - 9.32159 = the logarithmic tangent of 11° 50′, or of the angle which the hour-line of XI or I makes with the hour of XII.

And by computing in this manner, with the ſine of the latitude, and the tangents of 30, 45, 60, and 75°, for the hours of II, III, IIII, and V in the afternoon; or of X, IX, VIII, and VII in the forenoon; you will find their angular diſtances from XII to be 24° 18′, 38° 3′, 53° 35′ and 71° 6′; which are all that there is occaſion to compute for.——And theſe diſtances may be ſet off from XII by a line of chords; or rather, by taking 1000 from a ſcale of equal parts, and ſetting that extent as a radius from C to XII; and then, taking 209 of the ſame parts (which, in the tables, are the natural tangent of 11° 50′) and ſetting them from XII to XI and to I, on the line ho, which is perpendicular to C XII: and ſo for the reſt of the hour-lines, which, in the table of natural tangents, againſt the above diſtances, are 451, 782, 1355, and 2920, of ſuch equal parts from XII, as the radius C XII contains 1000. And laſtly, ſet off 1257 (the natural tangent of 51° 30′) for the angle of the ſtile's height, which is equal to the latitude of the place.

RULE II. *The latitude of the place, the ſun's declination, and his hour-diſtance from the meridian, being given; to find* (1.) *his altitude*; (2.) *his azimuth.*

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* That is, of 15, 30, 45, 60, 75°, for the hours of I, II, III, IIII, V in the afternoon; and XI, X, IX, VIII, VII in the afternoon.

† In all horizontal dials, and erect north or ſouth dials, the ſubſtile and meridian are the ſame: but in all declining dials, the ſubſtile line makes an angle with the meridian.

‡ In which caſe, the radius CK is ſuppoſed to be divided into 1000000 equal parts.

1. Let d, (Plate LXXI. fig. 1.) be the ſun's place, dR, his declination; and in the triangle PZd, Pd the ſum, or the difference, of dR, and the quadrant PR, being given by the ſuppoſition, as alſo the complement of the latitude PZ, and the angle dPZ, which meaſures the horary diſtance of d from the meridian; we ſhall (by Caſe 4. of Keill's oblique ſpherie Trigonometry) find the baſe Zd, which is the ſun's diſtance from the zenith, or the complement of his altitude.

And (2.) As ſine Zd : ſine Pd : : dPZ : dZP, or of its ſupplement DZS, the azimuthal diſtance from the ſouth.

Or, the practical rule may be as follows.

Write A for the ſign of the ſun's altitude, L and l for the ſine and co-ſine of the latitude, D and d for the ſine and co-ſine of the ſun's declination, and H for the ſine of the horary diſtance from VI.

Then the relation of H to A will have three varieties.

1. When the declination is toward the elevated pole, and the hour of the day is between XII and VI; it is $A = LD + Hld$, and $H = \frac{A - LD}{ld}$

2. When the hour is after VI, it is $A = LD - Hld$ and $\frac{LD + A}{ld}$

3. When the declination is toward the depreſſed pole, we have $A = Hld - LD$, and $H = \frac{A + LD.}{ld}$

Which theorems will be found uſeful, and expeditious enough for ſolving thoſe problems in geography and dialing, which depend on the relation of the ſun's altitude to the hour of the day.

EXAMPLE I.

Suppoſe the latitude of the place to be 51½ degrees north: the time five hours diſtant from XII, that is, an hour after VI in the morning, or before VI in the evening; and the ſun's declination 20° north. *Required the ſun's altitude?*

Then to log. L = log. ſin. 51° 30′ 1.89354*
add log. D = log. ſin. 20° 0′ 1.53405

Their ſum 1.42759 gives

LD = logarithm of 0.267664, in the natural ſines.

And, to log. H = log. ſin. † 15° 0′ 1.41300
add { log. l = log. ſin. ‡ 38° 0′ 1.79415
add { log. d = log. ſin. * 70° 0′ 1.97300

Their ſum 1.18015 gives

Hld = logarithm of 0.151408, in the natural ſines.

And theſe two numbers (0.267664 and 0.151408) make 0.419072 = A; which, in the table, is the neareſt natural ſine of 24° 47′, the ſun's altitude ſought.

The ſame hour-diſtance being aſſumed on the other ſide of VI, then $LD - Hld$ is 0.116256, the ſine of 6° 40′½; which is the ſun's altitude at V in the morning, or VII in the evening, when his north declination is 20°.

But when the declination is 20° ſouth (or towards the depreſſed pole) the difference $Hld - LD$ becomes negative, and thereby ſhews that, an hour before VI in the morning, or paſt VI in the evening, the ſun's center is 6° 40′½ below the horizon.

EXAMPLE II.

From the ſame *data* to find the ſun's *azimuth*.

If H, L and D are given, then (by par. 2. of Rule II.) from H having found the altitude and its complement Zd; and the arc Pd (the diſtance from the pole) being given; ſay, As the co-ſine of the altitude is to the ſine of the diſtance from the pole, ſo is the ſine of the hour-diſtance from the meridian to the ſine of the azimuth diſtance from the meridian.

Let the latitude be 51° 30′ north, the declination 15° 9′ ſouth, and the time II h. 24. m. in the afternoon, when the ſun begins to illuminate a vertical wall, and it is required to find the poſition of the wall.

Then, by the foregoing theorems, the complement of the altitude will be 81° 32′½, and Pd the diſtance from the pole being 109° 5′, and the horary diſtance from the meridian, or the angle dPZ, 36°.

To log. ſin. 74° 51′ - - - - 1.98464
Add log. ſin. 36° 0′ - - - - 1.76922

And from the ſum - - - - - 1.75386
Take the log. ſin. 81° 32′½ - - 1.99525

Remains 1.75861 = log. ſin. 35°, the azimuth diſtance ſought.

When the altitude is given, find from thence the hour, and proceed as above.

This praxis is of ſingular uſe on many occaſions; in finding the declination of vertical planes more exactly than in the common way, eſpecially if the tranſits of the ſun's center is obſerved by applying a ruler with ſights, either plain or teleſcopical, to the wall or plane, whoſe declination is required.—In drawing a meridian line, and finding the magnetic variation —In finding the bearings of places in terreſtrial ſurveys; the tranſits of the ſun over any place, or his horizontal diſtance from it being obſerved, together with the altitude and hour.—And thence determining ſmall differences of longitude.—In obſerving the variation at ſea, *&c.*

Of the double horizontal dial; *and the* Babylonian *and* Italian *dials*.

To the *gnomonic* projection, there is ſometimes added a *ſtereographic* projection of the hour-circles, and the parallels of the ſun's declination, on the ſame horizontal plane; the upright ſide of the gnomon being ſloped into an edge, ſtanding perpendicularly over the center of the projection: ſo that the dial, being in its due poſition, the ſhadow

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* Here we conſider the radius as unity, and not 10,00000, by which, inſtead of the index 9, we have—1, as above; which is of no farther uſe, than making the work a little eaſier.

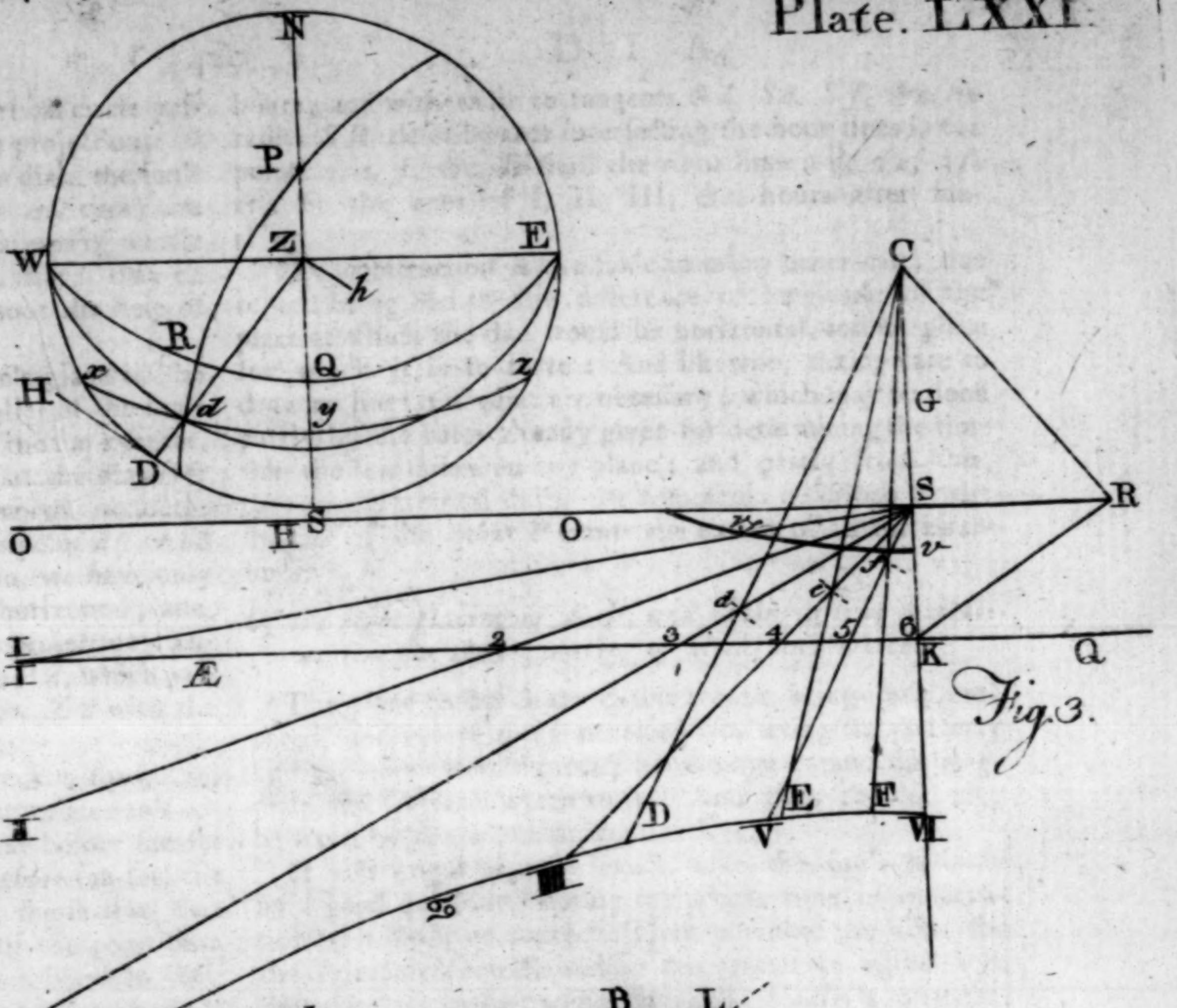
† The diſtance of one hour from VI.

‡ The co-latitude of the place.

* The co-declination of the ſun.

Fig. 1.

Fig. 3.


N
P
Z
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W
h
R
Q
z
H
x
d
y
D
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C
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x
v
d
c
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5
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K
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I
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I
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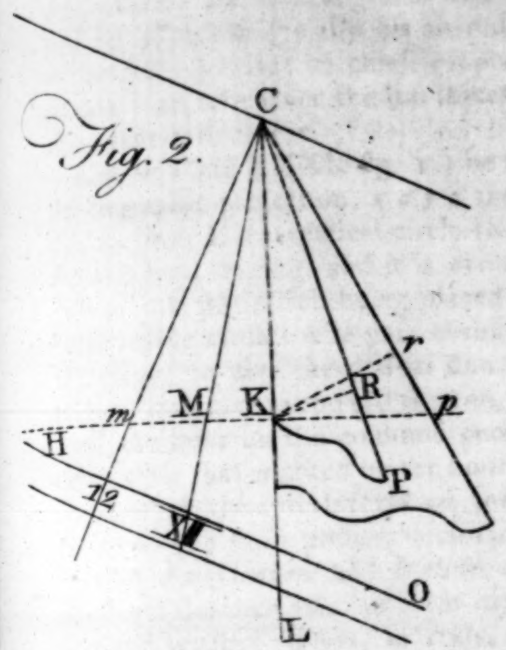
F
VI
II
III

Fig. 2.


C
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H
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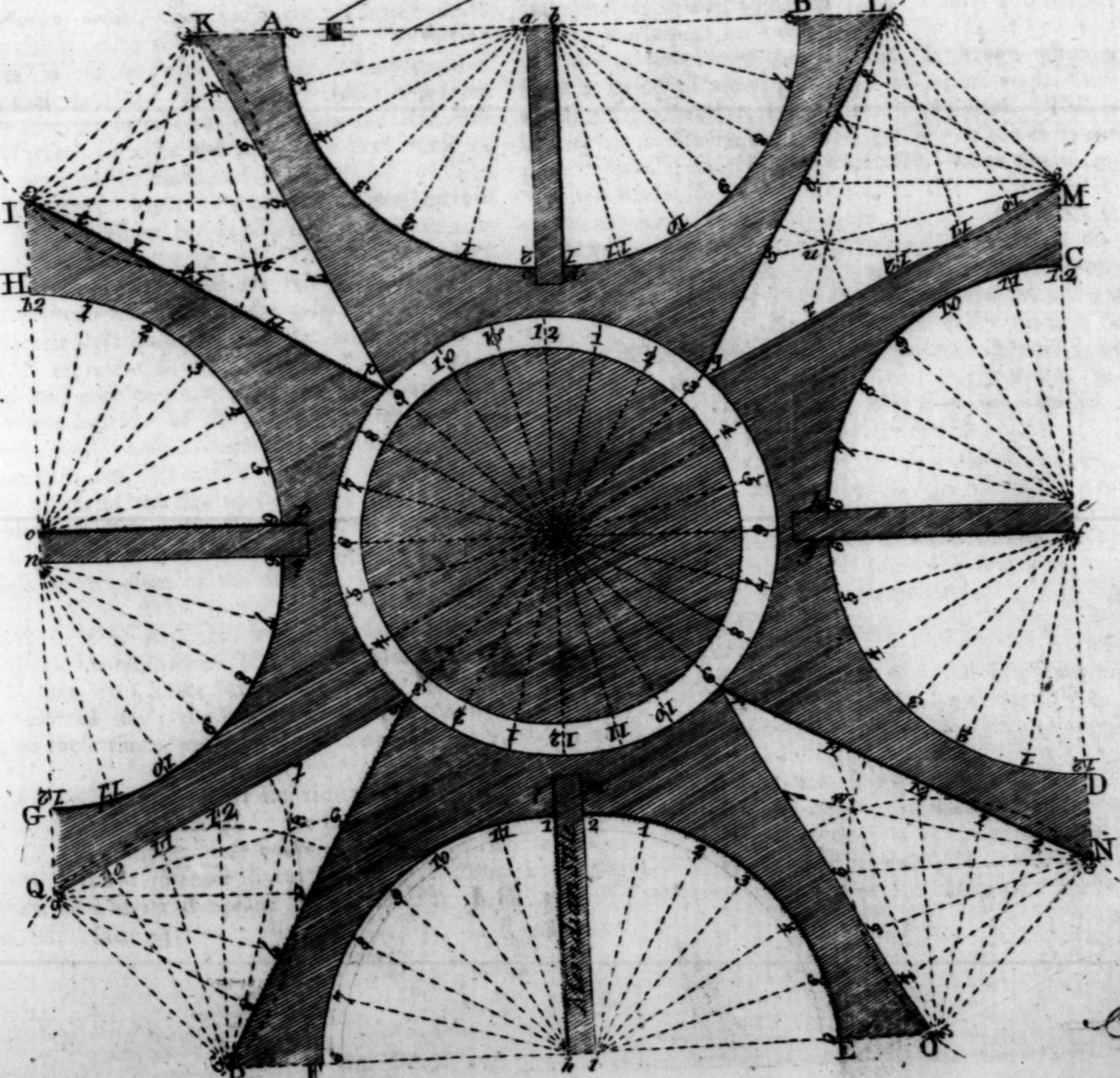
12
XI
O
L

Fig. 4.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A. Bell Sculp.

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ſhadow of *that* perpendicular edge is a vertical circle paſſing through the ſun, in the ſtereographic projection.

The months being duly marked on this dial, the ſun's declination, and the length of the day at any time, are had by inſpection (as alſo his altitude, by means of a ſcale of tangents.) But its chief property is, that it may be placed true, whenever the ſun ſhines, without the help of any other inſtrument.

Let *d* (Plate LXXI. fig. 1.) be the ſun's place in the ſtereographic projection, *x d y z* the parallel of the ſun's declination, *Z d* a vertical circle through the ſun's center, *Pd* the hour-circle; and it is evident, that the diameter *NS* of this projection being placed duly north and ſouth, theſe three circles will paſs through the point *d*. And therefore, to give the dial its due poſition, we have only to turn its gnomon toward the ſun, on a horizontal plane, until the hour on the common gnomonic projection coincides with that marked by the hour-circle *P d*, which paſſes through the interſection of the ſhadow *Z d* with the circle of the ſun's preſent declination.

The *Babylonian* and *Italian* dials reckon the hours, not from the meridian, as with us, but from the ſun's riſing and ſetting. Thus, in *Italy*, an hour before ſun-ſet is reckoned the 23d hour; two hours before ſun-ſet, the 22d hour; and ſo of the reſt. And the ſhadow that marks them on the hour-lines, is *that* of the point of a ſtile. This occaſions a perpetual variation between their dials and clocks, which they muſt correct from time to time, before it ariſes to any ſenſible quantity, by ſetting their clocks ſo much faſter or ſlower. And in *Italy*, they begin their day, and regulate their clocks, not from ſun-ſet, but from about mid-twilight, when the *Ave Maria* is ſaid; which corrects the difference that would otherwiſe be between the clock and the dial.

The improvements which have been made in all ſorts of inſtruments and machines for meaſuring time, have rendered ſuch dials of little acconnt. Yet, as the theory of them is ingenious, and they are really, in ſome reſpects, the beſt contrived of any for vulgar uſe, a general idea of their deſcription may not be unacceptable.

Let fig. 5. repreſent an erect ſouth wall, on which a *Babylonian dial* is to be drawn, ſhewing the hours from ſun-riſing; the latitude of the place, whoſe horizon is parallel to the wall, being equal to the angle *KCR*. Make, as for a common dial, *KG*=*KR* (which is perpendicular to *CR*) the radius of the equinoctial *ÆQ*, and draw *RS* perpendicular to *C K* for the ſtile of the dial: the ſhadow of whoſe point *R* is to mark the hours, when *S R* is ſet upright on the plane of the dial.

Then it is evident, that, in the contingent line *ÆQ*, the ſpaces *K* 1, *K* 2, *K* 3, &c. being taken equal to the tangents of the hour-diſtances from the meridian, to the radius *KG*, one, two, three, &c. hours after ſun-riſing, on the equinoctial day; the ſhadow of the point *R* will be found, at theſe times, reſpectively in the points, 1, 2, 3, &c.

Draw, for the like hours after ſun-riſing, when the ſun is in the tropic of Capricorn ♑ *V*, the like common lines *CD*, *CE*, *CF*, &c. and at theſe hours the ſhadow of the point *R* will be found in thoſe lines reſpectively. Find the ſun's altitudes above the plane of the dial at theſe hours, and with their co-tangents *S d*, *S e*, *S f*, &c. to radius *S R*, deſcribe arcs interſecting the hour-lines in the points *d*, *e*, *f*, &c. ſo ſhall the right lines 1 *d*, 2 *e*, 3 *f*, &c. be the lines of I, II, III, &c. hours after ſun-riſing.

The conſtruction is the ſame in every other caſe, due regard being had to the difference of longitude of the place at which the dial would be horizontal, and the place for which it is to ſerve: And likewiſe, taking care to draw no lines but what are neceſſary; which may be done partly by the rules already given for determining the time that the ſun ſhines on any plane; and partly from this, that on the tropical days, the hyperbola deſcribed by the ſhadow of the point *R* limits the extent of all the hour-lines.

Of the right placing of dials, and having a true meridian line for the regulating of clocks and watches.

The plane on which the dial is to reſt being duly prepared, and every thing neceſſary for fixing it, you may find the hour tolerably exact by a large equinoctial ring-dial, and ſet your watch to it. And then the dial may be fixed by the watch at your leiſure.

If you would be more exact, take the ſun's altitude by a good quadrant, noting the preciſe time of obſervation by a clock or watch. Then compute the time for the altitude obſerved, and ſet the watch to agree with that time, according to the ſun. A *Hadley*'s quadrant is very convenient for this purpoſe; for, by it you may take the angle between the ſun and his image reflected from a baſon of water; the half of which angle, ſubtracting the refraction, is the altitude required. This is beſt done in ſummer, and the nearer the ſun is to the prime vertical (the eaſt or weſt azimuth) when the obſervation is made, ſo much the better.

Or, in ſummer, take two equal altitudes of the ſun in the ſame day; one any time between 7 and 10 in the morning, the other between 2 and 5 in the afternoon; noting the moments of theſe two obſervations by a clock or watch: and if the watch ſhews the obſervations to be at equal diſtances from noon, it agrees exactly with the ſun: if not, the watch muſt be corrected by half the difference of the forenoon and afternoon intervals; and then the dial may be ſet true by the watch.

Thus, for example, ſuppoſe you had taken the ſun's altitude when it was 20 minutes paſt VIII in the morning by the watch; and found, by obſerving in the afternoon, that the ſun had the ſame altitude 10 minutes before IIII; then it is plain, that the watch was 5 minutes too faſt for the ſun: for 5 minutes after XII is the middle time between VIII h. 20 m. in the morning, and III h. 50 m. in the afternoon; and therefore, to make the watch agree with the ſun, it muſt be ſet back five minutes.

A good *meridian line*, for regulating clocks or watches, may be had by the following method.

Make a round hole, almoſt a quarter of an inch diameter, in a thin plate of metal; and fix the plate in the top of a ſouth window, in ſuch a manner, that it may recline from the zenith at an angle equal to the co-latitude of your place, as nearly as you can gueſs: for then the plate will face the ſun directly at noon on the equinoctial days. Let the ſun ſhine freely through the hole into the room; and hang a plumb-line to the cieling of the room, at leaſt five or ſix feet from the window, in ſuch a place as that the ſun's rays, tranſmitted through the hole, may fall upon the line when it is noon by the clock; and having marked the ſaid place on the cieling, take away the line.

Having adjuſted a ſliding bar to a dove-tail groove, in a piece of wood about 18 inches long, and fixed a hook into the middle of the bar, nail the wood to the above-mentioned place on the cieling, parallel to the ſide of the room in which the window is; the groove and bar being towards the floor. Then, hang the plumb-line upon the hook in the bar, the weight or plummet reaching almoſt to the floor; and the whole will be prepared for farther and proper adjuſtment.

This done, find the true ſolar time by either of the two laſt methods, and thereby regulate your clock. Then, at the moment of next noon by the clock, when the ſun ſhines, move the ſliding-bar in the groove, until the ſhadow of the plumb-line biſects the image of the ſun (made by his rays tranſmitted through the hole) on the floor, wall, or on a white ſcreen placed on the north ſide of the line; the plummet or weight at the end of the line hanging freely in a pail of water placed below it on the floor.—But becauſe this may not be quite correct for the firſt time, on account that the plummet will not ſettle immediately, even in water; it may be farther corrected on the following days, by the above method, with the ſun and clock; and ſo brought to a very great exactneſs.

N. B. The rays tranſmitted through the hole, will caſt but a faint image of the ſun, even on a white ſcreen, unleſs the room be ſo darkened that no ſunſhine may be allowed to enter, but what comes through the ſmall hole in the plate. And always, for ſome time before the obſervation is made, the plummet ought to be immerſed in a jar of water, where it may hang freely; by which means the line will ſoon become ſteady, which otherwiſe would be apt to continue ſwinging.

An univerſal dial, ſhewing the hours of the day by a terreſtrial globe, and by the ſhadows of ſeveral gnomons, at the ſame time: together with all the places of the earth which are then enlightened by the ſun; and thoſe to which the ſun is then riſing, or on the meridian, or ſetting.

This dial (ſee Plate LXXII.) is made of a thick ſquare piece of wood, or hollow metal. The ſides are cut into ſemicircular hollows, in which the hours are placed; the ſtile of each hollow coming out from the bottom thereof, as far as the ends of the hollows project. The corners are cut out into angles, in the inſides of which the hours are alſo marked; and the edge of the end of each ſide of the angle ſerves as a ſtile for caſting a ſhadow on the hours marked on the other ſide.

In the middle of the uppermoſt ſide, or plane, there is an equinoctial dial; in the centre whereof an upright wire is fixt, for caſting a ſhadow on the hours of that dial, and ſupporting a ſmall terreſtrial globe on its top.

The whole dial ſtands on a pillar, in the middle of a round horizontal board, in which there is a compaſs and magnetic needle, for placing the *meridian* ſtile toward the ſouth. The pillar has a joint with a quadrant upon it, divided into 90 degrees (ſuppoſed to be hid from ſight under the dial in the figure) for ſetting it to the latitude of any given place; the ſame way as already deſcribed in the dial on the croſs.

The equator of the globe is divided into 24 equal parts, and the hours are laid down upon it at theſe parts. The time of the day may be known by theſe hours, when the ſun ſhines upon the globe.

To rectify and uſe this dial, ſet it on a level table, or ſole of the window, where the ſun ſhines, placing the meridian ſtile due ſouth, by means of the needle; which will be, when the needle points as far from the north fleur-de-lis toward the weſt, as it declines weſtward, at your place. Then bend the pillar in the joint, till the black line on the pillar comes to the latitude of your place in the quadrant.

The machine being thus rectified, the plane of its dial-part will be parallel to the equator, the wire or axis that ſupports the globe will be parallel to the earth's axis, and the north pole of the globe will point toward the north pole of the heavens.

The ſame hour will then be ſhewn in ſeveral of the hollows, by the ends of the ſhadows of their reſpective ſtiles: the axis of the globe will caſt a ſhadow on the ſame hour of the day, in the equinoctial dial, in the centre of which it is placed, from the 20th of March to the 23d of September; and, if the meridian of your place on the globe be ſet even with the meridian ſtile, all the parts of the globe that the ſun ſhines upon, will anſwer to thoſe places of the real earth which are then enlightened by the ſun. The places where the ſhade is juſt coming upon the globe, anſwer to all thoſe places of the earth to which the ſun is then ſetting; as the places where it is going off, and the light coming on, anſwer to all the places of the earth where the ſun is then riſing. And laſtly, if the hour of VI be marked on the equator in the meridian of your place (as it is marked on the meridian of London in the figure) the diviſion of the light and ſhade on the globe will ſhew the time of the day.

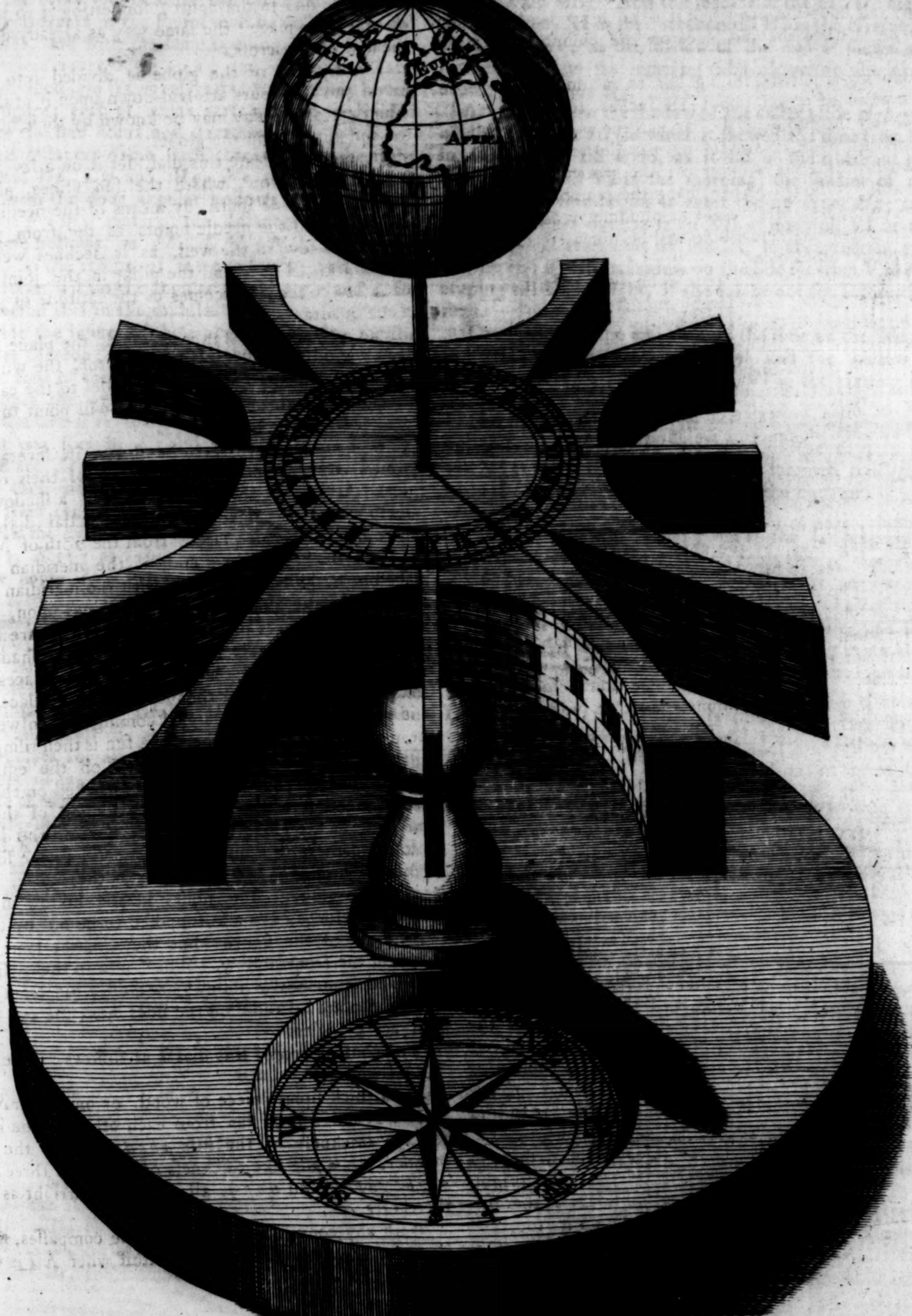
The northern ſtile of the dial (oppoſite to the ſouthern or meridian one) is hid from ſight in the figure, by the axis of the globe. The hours in the hollow to which that ſtile belongs, are alſo ſuppoſed to be hid by the oblique view of the figure: but they are the ſame as the hours in the front-hollow. Thoſe alſo in the right and left hand ſemicircular hollows are moſtly hid from ſight; and ſo alſo are all thoſe on the ſides next the eye of the four acute angles.

The conſtruction of this dial is as follows: (See Plate LXXI. fig. 4.)

On a thick ſquare piece of wood, or metal, draw the lines *a c* and *b d*, as far from each other as you intend for the thickneſs of the ſtile *a b c d*; and in the ſame manner, draw the like thickneſs of the other three ſtiles, *e f g h*, *i k l m*, and *n o p q*, all ſtanding outright as from the centre.

With any convenient opening of the compaſſes, as *a A* (ſo as to leave proper ſtrength of ſtuff when *K I* is equal to

Plate LXXII.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8

to *a A*) ſet one foot in *a*, as a centre, and with the other foot deſcribe the quadrantal arc *Ac*. Then, without altering the compaſſes, ſet one foot in *b* as a centre, and with the other foot deſcribe the quadrant *dB*. All the other quadrants in the figure muſt be deſcribed in the ſame manner, and with the ſame opening of the compaſſes, on their centres *e*, *f*; *i*, *k*; and *n*, *o*: and each quadrant divided into ſix equal parts, for ſo many hours, as in the figure; each of which parts muſt be ſubdivided into 4, for the half hours and quarters.

At equal diſtances from each corner, draw the right lines *Ip* and *Kp*, *Lq* and *Mq*, *Nr* and *Or*, *Ps* and *Qs*; to form the four angular hollows *IpK*, *LqM*, *NrO*, and *PsQ*; making the diſtances between the tips of theſe hollows, as *IK*, *LM*, *NO*, and *PQ*, each equal to the radius of the quadrants; and leaving ſufficient room within the angular points *p q r* and *s*, for the equinoctial dial in the middle.

To divide the inſides of theſe angles properly, for the hour-ſpaces thereon; take the following method.

Set one foot of the compaſſes in the point *I*, as a centre, and open the other to *K*; and with that opening deſcribe the arc *Kt*: then, without altering the compaſſes, ſet one foot in *K*, and with the other foot deſcribe the arc *It*. Divide each of theſe arcs, from *I* and *K* to their interſection at *t*, into four equal parts; and from their centres *I* and *K*, through the points of diviſion, draw the right lines *I*3, *I*4, *I*5, *I*6, *I*7; and *K*2, *K*1, *K*12, *K*11; and they will meet the ſides *Kp* and *Ip* of the angle *IpK* where the hours thereon muſt be placed. And theſe hour-ſpaces in the arcs muſt be ſubdivided into four equal parts, for the half-hours and quarters.—Do the like for the other three angles, and draw the dotted lines, and ſet the hours in the inſides where thoſe lines meet them, as in the figure: and the like hour-lines will be parallel to each other in all the quadrants and in all the angles.

Mark points for all theſe hours on the upper ſide; and cut out all the angular hollows, and the quadrantal ones quite through the places where their four gnomons muſt ſtand; and lay down the hours on their inſides, as in Plate LXXII. and then ſet in their gnomons, which muſt be as broad as the dial is thick; and this breadth and thickneſs muſt be large enough to keep the ſhadows of the gnomons from ever falling quite out at the ſides of the hollows, even when the ſun's declination is at the greateſt.

Laſtly, draw the equinoctial dial in the middle, all the hours of which are equidiſtant from each other: and the dial will be finiſhed.

As the ſun goes round, the broad end of the ſhadow of the ſtile *acbd* will ſhew the hours in the quadrant *Ac*, from ſun-riſe till VI in the morning; the ſhadow from the end *M* will ſhew the hours on the ſide *Lq* from V to IX in the morning; the ſhadow of the ſtile *egfh* in the quadrant *Dg* (in the the long days) will ſhow the hours from ſun-riſe till VI in the morning; and the ſhadow of the end *N* will ſhew the morning hours, on the ſide *Or*, from III to VII.

Juſt as the ſhadow of the northern ſtile *abcd* goes off the quadrant *Ac*, the ſhadow of the ſouthern ſtile *iklm* begins to fall within the quadrant *Fl*, at VI in the morning; and ſhews the time, in that quadrant, from VI till XII at noon; and from noon till VI in the evening in the quadrant *mE*. And the ſhadow of the end *O*, ſhews the time from XI in the forenoon till III in the afternoon, on the ſide *rN*; as the ſhadow of the end *P* ſhews the time from IX in the morning till I o'clock in the afternoon, on the ſide *Qs*.

At noon, when the ſhadow of the eaſtern ſtile *eſgh* goes off the quadrant *hC* (in which it ſhewed the time from VI in the morning till noon, as it did in the quadrant *gD* from ſun-riſe till VI in the morning) the ſhadow of the weſtern ſtile *nopq* begins to enter the quadrant *Hp*; and ſhews the hours thereon from XII at noon till VI in the evening; and after *that* till ſun-ſet, in the quadrant *qG*: and the end *Q* caſts a ſhadow on the ſide *Ps* from V in the evening till IX at night, if the ſun be not ſet before that time.

The ſhadow of the end *I* ſhews the time on the ſide *Kp* from III till VII in the afternoon; and the ſhadow of the ſtile *abcd* ſhews the time from VI in the evening till the ſun ſets.

The ſhadow of the upright central wire, that ſupports the globe at top, ſhews the time of the day, in the middle or equinoctial dial, all the ſummer half year, when the ſun is on the north ſide of the equator.

DIALECT, an appellation given to the language of a province, in ſo far as it differs from that of the whole kingdom. The term, however, is more particularly uſed in ſpeaking of the ancient Greek, whereof there were four dialects, the Attic, Ionic, Æolic, and Doric, each of which was a perfect language in its kind, that took place in certain countries, and had peculiar beauties.

DIALOGISM, in rhetoric, is uſed for the ſoliloquy of perſons deliberating with themſelves. See SOLILOQUY.

DIALOGUE, in matters of literature, a converſation between two or more perſons, either by writing or by word of mouth.

Dialogue appears to be the moſt ancient form of writing, and is greatly recommended by ſeveral authors. The archbiſhop of Cambray, at the head of his paſtoral inſtruction, gives an account of the advantages of dialogue.

DIALTHÆA, in pharmacy, an unguent much uſed as a reſolvent, ſo called from althæa, or marſh-mallows, which is the principal ingredient in it. See ALTHÆA.

DIALYSIS, in grammar, a mark or character, conſiſting of two points, ¨, placed over two vowels of a word, in order to ſeparate them, becauſe otherwiſe they would make a diphthong, as Moſaïc, *&c.* See DIÆRESIS.

DIAMETER, in geometry, a right line paſſing through the center of a circle, and terminated at each ſide by the circumference thereof. See GEOMETRY.

DIAMOND, in natural hiſtory, a genus of precious ſtones, of a fine pellucid ſubſtance, of great hardneſs, never fouled by any admixture of earthy or any other coarſe matter, ſuſceptible of elegant tinges from metal-ſine particles, giving fire with ſteel, not fermenting with acid menſtruums, ſcarcely calcinable by any decree of fire, and of one ſimple and permanent appearance in all lights.

This is the moſt valuable and hardeſt of all gems; and though found of different ſhapes, and ſometimes accidentally tinged to ſeveral colours, yet ever carries the ſame diſtinguiſhing characters, and is very evidently in all thoſe ſtates the ſame body. It is, when pure, perfectly clear and pellucid as the pureſt water, and is eminently diſtinguiſhed from all other ſubſtances, by its vivid ſplendor, and the brightneſs of its reflections. It is extremely various in ſhape and ſize, being found in the greateſt quantity very ſmall, and the larger ones extremely ſeldom met with; the largeſt diamond certainly known ever to have been found is that in the poſſeſſion of the Great Mogul, which weighs 279 carats, and is computed to be worth 779,244 l.

The diamond has certainly one proper and determinate figure, into which it naturally muſt concrete, when in a ſtate of reſt and impeded by no other accident in its formation: the true figure then is an equilateral octohedron; and where ever it has concreted in a perfect manner, and without any interrupting accidents, it has always formed itſelf into this figure; and often in this its ſeveral ſurfaces are as bright as if poliſhed by art: but, as in common ſalt, though its figure be pyramidal, yet very eaſy accidents can determine it into cubes and parallellopipeds; ſo the diamond has often, in the ſtate of formation, been thrown into two other figures, both alſo ſeeming regular ones; the one a priſmatic columnar one of ſix angles ſomewhat emulating the figure of cryſtal, the other an oblong quadrilateral column with two truncated ends: theſe ſeem the only regular figures of this gem; but beſides theſe, it is every day found in numberleſs other miſſhapen forms, often roundiſh, emulating the ſhape of pebbles, but full of ſmall flat planes or faces; frequently oblong, very often flat, and as often tapering, either from one end to the other, or elſe from the middle to both ends. A diamond bears the force of the ſtrongeſt fire, except the concentrated ſolar rays, without hurt; and even that infinitely fierceſt of all fires does it no injury, unleſs directed to its weaker parts.

It is a common thing for diamonds to be too thick or deep for the extent of their ſurface, and there is a certain proportion of depth, beyond which the gem ſhould not be allowed: in this caſe two diamonds are often made, by the regularly dividing one: this, when the maſs is of an angular figure, is done by cutting it through with a wire, wetted with oil, and covered with diamond-powder; but in the flat or more common maſſes, it is done much more expeditiouſly by finding the grain of the ſtone, and introducing the point of a fine flat chiſſel between them. This is not the only uſe of the ſplitting; for when a diamond has a flaw or blemiſh in it, which greatly debaſes its value, the plates may be ſeparated at a proper breadth, and the flaw removed; in which caſe the thinner cruſt, ſtruck off, is of value in proportion to its ſize, and the remainder, being now freed from its flaw, is of much more value than it was at firſt. The places whence we have the diamonds are the Eaſt-Indies, in the iſland of Borneo, and in the kingdoms of Viſapour, Golconda, Bengal; and the Brazils in the Weſt-Indies. They are not unfrequently found yellowiſh, blueiſh, and reddiſh, but more rarely greeniſh.

Valuation of DIAMONDS, among jewellers, is thus calculated: they ſuppoſe the value of a rough diamond to be 2 l. per carat; then to find the value of thoſe of greater weight, they multiply the ſquare of their weight by 2, and this laſt product is the value of the diamonds in their rough ſtate: thus, the value of a rough diamond weighing 4 carats, is equal $4\times4\times2=16\times2=32$ l. and ſo in other caſes. Again, to find the value of wrought diamonds, they ſuppoſe half their weight loſt in the manufacturing them, and therefore multiply the ſquare of double their weight by 2; thus the value of a wrought diamond, weighing 3 carrats, is equal $6\times6\times2=36\times2=72$ l.

Roſe-DIAMOND is that quite flat underneath, with its upper part cut in divers little faces, uſually triangles, the uppermoſt of which terminate in a point.

Table-DIAMOND is that which has a large ſquare face at top, encompaſſed with four leſſer.

Brilliant DIAMOND is that cut in faces both at top and bottom; and whoſe table, or principal face at top, is flat.

DIAMOND, in the glaſs-trade, an inſtrument uſed for ſquaring the large plates or pieces; and, among glaziers, for cuting their glaſs.

Theſe ſort of diamonds are differently fitted up; that uſed for large pieces, as looking-glaſſes, &c. is ſet in an iron ferril, about two inches long, and a quarter of an inch in diameter; the cavity of the ferril being filled up with lead, to keep the diamond firm: there is alſo a handle of box, or ebony, fitted to the ferril, for holding it by.

DIAMOND, in heraldry, a term uſed for expreſſing the black colour in the atchievements of peerage.

Guillim does not approve of blazoning the coats of peers by precious ſtones inſtead of metals and colours; but the Engliſh practice allows it. Morgan ſays the diamond is an emblem of fortitude.

DIANÆ ARBOR, or ARBOR LUNÆ, in chemiſtry, the beautiful cryſtallizations of ſilver, diſſolved in aqua fortis, to which ſome quickſilver is added: and ſo called from their reſembling the trunk, branches, leaves, &c. of a tree. See CHEMISTRY.

DIANDRIA, in the Linnæan ſyſtem of botany. See BOTANY, p. 635.

DIANO, a town of the Genoeſe, about three miles from the ſea. The country about produces great numbers of olives.

DIANTHERA, in botany, a genus of the diandria monogynia claſs. The corolla is ringent; and the capſule has two elaſtic valves. There are two ſpecies, both natives of America.

DIANTHUS, in botany, a genus of the decandria digynia claſs. The calix is cylindrical, and conſiſts of one leaf, with four ſcales at the baſe; the corolla conſiſts of five clawed petals; and the capſule is cylindrical, and has but one cell. There are ſeventeen ſpecies, five of which are natives of Britain, *viz.* the armeria, or Deptford pink; the prolifer, or limewort; the deltoides, or maiden pinks; the glaucus, or mountain pink; and the arenarius, or ſtone pink.

DIAPASON, in muſic, a muſical interval, by which moſt authors, who have wrote upon the theory of muſic, uſe to expreſs the octave of the Greeks. See Octave.

Diapason, among the muſical-inſtrument makers, a kind of rule or ſcale, whereby they adjuſt the pipes of their organs, and cut the holes in their flutes, hautboys, *&c.* in due proportion, for performing the tones, ſemitones, and concords juſt.

Dapason diaex, in muſic, a kind of compound concord, whereof there are two ſorts; the greater, which is in the proportion of 10 : 3; and the leſſer, in that of 16 : 5.

Diapason diapente, in muſic, a compound conſonance in a triple ratio, as 3 : 9. This interval, ſays Martianus Capella, conſiſts of nine tones and a ſemitone, nineteen ſemitones, and thirty eight dieſes. It is a ſymphony made when the voice proceeds from the firſt to the twelfth ſound.

Diapason diatessaron, in muſic, a compound concord, founded on the proportion of 8 : 3. To this interval Martianus Capella allows eight tones and a ſemitone, ſeventeen ſemitones, and thirty-four dieſes.

This is when the voice proceeds from its firſt to its eleventh ſound. The moderns would rather call it the eleventh.

Diapason ditone, in muſic, a compound concord, w[illegible]e terms are as 10 : 4, or 5 : 2.

Diapason semiditone, in muſic, a compound concord, whoſe terms are in the proportion of 12 : 5.

DIAPEDESIS, in medicine, a tranſudation of the fluids through the ſides of the veſſels that contain them, occaſioned by the blood's becoming too much attenuated, or the pores becoming too patent.

DIAPENSIA, in botany, a genus of the pentandria-monogynia claſs. The calix conſiſts of five leaves, imbricated with three ſmaller ones; the ſtamina ariſe from the tube of the corolla; and the capſule has three cells; there are three ſpecies, none of them natives of Britain.

DIAPENTE, in the ancient muſic, an interval marking the ſecond of the concords; and with the diateſſaron, an octave. This is what in the modern muſic is called a fifth.

DIAPHANOUS, an appellation given to all tranſparent bodies, or ſuch as tranſmit the rays of light. See Optics.

DIAPHOENICUM, in pharmacy, a ſort of medicine or electuary chiefly made of dates. It purges ſeroſities, and excites the menſes. It is alſo uſed in dropſies, lethargies, apoplexies, and palſies.

DIAPHORESIS, in medicine, an elimination of the humours in any part of the body through the pores of the ſkin. See Perspiration.

DIAPHORETICS, among phyſicians, all medicines which promote perſpiration.

DIAPHRAGM, in anatomy. See Vol. I. p. 213.

DIAPORESIS, in rhetoric, a figure of oratory, expreſſing the uncertainty of the ſpeaker how he ſhall proceed in his diſcourſe.

DIARBEC, or Diarbeck, the capital of a province of the ſame name, anſwering to the ancient Meſopotamia: it is ſituated on the river Tigris, near its ſource, in 42° E. long. and 37° 30′ N. lat.

DIARRHOEA, or Looseness, in medicine, is a frequent and copious evacuation of liquid excrement, by ſtool. See Medicine.

DIARTHROSIS, in anatomy. See Vol. I. p. 148.

DIARY, among traders, denotes a day-book containing the proceedings of one day.

DIACHISM, among muſicians, denotes the difference between the comma and enharmonic dieſis, commonly called the leſſer comma.

DIASCORDIUM, in pharmacy, a celebrated compoſition, ſo called from ſcordium, one of its ingredients. It is otherwiſe termed *confectio fracaſtorii,* and is thus directed by the college.

Take of cinnamon and caſſia-wood, of each half an ounce; of true ſcordium, one ounce; of Cretan dittany, tormentil, biſtort, galbanum, and gum-arabic, of each half an ounce; of ſtorax, four drams and an half; of opium, and ſeeds of ſorrel, of each one dram and an half; of gentian, half an ounce; of American bole, one ounce and an half; of Lemnian ſealed earth, half an ounce; of long pepper and ginger, of each two drams; of clarified honey, two pounds and an half; of ſugar of roſes, one pound; of generous canary, eight ounces; make into an electuary. It is excellent in all kinds of fluxes, and a great ſtrengthener both of the ſtomach and bowels.

DIASEBESTEN, in pharmacy, a ſoft purgative electuary, whereof ſebeſtens are the principal ingredients. The other ingredients are prunes, tamarinds, juices of iris, anguria and mercurialis, penidies, ſimple diaprunum, violet ſeeds, and diagrydium. It is good in remitting and continued fevers, *&c.*

DIASENNA, in pharmacy, the name of a medicine in which ſenna is the principal ingredient.

The other ingredients are ſugar-candy, cinnamon, lapis lazuli, ſilk, cloves, galanga-minor, black pepper, nardus indica, ſeed of baſilicum, flowers of cloves, cardamoms, ſaffron, ginger, zedoary, *&c.*

This electuary is taken againſt melancholy and ſpleen, and againſt diſeaſes ariſing from an atrabilis.

DIASTOLE, among phyſicians, ſignifies the dilatation of the heart, auricles and arteries; and ſtands oppoſed to the ſyſtole, or contraction of the ſame parts. See Circulation.

Diastole, in grammar, a figure of proſody, whereby a ſyllable naturally ſhort is made long: ſuch is the firſt ſyllable of Priamides, in the following verſe of Virgil.

Atque hic Priamides! nihil ô tibi, amice, relictum.

DIASYRMUS, in rhetoric, a kind of hyperbole, being an exaggeration of ſome low ridiculous thing.

DIATESSARON, among ancient muſicians, a concord, or harmonical interval, compoſed of a greater tone, a leſs tone, and one greater ſemi-tone: its proportion in numbers is as 4 : 3.

Diatessaron, in pharmacy, the name of a compoſition ſo called, from the four ingredients it comprehends: it is prepared thus.

Take of gentian root, bay-berries, myrrh, and roots of birthwort, of each two ounces; of honey, two pounds; mix them into an electuary. This, with the addition of the ſhavings of ivory, two ounces, is entitled diapente, or a compoſition of five ingredients.

DIATONIC, an epithet given to muſic, as it proceeds by tones and ſemi-tones, both aſcending and deſcending. See Music.

DIATRAGACANTH, in pharmacy, a name applied to certain powders, whereof gum tragacanth is the principal ingredient; of which there are two kinds, the cold and the hot: the cold is directed thus: take of gum tragacanth, two ounces; of gum arabic, an ounce and two drams; of ſtarch, half an ounce; of liquorice, and the ſeeds of melons and white poppies, of each two drams; of ſugar-candy, three ounces; mix them into a powder. This is frequently preſcribed in hectical heats, in choleric conſtitutions, in diſtempers of the breaſt, in ſtranguries, heat of urine, and the pungency of venereal gleets.

Powder of hot diatragacanth is compoſed of gum tragacanth, cinnamon, hyſſop, almonds, linſeed, fenugreek, liquorice, and ginger, It is good againſt aſthmas, to promote expectoration, ſtrengthen the ſtomach, and aſſiſt digeſtion.

DIAUGOPHRAGMIA, in natural hiſtory, a genus of foſſils of the order of ſeptariæ, whoſe partitions, or ſepta, conſiſt of ſpar with an admixture of cryſtal. Of this genus there are three ſpecies. 1. A red kind, with browniſh-yellow partitions. 2. A browniſh yellow kind, with whitiſh partitions. 3. A bluiſh-white kind, with ſtraw-coloured partitions.

DICE, among gamſters, certain cubical pieces of bone or ivory, marked with dots on each of their faces, from one to ſix, according to the number of faces.

Sharpers have ſeveral ways of falſifying dice. 1. By ſticking a hog's briſtle in them, ſo as to make them run high or low, as they pleaſe. 2. By drilling and loading them with quickſilver; which cheat is found out by holding them gently by two diagonal corners; for if falſe, the heavy ſides will turn always down. 3. By filling and rounding them. But all theſe ways fall far ſhort of the art of the dice-makers; ſome of whom are ſo dextrous this way, that your ſharping gamſters will give any money for them.

Dice formerly paid 5 s. every pair imported, with an additional duty of 4 s. 9$\frac{41}{100}$d. for every 20s. value upon oath; but are now prohibited to be imported.

DICHOTOMY, a term uſed by aſtronomers for that phaſis, or appearance of the moon, wherein ſhe is biſected, or ſhews juſt half her diſk. In this ſituation the moon is ſaid to be in a quadrate aſpect, or to be in her quadrature.

Dichotomy, in botany. See Botany, p. 641.

DICHOTOPHYLLUM, it botany. See Ceratophyllum.

DICKER, in old writers, denotes the quantity of ten hides of ſkins, whereof twenty made a laſt: alſo ten pair of gloves, ten bars of iron, and the like, are ſometimes expreſſed by the term dicker.

DICTAMUS, dittany, in botany, a genus of the decandria monogynia claſs. The calix conſiſts of five leaves, and the corolla of five open petals; the filaments have many glandular points; and the five capſules are united. There is but one ſpecies, *viz.* the oblus, a native of Italy. The root is ſaid to be alexipharmic, but is not regarded in practice.

DICTATOR, in the policy of the ancient Romans, a magiſtrate inveſted with ſovereign and even arbitrary power.

He had power of life and death; alſo to raiſe and diſband troops, make war or peace, and that without the conſent either of the ſenate or people, or being accountable for his proceedings. He was elected by one of the conſuls in the night-time, on the frontiers of the commonwealth, and nowhere elſe; and the ordinary duration of his office was only for ſix months, during which time all other magiſtracies ceaſed, the tribuneſhip excepted. Whenever he appeared in public, he was attended by twenty-four lictors, or double the number allowed a conſul. However, notwithſtanding all this power, he could not go out of Italy, or even ride on horſeback during a march, without leave from the people.

This office was accounted the ſafeguard of the commonwealth for four hundred years together, till Sylla and Cæſar, by aſſuming the title of perpetual dictators, converted it into tyranny, and rendered the very name odious.

DICTION, the phraſe, elocution, or ſtyle of a writer or ſpeaker. See Composition,

DICTIONARY, in its original acceptation, is the arranging all the words of a language according to the order of the alphabet, and annexing a definition or explanation to each word. When arts and ſciences began to be improved and extended, the multiplicity of technical terms rendered it neceſſary to compile dictionaries either of ſcience in general, or of particular ſciences, according to the views of the compiler. For further particulars concerning dictionaries of this kind, ſee the *Preface.*

Dictionary *of the Engliſh language.* The only attempt which has hitherto been made towards forming a regular dictionary of the Engliſh language, is that of the learned Dr Samuel Johnſon. But although it is executed in a maſterly manner, yet as it cannot be expected that an undertaking of this nature could be brought to perfection by one man, we ſhall venture to ſuggeſt a few circumſtances which, if duely attended to, may perhaps be of ſome utility.

The deſign of every dictionary of language, is to explain, in the moſt accurate manner, the meaning of every word, and to ſhow the various ways in which it can be combined with others, in as far as this tends to alter its meaning. The dictionary which does this in the moſt accurate manner, is the moſt complete. Therefore the principal ſtudy of a lexicographer ought to be, to diſcover a method which will be beſt adapted for that purpoſe. Dr Johnſon, with great labour, has collected the various meanings of every word, and quoted the authorities: But, would it not have been an improvement if he had given an accurate definition of the preciſe meaning of every word; pointed out the way in which it ought to be employed with the greateſt propriety; ſhewed the various deviations from that original meaning, which cuſtom had ſo far eſtabliſhed as to render allowable; and fixed the preciſe limits beyond which it could not be employed without becoming a vicious expreſſion? With this view, it would have been neceſſary to exhibit the nice diſtinctions that take place between words which are nearly ſynonymous. Without this, many words can only be defined in ſuch a manner, as that they muſt be conſidered as exactly ſynonymous. We omit giving any quotations from Johnſon to point out theſe defects; but ſhall content ourſelves with giving a few examples, to ſhew how, according to our idea, a dictionary of the Engliſh language ought to be compiled.

IMMEDIATELY. *adv. of time.*

1. Inſtantly, without delay. Always employed to denote future time, and never paſt. Thus, we may ſay, *I will come immediately*; but not, *I am immediately come from ſuch a place.* See PRESENTLY.
2. Without the intervention of any cauſe or event; as oppoſed to mediately.

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FORM. *ſubſt.* The external appearance of any object, when conſidered only with reſpect to ſhape or figure. This term therefore, in the literal ſenſe, can only be applied to the objects of the ſight and touch; and is nearly ſynonymous with figure; but they differ in ſome reſpects. *Form* may be employed to denote more rude and unfiniſhed ſhapes; *figure*, thoſe which are more perfect and regular. *Form* can never be employed without denoting matter; whereas *figure* may be employed in the abſtract: Thus, we ſay a ſquare or a triangular *figure*; but not a ſquare or triangular *form*. And in the ſame manner we ſay, the *figure* of a houſe: but we muſt denote the ſubſtance which forms that figure, if we uſe the word *form*; as, *a cloud of the form of a houſe, &c.* See FIGURE.

2. In contraſt to irregularity, or confuſion. As beauty cannot exiſt without order, it is by a figure of ſpeech employed to denote beauty, order, *&c.*
3. As *form* regards only the external appearance of bodies, without regard to their internal qualities, it is, by a figure of ſpeech, employed in contraſt to theſe qualities, to denote empty ſhew, without eſſential qualities. In this ſenſe it is often taken when applied to religious ceremonies, *&c.*
4. As *form* is employed to denote the external appearance of bodies; ſo, in a figurative ſenſe, it is applied to reaſoning, denoting the particular mode or manner in which this is conducted; as, *the form of a ſyllogiſm*, &c.
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7. But when bodies of different kinds are compared with one another, this term may be employed to denote other circumſtances than ſhape or figure; for we may ſay, *a juice exſuding from a tree in the form of wax or reſin*; although, in this caſe, the conſiſtence, colour, *&c.* and not the external arrangement of parts, conſtitutes the reſemblance.
8. From the regular appearance of a number of perſons arranged in one long ſeat, ſuch perſons ſo arranged are ſometimes called a *form*; as, *a form of ſtudents*, &c. And,
9. By an eaſy tranſition, the ſeat itſelf has alſo acquired that name.

GREAT. *adj.* A relative term, denoting largeneſs of quantity, number, *&c.* ſerving to augment the value of thoſe terms with which it is combined, and oppoſed to *ſmall* or *little*. The principal circumſtances in which this term can be employed, are the following:

1. When merely inanimate objects are conſidered with regard to quantity, *great* is with propriety employed, to denote that the quantity is conſiderable; as, *a great mountain, a great houſe*, &c. and it is here contraſted with *ſmall*. When *great* is thus employed, we have no other word that is exactly ſynonymous.
2. When inanimate objects are conſidered with regard to their extent, this term is ſometimes employed, although with leſs propriety; as, *a great plain, a great field*, &c. and in this ſenſe it is nearly ſynonymous with *large*; and they are often uſed indiſcriminately, but with ſome difference of meaning: for, as *large* is a term chiefly employed to denote extent of ſuperficies, and as *great* more particularly regards the quantity of matter; therefore, when *large* is applied to any object which is not merely ſuperficial, it denotes that it is the extent of ſurface that is there meant to be conſidered, without regard to the other dimenſions; whereas when the term *great* is employed, it has a reference to the whole contents. If, therefore, we ſay, *a large houſe*, or *a large river*, we expreſs that the houſe, the river,

have

leſs tone, and one greater ſemi-tone: its proportion in numbers is as 4 : 3.

Diatessaron, in pharmacy, the name of a compoſition ſo called, from the four ingredients it comprehends: it is prepared thus.

Take of gentian root, bay-berries, myrrh, and roots of birthwort, of each two ounces; of honey, two pounds; mix them into an electuary. This, with the addition of the ſhavings of ivory, two ounces, is entitled diapente, or a compoſition of five ingredients.

DIATONIC, an epithet given to muſic, as it proceeds by tones and ſemi-tones, both aſcending and deſcending. See Music.

DIATRAGACANTH, in pharmacy, a name applied to certain powders, whereof gum tragacanth is the principal ingredient; of which there are two kinds, the cold and the hot: the cold is directed thus: take of gum tragacanth, two ounces; of gum arabic, an ounce and two drams; of ſtarch, half an ounce; of liquorice, and the ſeeds of melons and white poppies, of each two drams; of ſugar-candy, three ounces; mix them into a powder. This is frequently preſcribed in hectical heats, in choleric conſtitutions, in diſtempers of the breaſt, in ſtranguries, heat of urine, and the pungency of venereal gleets.

Powder of hot diatragacanth is compoſed of gum tragacanth, cinnamon, hyſſop, almonds, linſeed, fenugreek, liquorice, and ginger, It is good againſt aſthmas, to promote expectoration, ſtrengthen the ſtomach, and aſſiſt digeſtion.

DIAUGOPHRAGMIA, in natural hiſtory, a genus of foſſils of the order of ſeptariæ, whoſe partitions, or ſepta, conſiſt of ſpar with an admixture of cryſtal. Of this genus there are three ſpecies. 1. A red kind, with browniſh-yellow partitions. 2. A browniſh yellow kind, with whitiſh partitions. 3. A bluiſh-white kind, with ſtraw-coloured partitions.

DICE, among gamſters, certain cubical pieces of bone or ivory, marked with dots on each of their faces, from one to ſix, according to the number of faces.

Sharpers have ſeveral ways of falſifying dice. 1. By ſticking a hog's briſtle in them, ſo as to make them run high or low, as they pleaſe. 2. By drilling and loading them with quickſilver; which cheat is found out by holding them gently by two diagonal corners; for if falſe, the heavy ſides will turn always down. 3. By filling and rounding them. But all theſe ways fall far ſhort of the art of the dice-makers; ſome of whom are ſo dextrous this way, that your ſharping gamſters will give any money for them.

Dice formerly paid 5 s. every pair imported, with an additional duty of 4 s. $9\frac{41}{100}$d. for every 20s. value upon oath; but are now prohibited to be imported.

DICHOTOMY, a term uſed by aſtronomers for that phaſis, or appearance of the moon, wherein ſhe is biſected, or ſhews juſt half her diſk. In this ſituation the moon is ſaid to be in a quadrate aſpect, or to be in her quadrature.

Dichotomy, in botany. See Botany, p. 641.

DICHOTOPHYLLUM, it botany. See Ceratophyllum.

DICKER, in old writers, denotes the quantity of ten hides of ſkins, whereof twenty made a laſt: alſo ten pair of gloves, ten bars of iron, and the like, are ſometimes expreſſed by the term dicker.

DICTAMUS, dittany, in botany, a genus of the decandria monogynia claſs. The calix conſiſts of five leaves, and the corolla of five open petals; the filaments have many glandular points; and the five capſules are united. There is but one ſpecies, *viz.* the oblus, a native of Italy. The root is ſaid to be alexipharmic, but is not regarded in practice.

DICTATOR, in the policy of the ancient Romans, a magiſtrate inveſted with ſovereign and even arbitrary power.

He had power of life and death; alſo to raiſe and diſband troops, make war or peace, and that without the conſent either of the ſenate or people, or being accountable for his proceedings. He was elected by one of the conſuls in the night-time, on the frontiers of the commonwealth, and nowhere elſe; and the ordinary duration of his office was only for ſix months, during which time all other magiſtracies ceaſed, the tribuneſhip excepted. Whenever he appeared in public, he was attended by twenty-four lictors, or double the number allowed a conſul. However, notwithſtanding all this power, he could not go out of Italy, or even ride on horſeback during a march, without leave from the people.

This office was accounted the ſafeguard of the commonwealth for four hundred years together, till Sylla and Cæſar, by aſſuming the title of perpetual dictators, converted it into tyranny, and rendered the very name odious.

DICTION, the phraſe, elocution, or ſtyle of a writer or ſpeaker. See Composition,

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have a ſurface of great extent, without having any neceſſary connection with the ſize in other reſpects. But if we ſay, *a great houſe*, or *a great river*, it at once denotes that they have not only a large ſurface, but are alſo of great ſize in every reſpect.

3. *Great*, when applied to the human ſpecies, never denotes the ſize or largeneſs of body, but is applied ſolely to the qualities of the mind. Thus, when we ſay, that *Socrates was a great man*, we do not mean that he was a man of great ſize, but that he was a man who excelled in the endowments of the mind. The terms which denote largeneſs of ſize in the human body are, *big*, *bulky*, *huge*, &c.

4. *Great* is ſometimes applied to the human ſpecies, as denoting high rank. In this caſe it is oftener uſed in the plural number than otherwiſe. Thus we ſay ſimply, *the great*, meaning the whole body of men in high ſtation, as oppoſed to *mean*. It ſhould ſeldom be employed in this ſenſe, as it tends to confound dignity of rank with elevation of mind.

5. As this is a general term of augmentation, it may be joined with all nouns which denote *quantity*, *quality*, *number*, *excellence*, or *defects*; or ſuch as imply *praiſe*, *blame*, *anger*, *contempt*, or any other affection of the mind.

6. It is employed to denote every ſtep of aſcending or deſcending conſanguinity; as, *great-grandfather*, *great-grandſon*, &c.

HIGH. *adj.* Exalted in a perpendicular direction at a diſtance from the ſurface of the earth. Oppoſed to *low*.

1. *High* is a term altogether indefinite, and is employed to expreſs the degree of elevation of any inanimate body. Thus, we ſay, *a high mountain*, *a high houſe*, *ſteeple*, *tower*, *pillar*, &c. nor is there any other word that can here be conſidered as ſynonymous; *lofty* being employed only to denote a very eminent degree of elevation.

2. To expreſs the perpendicular elevation of vegetables, either *high* or *tall* may be employed, as being in this caſe nearly ſynonymous, we may therefore ſay, a *high* or *tall tree*, a *high* or *tall maſt*, &c. but with this difference between theſe two expreſſions, that *tall* can be more properly applied to thoſe that are much elevated and of ſmall dimenſions; and *high*, to ſuch as are more bulky, and of greater ſize.

3. The perpendicular height of man can never be expreſſed by the word *high*; *tall* being here the proper expreſſion. And although *high* is ſometimes uſed to expreſs the height of other animals, yet it ſeems to be an improper expreſſion. See TALL.

4. *High*, when applied to the human ſpecies, always refers to the mind; and denotes *haughtineſs*, *ſtatelineſs*, *pride*, &c.; and, when combined with the expreſſions of any energy of the mind, it denotes that in a higher degree. In this ſenſe, it is oppoſed to *meanneſs*, *abjectneſs*, and *humility*.

5. As this is an indefinite term, tending to denote any thing that is elevated above us, it may be combined with almoſt every noun which admits of this elevation. And as objects high above us are always out of our reach, it is in a metaphorical ſenſe uſed to denote any thing that ſeems to be above the ordinary condition of mankind; or thoſe qualities or endowments of mind that are not eaſily acquired; as, *dignity* or *elevation of ſentiment*, *dignity of rank*, *acuteneſs in reaſoning on difficult ſubjects*; *pride*, *haughtineſs*, or any other quality which ſeems beyond the ordinary level of mankind; *dearneſs of price*, &c.

6. In the ſame manner we employ this term to time; which having a metaphorical reſemblance to a river, flowing on with an unceaſing current through all ſucceſſive ages, any thing of remote antiquity is denoted by the term *high*.

7. Likewiſe thoſe degrees of latitude far removed from the line, where the pole becomes more elevated.

8. And to ſome particular crimes, as being attended with peculiar degrees of guilt; as, *high treaſon*.

TALL. *adj.* Something elevated to a conſiderable degree in a perpendicular direction. Oppoſed to *low*.

1. This term is chiefly employed to expreſs the height of man, and other animals; and is applied to denote the height of the body only, without having any reference to the mind. When applied to man, no other word can be ſubſtituted in its ſtead: when applied to other animals, *high* is ſometimes conſidered as nearly ſynonymous. See HIGH.

2. It is likewiſe employed to denote the perpendicular height of vegetables; and in this caſe it is nearly ſynonymous with *high*. See HIGH.

3. It can in no caſe be employed to expreſs the height of merely inanimate objects; as we can never ſay a *tall ſteeple*, *tower*, or *pillar*, but a *high ſteeple*, &c. For the diſtinctions in theſe caſes, ſee HIGH.

LONG. *adj.* A relative term, denoting the diſtance between the extremes of any body, which is extended more in one of its geometrical dimenſions than another. Oppoſed to *ſhort*.

1. This term may be applied to all inanimate objects, of whatever kind, whoſe dimenſions in one way exceeds the other, and when not in an erect poſture, whatever be the other circumſtances attending them; whether it relates to ſuperficies alone, or to ſolid bodies; whether theſe be bounded or open, ſtraight or crooked, flexible or rigid, or in any other circumſtances whatever; thus we ſay *a long* or *ſhort line*, *a long* or *ſhort ridge*, *ſtreet*, *ditch*, *rope*, *chain*, *ſtaff*, &c. But it is to be obſerved, that although *long* is, in the ſtrict ſenſe only, oppoſed to *ſhort*; yet as it expreſſes the extenſion of matter in one of its geometrical proportions, it is often contraſted by thoſe words which expreſs the other proportions when we mean only to deſcribe the ſeveral proportions; as, *a table long and broad*: and as theſe ſeveral dimenſions are expreſſed by different words, according to the various forms, modifications, and circumſtances, in which bodies are found; therefore it is in this ſenſe contraſted by a great diverſity of terms; as, *a long*

and broad, or *wide*, *narrow*, or *ſtrait ſtreet* or *lane*, *a long and thick*, or *ſmall rope*, *chain*, *ſtaff*, &c. For the diſtinctions in theſe caſes, ſee BROAD, WIDE, *&c.*

2. Objects neceſſarily fixed in an erect poſition can never have this term applied to them; and therefore we cannot ſay *a long*, but *a high tower* or *ſteeple*. And for the ſame reaſon, while trees are growing and fixed in an erect poſition, we cannot apply this term to them; but when they are felled and laid upon the ground, it is quite proper and neceſſary. Thus, we do not ſay *a long*, but *a tall* or *high tree*, while it is growing; but we ſay *a long*, not *a tall log of wood*: and in the ſame manner we ſay *a tall maſt*, when it is fixed in the ſhip; but *a long maſt*, while it lies upon the beech. See TALL and HIGH.

3. Thoſe vegetables which are of a tender pliant nature, or ſo weak as not to be able to retain a fixt poſition, being conſidered as of a middle nature between erect and proſtrate bodies, admit of either of the terms *long*, *tall*, or *high*; as, *a long* or *tall ruſh* or *willow wand*, or *a long*, *tall*, or *high ſtalk of corn*. See HIGH and TALL.

4. The parts of vegetables, when conſidered as diſtinct from the whole, even when growing and erect, aſſume the term *long*: for we no not ſay *a tall*, but *a long ſhoot of a tree*; and *a tree with a long ſtem*, in preference to *a tree with a high ſtem*.

5. For the ſame reaſon, a ſtaff, and pole, even when fixed in a perpendicular direction, aſſume the word *long*, in preference to *tall* or *high*.

6. With regard to animals, the general rule is applied, without any exceptions; *tall*, and not *long*, being employed to denote the height of the human body, when in an erect poſture; and *long* and not *tall*, to denote its length when in an incumbent ſituation. *Long*, applied to all other animals which do not walk erect, always denotes their greateſt length in a horizontal poſition from head to tail.

7. In a figurative ſenſe, it denotes, with regard to time, any thing at a great diſtance from us.

8. As alſo, any thing that takes up much time before it is finiſhed; as, *a long diſcourſe*, *a protracted note in muſic*, &c.

BROAD. *adj.* The diſtance between the two neareſt ſides of any body, whoſe geometrical dimenſions are larger in one direction than in another; and has a reference to ſuperficies only, and never to the ſolid contents. Oppoſed to *narrow*.

1. *Broad*, in the ſtricteſt acceptation, is applied to denote thoſe bodies only whoſe ſides are altogether open and unconfined; as, *a broad table*, *a broad wheel*, &c. and in theſe caſes it is invariably contraſted by the word *narrow*; nor is there any other word which in theſe caſes can be conſidered as ſynonymous with it, or uſed in its ſtead.

2. When any object is in ſome ſort bounded on the ſides, although not quite cloſed up, as a road, ſtreet, ditch, *&c.* either *broad* or *wide* may be employed, but with ſome difference of ſignification; *broad* being moſt properly uſed for thoſe that are more open, and *wide* to thoſe which are more confined; nor can this term be ever applied to ſuch objects as are cloſe bounded all around, as a houſe, church, &c. *wide* being here employed. For the more accurate diſtinctions in theſe caſes, ſee the article WIDE.

WIDE. *adj.* A term employed to denote relative extent in certain circumſtances. Oppoſed to *narrow* and *ſtrait*.

1. This term is in its proper ſenſe applied only to denote the ſpace contained within any body cloſed all round on every ſide, as a houſe, gait, *&c.* and differs from *broad* in this, that it never relates to the ſuperficies of ſolid objects, but is employed to expreſs the capaciouſneſs of any body which containeth vacant ſpace; nor can capaciouſneſs in this ſenſe be expreſſed by any other word but *wide*.

2. As many bodies may be conſidered either with reſpect to their capaciouſneſs, or ſuperficial extent; in all theſe caſes, either the term *broad* or *wide* may be uſed; as, *a broad* or *wide ſtreet* or *ditch*, *&c.* but with a greater or leſs degree of propriety, according to the circumſtances of the object, or the idea we wiſh to convey. In a ſtreet where the houſes are low, and the boundaries open, or in a ditch of ſmall depth and large ſuperficies, as this largeneſs of ſuperficies bears the principal proportion, *broad* would be more proper; but if the houſes are of great height, or the ditch of great depth, and capaciouſneſs is the principal property that affects the mind, we would naturally ſay *a wide ſtreet* or *ditch*; and the ſame may be ſaid of all ſimilar caſes: but there are ſome caſes in which both theſe terms are applied, with a greater difference of meaning; thus we ſay, *a broad*, or *a wide gate*; but as the gate is employed to denote either the aperture in the wall, or the matter which cloſes that aperture, theſe terms are each of them uſed to denote that particular quality to which they are generally applied: and as the opening itſelf can never be conſidered as a ſuperficies, the term *wide*, in this caſe, denotes the diſtance between the ſides of the aperture; while, on the contrary, *broad* denotes the extent of matter fitted to cloſe that aperture; nor can theſe two terms in any caſe be ſubſtituted for one another.

3. As a figurative expreſſion, it is uſed as a cant phraſe for a miſtake; as, *you are wide of the mark*; that is, not near the truth.

NARROW. *adj.* A relative term, denoting a proportional ſmallneſs of diſtance between the ſides of the ſuperficies of plain bodies. Oppoſed to *broad*.

1. As this is only applied to ſuperficies, it is exactly contraſted by *broad*, and is applied in all caſes where the term *broad* can be uſed, (ſee BROAD); and in no other caſe but as a contraſt to it, except the following.

2. It ſometimes is employed to deſcribe the ſmallneſs of ſpace circumſcribed between certain boundaries, as oppoſed to *wide*, and nearly ſynonymous with

ſtrait: as we ſay *a wide* or *a narrow houſe, church,* &c. For the neceſſary diſtinctions here, ſee the article STRAIT.

3. In a figurative ſenſe it denotes *parſimony, poverty, confined ſentiments,* &c.

STRAIT. *adj.* A relative term, denoting the extent of ſpace in certain circumſtances. Oppoſed to *wide,* ſee WIDE.

1. This term is employed, in its proper ſenſe, to denote only ſpace, as contained between ſurrounding bodies in ſuch circumſtances as to denote ſome degree of confinement; and is exactly oppoſed to *wide;* as, *a wide* or *a ſtrait gate,* &c. See WIDE.

2. So neceſſary is it that the idea of confinement ſhould be connected with this word, that in all thoſe caſes where the ſpace contained is large, as in a church or houſe, we cannot expreſs a ſmaller proportional width by this term. And as we have no other word to expreſs ſpace in theſe circumſtances, we have been obliged to force the word *narrow* from its natural ſignification, and make it expreſs this. See NARROW.

3. In ſome particular caſes *narrow* or *ſtrait* may be employed to the ſame object; as, *a narrow* or *a ſtrait lane:* but here *ſtrait* is never employed but where an idea of confinement is ſuggeſted, and where it is exactly contraſted to *wide*; nor can *narrow* be employed but in ſuch circumſtances where *broad* would be a perfect contraſt to it. Therefore theſe two terms may be always employed in the ſame circumſtances as thoſe which contraſt them may be. For an account of which, ſee WIDE.

3. The term *ſtrait* is likewiſe in a peculiar manner uſed to denote the ſmallneſs of the internal diameter of thoſe ſmall bodies which are fitted to receive or contain others as, any kind of bag, tube, body-cloaths, mortoiſes, and others of the ſame kind; and in all theſe caſes this term may be employed to denote the ſmallneſs of their leſſer diameter, and never the term *narrow.* But in certain circumſtances the word *tight* may be ſubſtituted for it. See TIGHT.

4. *Strait,* in a figurative ſenſe, denotes any ſort of confinement of ſentiment or diſpoſition.

TIGHT. *adj.* A term employed in certain circumſtances to denote the internal capacity of particular bodies. Nearly ſynonymous with *ſtrait.*

This term is confined entirely to denote the ſmallneſs of the internal dimenſions of ſuch objects as are formed to cover or to receive or contain other ſolid bodies, and can be employed in no other caſe. And although it agrees with *ſtrait,* in always denoting confinement, and by being applicable to the ſame ſpecies of objects, yet it differs in the the following reſpects: 1. If there be any difference of the diameter of the objects to which the term *ſtrait* can be employed, it always has reference to the ſmaller; yet *tight* may be employed to any ſort of confinement, whether it regards the length or breadth. 2. *Strait* can be applied to all bodies of capacity when of ſmall diameter, without any ſort of reference to the nature of the ſubſtance which it may be capable of containing. For we can ſay *a ſtrait bag, a ſtrait ſleeve, a ſtrait mortoiſe, a ſtrait gate,* &c. whereas *tight* can only be applied to any body when it is conſidered as having reference to another body which is intended to be contained in it and is pinched for want of room. Thus, we ſay, *the ſleeve of a coat is too tight for the arm, the mortoiſe is too tight for the tenon,* &c. but we cannot ſay, *the bag, or the gate is too tight,* becauſe theſe are fitted to receive any ſort of objects. And hence it happens, that, in many caſes, the dimenſions of the ſame body may be expreſſed by *tight* or *ſtrait* when conſidered in different circumſtances. Thus, we may ſay, *this ſleeve is too ſtrait,* when we look at a coat when lying on the table, and conſider its proportions; but it is not till we have tried it upon the arm that it is intended to cover, that we call it *tight.* And we may ſay, *a gate is too ſtrait,* or *too tight*; but in the firſt caſe we conſider it as being too confined for admitting objects to paſs through it, and in the laſt as being too confined with reſpect to the leaves that are to ſhut the aperture, not allowing them ſpace to move with freedom.

Theſe examples may ſerve to give ſome idea of the plan of an Engliſh dictionary compoſed upon philoſophical principles: But, beſides the circumſtances above enumerated, there are many others which would require particular attention in the execution of a work of this kind. In the Engliſh language, a great variety of terms occur, which denote matter under certain general forms or circumſtances, without regarding the minute diverſities that may take place; as the word *cloth,* which denotes matter as manufactured into a particular form, including under it all the variety of ſtuffs manufactured in that particular way, of whatever materials, colours, texture, or fineneſs they may be. The ſame may be ſaid of *wood, iron, yarn,* and a great variety of terms of the ſame nature, ſome of which cannot aſſume any plural; while others admit of it in all caſes; and others admit or refuſe it according to the different circumſtances in which they are conſidered. In a dictionary, therefore, all this variety of caſes ought to be clearly and diſtinctly pointed out under each particular article: this is the more neceſſary, as ſome of theſe words have others formed from them, which might be readily miſtaken for their plurals, although they have a very different ſignification; as *cloaths* which does not denote any number of pieces or different kinds of *cloth,* but *wearing apparel.* The following example will illuſtrate this head

WOOD. *ſub.* A ſolid ſubſtance of which the trunks and branches of trees conſiſt.

1. This term is allowed to denote the ſolid parts of vegetables of all kinds, in whatever form or circumſtances they are found. Nor does this term admit of plural with propriety, unleſs in the circumſtances after-mentioned: for we ſay, *many different kinds of wood,* in preference to *many kinds of woods*; or, we ſay, *oak, aſh,* or *elm wood;* not *woods.*

2. But where we want to contraſt *wood* of one quality,

lity or country with that of another, it admits of a plural; for we ſay, *white woods are in general ſofter than red*; or *Weſt-Indian woods are in general of greater ſpecific gravity than the European woods*: But unleſs where the colour, or ſome quality which diſtinguiſhes it from growing wood, is mentioned, this plural ought as much as poſſible to be avoided, as it always ſuggeſts an idea of growing wood.

3. *Wood* likewiſe denotes a number of trees growing near one another; being nearly ſynonymous with *foreſt*: See Forest. In this ſenſe it always admits of a plural; as, *Ye woods and wilds whoſe ſolitary gloom*, &c.

A dictionary cannot be reckoned complete without explaining obſolete words; and if the terms of the ſeveral provincial provincial dialects were likewiſe given, it would be of great utility: nor would this take much time; becauſe a number of theſe words need no other explanation than to mark along with them the words which had come in their place, when there happened to be one perfectly ſynonymous: and in theſe caſes where the ſame idea could not be expreſſed in modern language without a periphraſis, it would be of uſe to explain them diſtinctly; ſo that, when a writer found himſelf at a loſs for a term, and obliged to ſearch for one beyond the bounds of our own language, he might take one of theſe, when he found that it was expreſſive and energetic, in preference to another drawn from a foreign language. This would at leaſt have one good effect: it would make our language more fixed and ſtable; not to ſay more accurate and preciſe, than by borrowing from foreign languages. The following examples may ſerve to give ſome idea of the manner of treating this part of the work.

MOE, or MO. *adj*. An obſolete term ſtill employed in the Scotch dialect, and by them pronounced *mae*: denoting a greater number, and nearly ſynonymous with *more*; but it differs in this reſpect, that, in the Scotch dialect, *mae* and *mair* (Engliſh, *more*) are each employed in their diſtinct ſphere, without encroaching upon one another; *mae* being employed to denote number, but never quantity or quality; and *mair*, to denote quantity and quality, but never number: thus they ſay *mae*, not *mair apples*, *men*, &c. and they ſay *mair*, not *mae cloth*, *earth*, *courage*, &c. See Mair. Both of theſe terms are ſupplied by the word *more*; which, in the Engliſh language, is applied indiſcriminately to denote quantity, quality, and number. See More.

THIR. pron. Obſolete; ſtill employed in the Scotch dialect: the plural of *this*; and contraſted to *theſe*, in the ſame manner as *that* is to *this*.

As there is no word in the Engliſh language equivalent to this, we thus ſhew the manner in which it is employed. In the Engliſh language we ſay, *that ſtone* or *houſe*, pointing at one at a diſtance, *is larger or more commodious than this ſtone* or *this houſe*, which is ſuppoſed to be at hand. In the ſame manner, in the Scotch dialect, they ſay, *theſe* (or as it is pronounced, *thae*) *ſtones are whiter than thir ſtones*; denoting, that the former are at a diſtance, and the latter at hand. And, in the ſame manner, it is invariably applied to denote any preſent object in the plural number, as oppoſed to *theſe*; as *theſe* or *thir apples*, as at hand or at a diſtance; *theſe* or *thir trees*, &c.; but never in the ſingular number, as it is always *this* or *that tree*, *hoſe*, &c.

As the Engliſh language is ſo exceedingly irregular in the pronunciation, the ſame letter in the ſame ſituation often aſſuming ſounds totally different in different words, it is impoſſible to eſtabliſh any general rules on this ſubject, which do not admit of many exceptions: therefore, a dictionary is the beſt means of aſcertaining and pointing out the proper pronunciation of words. For, if the writer firſt pointed out all the different ſounds that the ſame letter could ever be made to expreſs, and aſſigned to every particular ſound which each letter could be made to aſſume, a particular mark, which was appropriated to denote that particular ſound of the letter whenever it occurred; by placing theſe particular marks above the letters in the dictionary, the ſound of each letter would be pointed out in all caſes with the utmoſt certainty. It would be impoſſible for us to illuſtrate this by examples, without firſt aſcertaining all the ſounds of each letter; which would lead us into a diſcuſſion too long for this place; and this is at preſent the more unneceſſary, as the public have been long in expectation of a dictionary, by a very able hand, in which this particular will be attended to.

We ſhall only further obſerve, that, beſides having the accented ſyllable of every word *properly* diſtinguiſhed in a dictionary to aſſiſt in the pronunciation, the Engliſh language requires another eſſential improvement, *viz*. the uſe of accents to diſtinguiſh the meaning of *words* and *phraſes*; which, although it is not ſo properly confined to a lexicographer, yet it is not quite without his ſphere. Thus the word *as* admits of two very different ſounds, as well as different ſignifications; as in this example, "Cicero was nearly *as* eloquent *as* Demoſthenes:" in which the firſt *as* is pronounced *aſs*, and the laſt is pronounced *az*. Now, it often happens, that, in reading, the particular way in which it ought to be underſtood is not pointed out by the context, till after the word itſelf is pronounced, which has an equal chance at leaſt of being pronounced wrong; whereas, if it were always accented when employed in the one ſenſe, and not in the other, it would free the reader from this perplexity. There are other caſes in which the uſe of proper accents in writing would be of great conſequence; as at the beginning of a ſentence, when it was put as a queſtion, or uſed ironically, *&c*. the want of which every one muſt have obſerved. But as this does not ſo properly belong to the lexicographer as the grammarian, we ſhall here take no further notice of it.

The above examples, we hope, will be ſufficient to give the reader ſome idea of the plan that we would propoſe; and enable him to determine, whether or not a dictionary, executed upon this plan, would convey to his mind a more perfect knowledge of the Engliſh language, than thoſe dictionaries that have been hitherto publiſhed.

Theſe examples were given rather with a view to ſhew the manner in which a work of this kind might be conducted, than as perfect and unexceptionable explanations of the ſeveral articles there enumerated; and therefore we did not think it neceſſary to produce any authorities, although we are ſenſible that they would be neceſſary in a work of this kind.

DIDACTIC, in the ſchools, ſignifies the manner of ſpeaking, or writing, adapted to teach or explain the nature of things.

DIDAPPER, in ornithology, See Colymbus.

DIDELPHIS, in zoology, a genus of quadrupeds belonging to the order of feræ, the characters of which are theſe: they have ten foreteeth in the upper-jaw, and eight in the under one; the dog-teeth are long; the tongue is ſomewhat ciliated; and they have a pocket, formed by a duplicature of the ſkin of the belly, in which the dugs are included. There are five ſpecies, *viz.* 1. The marſupialis, with eight dugs incloſed in the abdominal pocket. He is about ſixteen inches long from the ſnout to the root of the tail, which is about twelves inches long: he has five toes on the fore-feet, with crooked claws and five toes on the hind-feet, only four of them furniſhed with claws; the fifth, which is a kind of thumb, is at a diſtance from the others, and has no claw; the tail is bare from a little below the root: The ears and legs are likewiſe bare; the eyes are ſmall, prominent, of a black colour, and very lively. The body is of a greyiſh colour, with ſome ſmall tufts of black and white hairs upon the back and ſides. Under the belly of the female there is a large bag or pocket, formed by a remarkable duplicature of the ſkin, in which the dugs are contained. This pocket the animal can ſhut or open at pleaſure, by means of a couple of muſcles and two bones which are placed before the os pubis, and are peculiar to the didelphis. The interior ſide of this pocket is full of ſmall glands, which ſecrete a yellowiſh ſtinking ſubſtance, which difſuſes its odour through the whole body of the animal: but this ſubſtance, when dried, loſes its diſagreeable odour, and acquires a ſmell like that of muſk.—This animal is originally a native of South America. Moſt authors affirm that they bring forth five or ſix young ones at a time. As ſoon as they are brought forth, they creep into the pocket of the mother, where the dugs are ſituate, and continue there ſucking till they be able to run about. When alarmed or frightened, they run into the mother's pocket, and ſhe makes off with them in this ſituation. The didelphis is an animal of ſlow motion; a man can eaſily out run him; but then, he takes to a tree, which he mounts with great facility, and conceals himſelf among the leaves, or ſuſpends himſelf by twiſting his tail round a branch. Although a carnivorous animal, he is fond of the ſugar cane, potatoes, *&c.* See Plate LXVIII fig. 3.

The ſecond ſpecies is the philander, with four dugs, pendulous ears, and a tail buſhy at the baſe. 3. The opoſſum, with two dugs, and a leſs buſhy tail. 4. The murina, with ſix dugs. 5. The dorſigera, with the tail buſhy at the baſe, and longer than the body. The females of this ſpecies carry their young on their backs, the young having their tails twiſted about the tail of the mother. The above four are natives of America.

DIDUS, in ornithology, a genus belonging to the order of gallinæ. The bill is contracted in the middle by two tranſverſe rugæ; each mandible is inflected at the point; and the face is bare behind the eyes. The body is blackiſh and cloudy; the tail is very ſhort; and the upper part of the bill is red. It is a native of India, and is incapable of flying, becauſe the wings are not furniſhed with feathers ſufficient for that purpoſe.

DIDYNAMIA, in the Linnæan ſyſtem of botany. See Otany, p. 635.

DIE, in geography, a town of France, in the province of Dauphiny, ſituated on the river Drome, twenty-two miles ſouth of Grenoble: E. long. 5° 20′, N. lat. 44°. 50′.

DIEGEM, a town of the Auſtrian Netherlands, in the province of Brabant, about three miles north of Bruſſels: E. long. 4° 20′, and N. lat. 51°.

DIEPE, a port town of France, ſituated on the Britiſh channel, about thirty miles north of Rouen, and oppoſite to port Rye in England: E. long. 1° 15′, and N. lat. 49° 55′.

DIEPHOLT, a city of Weſtphalia in Germany, ſituated at the north end of the Dummer-lake, thirty-five miles ſouth of Bremen: E. long. 8°, N. lat. 53°.

It is ſubject to the king of Great Britain, as elector of Hanover.

DIERVILLA, in botany. See Lanicera.

DIES marchiæ, was the day of congreſs, or meeting of the Engliſh and Scotch, annually appointed to be held on the marches, or borders, in order to adjuſt all differences between them.

DIESIS, in muſic, is the diviſion of a tone leſs than a ſemi-tone; or an interval conſiſting of a leſs or imperfect ſemi-tone.

Dieſis is the ſmalleſt and ſofteſt change or inflexion of the voice imaginable: it is called a faint, expreſſed thus X, by a St Andrew's croſs, or ſaltier.

DIET, in medicine, according to ſome, comprehends the whole regimen, or rule of life, with regard to the ſix non-naturals, air, meats and drinks, ſleep and watching, motion and reſt, paſſions of the mind, retentions and excretions.

The more accurate writers, however, reſtrain the term of diet to what regards eating and drinking, or ſolid aliments and drinks. See Medicine.

Diet-drinks, a form in phyſic, including all the medicated wines, ales, and wheys, uſed in chronic caſes. They require a courſe or continuation to anſwer any intention of moment.

Diet *of appearance*, in Scots law, the day to which a defender is cited to appear in court, and every other day to which the court ſhall afterwards adjourn the conſideration of the queſtion.

Diet, or Dyet, in matters of policy, is uſed for the general aſſembly of the ſtates, or circles of the empire of Germany, and of Poland, to deliberate and concert meaſures proper to be taken for the good of the public.

The general diet of the empire is uſually held at Ratiſbon: it conſiſts of the emperor, the nine electors, and the eccleſiaſtical princes; *viz.* the archbiſhops, biſhops, abbots, and abbeſſes; the ſecular princes, who are dukes, marquiſſes, counts, viſcounts, or barons; and the repreſentatives of the imperial cities. It meets on the emperor's ſummons, and any of the princes may ſend their deputies thither in their ſtead. The diet makes laws, raiſes taxes, determines differences between the ſeveral princes and ſtates, and can relieve the ſubjects from the oppreſſions of their ſovereigns.

The diet of Poland, or the aſſembly of the ſtates, conſiſts of the ſenate and deputies, or repreſentative of every palatinate or county and city, and meet uſually every two years, and oftener upon extraordinary occaſions, if ſummoned by the king, or, in his abſence, by the archbiſhop of Gneſna. The general diet of Poland ſits but ſix weeks, and often breaks up in a tumult much ſooner: for one diſſenting voice prevents their paſſing any laws, or coming to any reſolutions on what is propoſed to them from the throne. Switzerland has alſo a general diet, which is uſually held every year at Baden, and repreſents the whole Helvetic body: it ſeldom laſts longer than a month. Beſides this general diet, there are diets of the proteſtant cantons, and diets of the catholic ones; the firſt aſſemble at Araw, and are convoked by the canton of Zurich; the ſecond at Lucern, convoked by the canton of that name.

DIETETIC, denotes ſomething belonging to diet, but particularly that part of phyſic which treats of this ſubject.

DIETS, a town in the circle of the Upper Rhine in Germany, ſituated on the river Lohn, twenty miles north of Mentz, and ſubject to the houſe of Naſſau-Orange: E. long. 7° 40′, and N. lat. 50 28′.

DIEU ET MON DROIT, i. e. *God and my right*, the motto of the royal arms of England, firſt aſſumed by king Richard I. to intimate that he did not hold his empire in vaſſalage of any mortal.

It was afterwards taken up by Edward III. and was continued without interruption to the time of the late king William, who uſed the motto *Je main-tiendray*, though the former was ſtill retained upon the great ſeal. After him queen Anne uſed the motto *Semper eadem*, which had been before uſed by queen Elizabeth; but ever ſince queen Anne, *Dieu et mon droit* continues to be the royal motto.

DIEXAHEDRIA, in natural hiſtory, a genus of pellucid and cryſtalliform ſpars, compoſed of two pyramids, joined baſe to baſe, without any intermediate column: the diexahedria are dodecahedral, or compoſed of two hexangular pyramids.

DIFFUSE, an epithet applied to ſuch writings as are wrote in a prolix manner. Among hiſtorians, Salluſt is reckoned ſententious, and Livy diffuſe. Thus alſo among the orators, Demoſthenes is cloſe and conciſe; Cicero, on the other hand, is diffuſe.

DIFFUSION, the diſperſion of the ſubtile effluvia of bodies into a kind of atmoſphere all round them. Thus the light diffuſed by the rays of the ſun, iſſues all round from that amazing body of fire.

DIGASTRICUS, in anatomy. See Vol. I. p. 222.

DIGEST, in matters of literature, a collection of the deciſions of the Roman lawyers properly digeſted, or arranged under diſtinct heads, by order of the emperor Juſtinian. It conſtitutes the firſt part or volume of the civil law.

DIGESTION, in medicine, is the diſſolution of the aliments into ſuch minute parts as are fit to enter the lacteal veſſels, and circulate with the maſs of blood.

Various are the ſyſtems and hypotheſes framed by phyſicians and philoſophers to account for digeſtion. Some contend, that it is done by a kind of elixation of the ſolid and groſſer parts of the food in the liquid by the heat of the ſtomach, and of the adjacent parts, the liver, ſpleen, *&c.* Others will have it done by attrition, as if the ſtomach, by thoſe repeated motions, which are the effects of reſpiration, rubbed off the minuter particles from the groſſer matters, and agitating the reſt againſt each other, attenuated and diſſolved them.

Others think the bilious juice, others the ſpirits, chiefly concerned in digeſtion.

Others will have the food diſſolved by a menſtruum; but then they are greatly divided as to the nature and origin of this menſtruum; ſome ſuppoſing it an acid furniſhed by the glands of the ſtomach; others, a nitro aerial ſpirit, which, by penetrating the maſs of food, breaks the connexion of the moſt ſolid parts: and others, a ſaline juice, which divides and volatilizes the parts of the food. Others, again, ſuppoſe digeſtion to be performed by means of a ferment or leaven, which mixing with the aliment, excites an inteſtine motion in the parts thereof, by which means the parts are attenuated and diſſolved. But theſe likewiſe differ in their opinion of this ferment; ſome taking it to be the remains of the food laſt digeſted, which, by its continuance in the ſtomach, has contracted an acid quality and become a ferment: others take the principles of fermentation to be contained in the aliment itſelf, which when incloſed in the ſtomach, heated there, and put in motion, enters on its office of fermentation: others ſuppoſe the matter of the ferment ſupplied by the glands of the ſtomach; and laſtly, others contend for the ſaliva, and make that the ferment ſerving principally for the digeſtion of the food.

Some ſuppoſe digeſtion owing to gentle heat and motion. By this heat and motion, ſay they, the texture of the nouriſhment is changed in the bodies of animals; and then the conſtituent ſolid parts are indued with peculiar attractive powers of certain magnitudes, by which they draw, out of the fluids moving through them, like parts in certain quantities, and thereby preſerve their forms and juſt magnitudes.

And, to mention no more, Boerhaave aſcribes digeſtion to the joint action of ſeveral of the above-mentioned cauſes, aided by the expanſion of the air contained in the aliments.

Want of **DIGESTION**, a diſeaſe attended with pain, and a ſenſe of weight, with eructations and copious flatulences from corrupt humours in the ſtomach.

DIGESTIVE, in medicine, ſuch remedies as ſtrengthen and increaſe the tone of the ſtomach, and aſſiſt in the digeſtion of foods. To this claſs belong all ſtomachics and ſtrengtheners, or corroborants.

DIGIT, in aſtronomy, the twelfth part of the diameter of the ſun or moon, is uſed to expreſs the quantity of an eclipſe. Thus an eclipſe is ſaid to be of ſix digits, when ſix of theſe parts are hid.

DIGITS, or **MONADES**, in arithmetic, ſignify any integer under 10; as 1, 2, 3, 4, 5, 6, 7, 8, 9.

DIGIT is alſo a meaſure taken from the breadth of the finger. It is properly ¾ of an inch, and contains the meaſure of four barley-corns laid breadth-wiſe.

DIGITALIS, or **FOX-GLOVE**, in botany, a genus of the didynamia angioſpermia claſs. The calix is divided into five ſegments; the corolla is bell-ſhaped, ventricoſe, and has five diviſions; and the capſule is oval, and has two cells. There are ſix ſpecies, only one of which, *viz.* the purpurea, or purple fox-glove, is a native of Britain. The leaves are ſaid to be emetic and vulnerary, but are little uſed.

DIGITATED, among botaniſts. See Vol I. p. 640.

DIGITUS, in anatomy. See Vol. I. p. 181.

DIGLYPH, in architecture, a kind of imperfect triglyph, conſole, or the like, with two channels or engravings, either circular or angular.

DIGNE, a city and biſhop's ſee of Provence in France, fifty-five miles north of Toulon: E. long. 6° 5′, and N. lat. 44° 6′.

DIGNITARY, in the canon law, a perſon who holds a dignity, that is, a benefice which gives him ſome preeminence over mere prieſts and canons. Such is a biſhop, dean, arch-deacon, prebendary, *&c.*

DIGNITY, as applied to the titles of noblemen, ſignifies honour and authority.

DIJON, the capital of the province of Burgundy, in France, ſituated on the river Ouche, 140 miles ſouth-eaſt of Paris: E. long. 5° 5′, and N. lat. 47° 15′.

DILATATION, in phyſics, a motion of the parts of any body, by which it is ſo expanded as to occupy a greater ſpace. This expanſive motion depends upon the elaſtic power of the body, whence it appears that dilatation is different from rarefaction, this laſt being produced by the means of heat. See MECHANICS.

DILATATORES, in anatomy, a name given to ſeveral muſcles in the human body. See ANATOMY, Part II.

DILEMMA, in logic, an argument conſiſting of two or more propoſitions, which divides the whole into all its parts, or members, by a disjunctive propoſition, and then infers ſomething concerning each part, which is finally referred to concerning the whole. See LOGIC.

DILIGENCE, in Scots law, ſignifies either that care and attention which parties are bound to give, in implementing certain contracts or truſts, and which varies according to the nature of the contract; as to which, ſee SCOTS LAW, title 7. 20. and 28.: Or it ſignifies certain forms of law, whereby the creditor endeavours to operate his payment, either by affecting the perſon or eſtate of the debtor; ſee title 18.

DILL, in botany. See ANETHUM.

DILLEMBURG, a city of the circle of the Upper Rhine in Germany, about forty miles north of Francfort, and ſubject to the houſe of Naſſau: E. long. 8° 8′, and N. lat. 50° 45′.

DILLENGEN, a city of Swabia, in Germany, ſituated on the Danube, about twenty miles north-eaſt of Ulm: E. long. 10° 20′, and N. lat. 48° 40′.

DILLENIA, in botany, a genus of the polyandria polygynia claſs. The calix conſiſts of five leaves, and the corolla of five petals; and the capſule contains many ſeeds. There is but one ſpecies, a native of Malabar.

DILUTE. To dilute a body is to render it liquid; or, if it were liquid before, to render it more ſo, by the addition of a thinner thereto. Theſe things thus added, are called diluents, or dilutors.

DIMENSION, in geometry, is either length, breadth, or thickneſs; hence, a line hath one dimenſion, *viz.* length; a ſuperficies two, *viz.* length and breadth; and a body, or ſolid, has three, *viz.* length, breadth, and thickneſs.

DIMINUTIVE, in grammar, a word formed from ſome other, to ſoften or diminiſh the force of it, or to ſignify a thing is little in its kind. Thus, cellule is a diminutive of cell, globule of globe, hillock of hill.

DIMORPHOTHECA, in botany. See CALENDULA.

DINANT, a town of Germany in the biſhopric of Liege, ſituated on the river Maeſe, about twelve miles ſouth of Namur: E. long 4° 50′, and N. lat. 50° 18′.

DINGWEL, or **DINGWAL**, a parliament-town of Scotland, ſituated at the weſt end of the Cromarty-bay, in the county of Roſs: W. long. 4° 15′, and N. lat. 57° 56′. It claſſes with Dornock, Wick, and Kirkwall.

DINKELSPIEL, a city of Swabia, about forty miles north of Ulm, E. long. 10° 12′, and N. lat. 49°.

DIOCESE, denotes a particular diſtrict, or diviſion, under the direction and government of a biſhop.

DIOCTAHEDRIA, in natural hiſtory, a genus of pellucid and cryſtalliform ſpars, compoſed of two octangular pyramids, joined baſe to baſe, without any intermediate column. Of theſe ſome have long pyramids, others ſhort and ſharp-pointed ones, and others ſhort and obtuſe pointed ones; the two former ſpecies being found in the hartz-foreſt, and the laſt in the mines of Cornwall.

DIODIA, in botany, a genus of the tetrandria monogynia claſs. The corolla conſiſts of one funnel-ſhaped petal; and the capſule has two cells, containing as many ſeeds. There is but one ſpecies, a native of Virginia.

DIODON, in ichthyology, a genus belonging to the order of amphibia nantes. The jaws are bony, ſtretched out, and undivided; the aperture or mouth is a tranſverſe line. The body is every way beſet with ſharp moveable prickles. It has no belly-fins. There are two ſpecies, *viz.* 1. The atringa, which is ſpherical, and has triangular prickles. It is a native of India. 2. The tryſtrix, which is oblong, with cylindrical prickles, and is a native of the Cape of Good Hope.

DIOMEDEA, in ornithology, a genus belonging to the order of anſeres. The bill is ſtrait; the ſuperior mandible is crooked at the point, and the lower one is truncated; the noſtrils are oval, open, a little prominent, and placed on the ſides. There are two ſpecies, *viz.* 1. The exulans, has pennated wings, and three toes on each foot. It is the abbatros of Edwards, and is found in the ocean betwixt the tropics, and at the Cape of Good Hope. It flies pretty high, feeds upon flying fiſh, and is about the ſize of a pelican. 2. The demerſa, has no quill-feathers on the wings; and the feet have four toes, connected together by a membrane. It is the black penguin of Edwards, about the ſize of a gooſe, and is found at the Cape of Good Hope.

DIONYSIA, in Grecian antiquity, ſolemnities in honour of Bacchus, ſometimes called by the general name of orgia; and by the Romans bacchanalia, and liberalia. See BACCHANALIA.

DIOECIA, in the Linnæan ſyſtem of botany. See Vol. I. p. 635.

DIOMEDIS AVIS, in ornithology. See PROCELLARIA.

DIOPTRICS, the ſcience of refractive viſion. See OPTICS.

DIOSCOREA, in botany, a genus of the dioecia hexandria claſs. The calix both of the male and female conſiſts of ſix ſegments, and they have no corolla. The female has three ſtyli; the capſule is compreſſed, has three cells, and contains two membranaceous ſeeds. There are eight ſpecies, none of them natives of Britain.

DIOSMA, in botany, a genus of the pentandria monogynia claſs. The corolla has five petals; and the nectarium is ſhaped like a crown, is divided into five ſegments, and ſituate above the germen; it has five united capſules; and the ſeeds are furniſhed with calyptræ. There are nine ſpecies, none of them natives of Britain.

DIOSPYROS, in botany, a genus of the polygamia dioecia claſs. The calix of the hermaphrodite has four ſegments, and the corolla is urceolated, and has four ſegments; it has eight ſtamina, and a quadrifid ſtylus; and the berry contains eight ſeeds. The calix, &c. of the male are the ſame with the above. There are two ſpecies, none of them natives of Britain.

DIOTOTHECA, in botany. See MORINA.

DIPHTHONG, in grammar, a double vowel, or the mixture of two vowels pronounced together, ſo as to make one ſyllable. See GRAMMAR.

DIPHYES, among natural hiſtorians, an appellation given to ſtones reſembling the male and female parts of generation in mankind.

DIPLOE, in anatomy, the ſoft meditullium, or medullary ſubſtance, which lies between the two laminæ of the bones of the cranium. See ANATOMY, Part I.

DIPLOMA, an inſtrument or licence given by colleges, ſocieties, &c. to a clergyman to exerciſe the miniſterial function, or to a phyſician to practiſe the profeſſion, &c. after paſſing examination, or admitting him to a degree.

DIPLOMA, in chemiſtry, &c. a double veſſel. To boil in diplomate, is to ſet one veſſel, containing the ingredients intended to be acted upon, in another larger veſſel full of water, and to this laſt the fire is to be applied.

DIPONDIUS, in the ſcripture-language, is uſed by St Luke to ſignify a certain coin, which was of very little value: our tranſlation of the paſſage is, *Are not two ſparrows ſold for two farthings?* In St Mathew, who relates the ſame thing, we read, *Are not two ſparrows ſold for a farthing?*

DIPPING, among miners, ſignifies the interruption, or breaking off, of the veins of ore; an accident that gives them a great deal of trouble before they can diſcover the ore again.

DIPSACUS, or TEASEL, in botany, a genus of the tetrandria monogynia claſs. The common calix conſiſts of many leaves, and the proper one is above the fruit; and the receptacle is paleaceous. There are three ſpecies, all natives of Britain, *viz.* the fullonum, or manured teaſel; the ſylveſtris, or wild teaſel; and the piloſus, or ſmall wild teaſel.

DIPSAS, in zoology. See COLUBER.

DIPTOTES, in grammar, are ſuch nouns as have only two caſes, as *ſuppetiæ*, *ſuppetias*, &c.

DIPTYCHS, in antiquity, a public regiſter, in which were written the names of the conſuls and other magiſtrates among the heathens; and among the Chriſtians, they were a ſort of tablets, on one of which were written the names of the deceaſed, and on the other thoſe of the living patriarchs, biſhops, &c. or thoſe who had done any ſervice to the church, for whom prayers were offered, the deacon reading the names at maſs.

DIRECTION, in mechanics, ſignifies the line or path of a body's motion, along which it endeavours to proceed, according to the force impreſſed upon it. See MECHANICS.

DIRECTOR, in commercial polity, a perſon who has the management of the affairs of a trading company: thus we ſay, the directors of the India company, South ſea-company, &c. See COMPANY.

The directors are conſiderable proprietors in the ſtocks of their reſpective companies, being choſen by plurality of votes from among the body of proprietors. The Dutch Eaſt-India company have ſixty ſuch directors; that of France, twenty-one; the Britiſh Eaſt-India company has twenty-four, including the chairman, who may be re-elected for four years ſucceſſively. Theſe laſt have ſalaries of 150l. a-year each, and the chairman 200l. They meet at leaſt once a week, and commonly oftener, being ſummoned as occaſion requires.

DIRECTOR, in ſurgery, a grooved probe, to direct the edge of the knife or ſciſſars, in opening ſinuſes, or fiſtulæ, that by this means the adjacent veſſels, nerves, and tendons may remain unhurt. See Surgery.

DIRIGENT, or Directrix, a term in geometry, ſignifying the line of motion, along which the deſcribent line or ſurface is carried in the geneſis of any plane or ſolid figure.

DIS, an inſeparable article prefixed to divers words, the effect whereof is either to give them a ſignification contrary to what the ſimple words have, as *diſoblige*, *diſobey*, &c. or to ſignify a ſeparation, detachment, &c. as *diſpoſing*, *diſtributing*.

DISC, in antiquity, a quoit made of ſtone, iron, or copper, five or ſix fingers broad, and more than a foot long, inclining to an oval figure, which they hurled in form of a bowl, to a vaſt diſtance, by the help of a leathern thong tied round the perſon's hand who threw it, and put through a hole in the middle. Homer has made Ajax and Ulyſſes great artiſts at this ſport.

Disc, in aſtronomy, the body and face of the ſun and moon, ſuch as it appears to us on the earth; or the body or face of the earth, ſuch as it appears to a ſpectator in the moon.

Disc, in optics, is the width of the aperture of teleſcopic glaſſes, whatever their form be, whether plain, convex, concave, *&c.*

DISCERNING, or Discernment, among logicians, a faculty of the mind, whereby it diſtinguiſhes between ideas.

DISCIPLE, one who learns any thing from another: thus, the followers of any teacher, philoſopher, *&c.* are called diſciples. In the Chriſtian ſenſe, they were followers of Jeſus Chriſt, in general; but in a more reſtrained ſenſe, the diſciples denote thoſe alone who were the immediate followers and attendants on his perſon, of which there were ſeventy or ſeventy-two. The names *diſciple* and *apoſtle* are often ſynonymouſly uſed in the goſpel-hiſtory; but ſometimes the apoſtles are diſtinguiſhed from diſciples, as perſons ſelected out of the number of diſciples, to be the principal miniſters of his religion; of theſe there were only twelve. The Latins kept the feſtival of the ſeventy or ſeventy-two diſciples on July 15th, and the Greeks on January 4th.

DISCIPLINE, in a general ſenſe, denotes inſtruction and government; as military diſcipline, eccleſiaſtical diſcipline, *&c.*

DISCLAMATION, in Scots law, is that caſualty whereby a vaſſal forfeited his feu to his ſuperior, by diſowning or diſclaiming him as ſuch without ſufficient reaſon. See Scots Law, title 12.

DISCORD, in muſic, the relation of two ſounds which are always and of themſelves diſagreeable, whether applied in ſucceſſion or conſonance.

DISCOUNT, in commerce, a term among traders, merchants, and bankers. It is uſed by the two former on occaſion of their buying commodities on the uſual time of credit, with a condition that the ſeller ſhall allow the buyer a certain diſcount at the rate of ſo much *per cent. per annum*, for the time for which the credit is generally given, upon condition that the buyer pays ready money for ſuch commodities, inſtead of taking the time of credit.

DISCRETE, or Disjunct Proportion, is when the ratio of two or more pairs of numbers or quantities is the ſame, but there is not the ſame proportion between all the four numbers. Thus if the numbers 3 : 6 : : 8 : 16 be conſidered, the ratio between 3 : 6, is the ſame as that between 8 : 16, and therefore the numbers are proportional; but it is only diſcretely or diſjunctly, for 3 is not to 6 as 6 to 8; that is, the proportion is broken off between 8 and 3, and is not continued as in the following continual proportionals, 3 : 6 : : 12 : 24.

DISCUS, in antiquity. See Disc.

DISCUSSION, in matters of literature, ſignifies the clear treating or handling of any particular point, or problem, ſo as to ſhake off the difficulties with which it is embaraſſed: thus we ſay, ſuch a point was well diſcuſſed, when it was well treated of and cleared up.

DISCUTIENTS, in medicine, are ſuch remedies, as, by their ſubtilty, diſſolve a ſtagnating or coagulated fluid, and diſſipate the ſame without an external ſolution of continuity.

DISDIAPASON, or Bisdiapason, in muſic, a compound concord, deſcribed by F. Parran, in the quadruple ratio of 4 : 1, or 8 : 2.

Disdiapason-diapente, a concord in a ſextuple ratio of 1 : 6.

Disdiapason-semi-diapente, a compound concord in the proportion of 16 : 3.

Disdiapason-ditone, a compound conſonance in the proportion of 10 : 2.

Disdiapason-semi-ditone, a compound concord in the proportion of 24 : 5.

DISEASE, in medicine, that ſtate of a living body, wherein it is deprived of the exerciſe of any of its functions, whether vital, natural, or animal. See Medicine.

DISFRANCHISING, among civilians, ſignifies the depriving a perſon of the rights and privileges of a free citizen or ſubject.

DISJUNCTIVE, ſomething that ſeparates or disjoins. Thus, *or*, *neither*, *&c.* which in connecting a diſcourſe yet ſeparates the parts of it, are called disjunctive conjunctions.

DISLOCATION, in ſurgery. See Luxation.

DISMA, a town of Japan, ſeparated from Nanqueſacque, only by a narrow canal. The Dutch have a very fine magazine there.

DISPENSARY, or Dispensatory, denotes a book containing the method of preparing the various kinds of medicines uſed in pharmacy. Such are thoſe of Bauderon, Quercetan, Zwelfer, Charas, Bates, Meſue, Salmon, Lemery, Quincy, *&c.* but the lateſt and moſt eſteemed are the Edinburgh and London Diſpenſatories.

Dispensary, or Dispensatory, is likewiſe a magazine or office for ſelling medicines at prime coſt to the poor.

DISPENSATION, in law, the granting a licenſe of doing ſome certain action that otherwiſe is not permitted.

DISPLAYED, in heraldry, is underſtood of the poſition of an eagle, or any other bird, when it is erect, with its wings expanded or ſpread forth. See Plate LXVIII. fig. 8.

DISPONDEE, in the Greek and Latin poetry, a double ſpondee or foot, conſiſting of four long ſyllables, as māēcēnātēs cōnclūdēntēs.

DISPOSITION, in Scots law, is that deed or writing which contains the ſale or grant of any ſubject: when applied to heritable ſubjects, it in ſome caſes gets the name of charter, which differs from a diſpoſition in nothing elſe than a few immaterial forms. See CHARTER.

DISPOSITION, in rhetoric, the placing words in ſuch an order as contributes moſt to the beauty and ſometimes even to the ſtrength of a diſcourſe.

DISQUISITION, a ſerious and exact examination into the circumſtances of any affair, in order to diſcourſe clearly about it.

DISS, a market-town of Norfolk, on the river Wavency, ſixteen miles ſouth of Norwich.

DISSECTION, in anatomy, the cutting up a body, with a view of examining the ſtructure and uſe of the parts. See ANATOMY.

DISSEISIN, in law, an unlawful diſpoſſeſſing a perſon of his lands or tenements.

DISSENTERS, ſeparatiſts from the ſervice and worſhip of any eſtabliſhed church.

DISSIPATION, in phyſics, an inſenſible loſs or conſumption of the minute parts of the body; or, that flux whereby they fly off, and are loſt.

Circle of **DISSIPATION**, in optics, is uſed for that circular ſpace upon the retina, which is taken up by one of the extreme pencils or rays iſſuing from an object. See OPTICS.

DISSOLVENT, in general, whatever diſſolves or reduces a ſolid body into ſuch minute parts as to be ſuſtained in a fluid. See CHEMISTRY.

DISSONANCE, in muſic. See DISCORD.

DISSYLLABLE, among grammarians, a word conſiſting only of two ſyllables: ſuch are nature, ſcience, *&c.*

DISTAFF, an inſtrument about which flax is tied in order to be ſpun.

DISTANCE, in general, an interval between two things, either with regard to time or place.

Acceſſible **DISTANCES**, in geometry, are ſuch as may be meaſured by the chain, *&c.* See GEOMETRY.

Inacceſſible **DISTANCES**, are ſuch as cannot be meaſured by the chain, *&c.* by reaſon of ſome river, or the like, which obſtructs our paſſing from one object to another. See GEOMETRY.

DISTASTE properly ſignifies an averſion or diſlike to certain foods; and may be either conſtitutional, or owing to ſome diſorder of the ſtomach.

DISTEMPER, among phyſicians, the ſame with diſeaſe. See DISEASE.

DISTEMPER, in painting, a term uſed for the working up of colours with ſomething beſides water or oil. If the colours are prepared with water, that kind of painting is called limning; and if with oil, it is called painting in oil, and ſimply painting. If the colours are mixed with ſize, whites of eggs, or any ſuch proper glutinous or unctuous matter, and not with oil, then they ſay it is done in diſtemper.

DISTENSION, in general, ſignifies the ſtretching or extending a thing to its full length or breadth.

DISTICH, a couplet of verſes making a complete ſenſe. Thus hexameter and pentameter verſes are diſpoſed in diſtichs.

DISTICHIASIS, in ſurgery, a diſeaſe of the eye-lids, when under the ordinary eye-laſhes there grows another extraordinary row of hair, which frequently eradicates the former, and pricking the membrane of the eye, excites pain, and brings on a defluxion.

DISTILLATION, in chemiſtry, the act of drawing off the ſpiritous, aqueous, oleaginous, or ſaline parts of a mixed body from the groſſer and more terreſtrial parts by means of fire, and collecting and condenſing them again by cold. The end of diſtillation is of two kinds: the firſt, and by far the moſt general, is for the ſeparation of ſome acquired bodies from others with which they were mixed, as in the caſe of vinous and volatile ſpirits, and eſſential oils: the other is for the quicker and more effectual combination of ſuch bodies, whoſe mixture is aſſiſted by a boiling heat, as in the caſe of ſpir. nitr. dulc. See CHEMISTRY.

The method of diſtilling malt-waſh, or a fermented mixture of meal and malt, for ſpirit. Fill two thirds of a ſtill, firſt moiſtened by the ſteam of boiling water, with malt-waſh; immediately clap on the head, and lute it down; there will ſoon run a ſpirituous inflammable liquor. Thus is obtained what the malt-diſtillers call a malt low-wine; what comes over after the ſpirit falls off from being proof, is called faints. This experiment may be rendered general, with ſlight variation; for if any wine, beer, or fermented liquor from ſugar, treacle, or fruits, *&c.* be thus treated, it affords a ſpirit differing only according to the nature of the ſubject; but none of them will afford the leaſt inflammable ſpirit without a previous fermentation. The requiſite cautions for ſucceſs are, 1. That the fermentation be well performed. 2. That it be gently diſtilled, with a ſoft well regulated fire. 3. That the groſſer oil, apt to riſe along with the ſpirit, be let out by flannel under the noſe of the worm. Theſe cautions obſerved, the low-wines will be pure and vinous.

The method of diſtilling the lower wines into proof ſpirits for ſale. The lower wines of the laſt proceſs, diſtilled in a bath-heat, give a higher rectified ſpirit than before, which being let down with fair water to a certain ſize or ſtandard, called proof, is what the malt-diſtillers underſtand by proof-goods, or their rectified malt-ſpirit.

The inconveniencies of this art, on account of the many large veſſels required, which increaſe the labour and price of the commodity, might perhaps be remedied by the introduction of a new art, ſubſervient to the malt-diſtillers, and confined to the boiling down the malt-wort to a rob; wherefore it were to be wiſhed, that thoſe who were ſkilled in this branch of diſtillation would try whether a ſpirit ſuperior to that of treacle may not be procured from the rob of malt, prudently prepared and fermented. See Chemistry.

Distinct base, in optics, is that diſtance from the pole of a convex glaſs, in which objects beheld through it appear diſtinct and well deſcribed; ſo that it is the ſame with the focus. See Optics.

DISTINCTION, in logic, is an aſſemblage of two or more words, whereby diſparate things, or their conceptions, are denoted.

DISTORTION, in medicine, a contraction of one ſide of the mouth, occaſioned by a convulſion of the muſcles of one ſide of the face: and it is likewiſe uſed to denote any part of an animal body when it is ill placed or ill favoured.

DISTRESS, in Scots law. When a perſon makes payment of a debt not voluntarily, but in obedience to legal diligence, he is ſaid to have paid in diſtreſs.

Distribution, in printing, the taking a form aſunder, ſeparating the letters, and diſpoſing them in the caſes again, each in its proper box. See Printing.

DISTRICT, in geography, a part of a province, diſtinguiſhed by peculiar magiſtrates, or certain privileges, in which ſenſe it is ſynonymous with hundred. See Hundred.

DISTRINGAS, in law, a writ commanding the ſheriff, or other officer, that he diſtrain a perſon for debt to the king, &c. or for his appearance at a certain day.

Distringas juratores, a writ directed to the ſheriff, whereby he is commanded to diſtrain upon a jury to appear, and to return iſſues on their lands, &c. for non-appearance. This writ of diſtringas juratores iſſues for the ſheriff to have their bodies in court, &c. at the return of the writ.

DITHYRAMBUS, in ancient poetry, a hymn in honour of Bacchus, full of tranſport and poetical rage.

DITONE, in muſic, an interval comprehending two tones. The proportion of the ſounds that form the ditone is 4:5, and that of the ſemiditone is 5:6.

DITRIHEDRIA, in mineralogy, a genus of ſpars with twice three ſides, or ſix planes, being formed of two trigonal pyramids joined baſe to baſe, without any intermediate column. See Spar.

The ſpecies of ditrihedria are diſtinguiſhed by the different figures of theſe pyramids.

DITTANY, in botany. See Dictamnus.

DITTO, uſually written D°, in books of accounts, an Italian word, ſignifying *the aforementioned*.

DIVAL, in heraldry, the herb nightſhade, uſed by ſuch as blazon by flowers and herbs, inſtead of colours and metals, for ſable, or black.

DIVALLIA. See Angeronalia.

DIU, a little iſland and town on the coaſt of Guzurat, in the hither India, and ſubject to Portugal: E. long. 69°, N. lat. 21° 15′.

Diu is alſo a town of Bulgaria, upon the Danube.

DIVAN, a council-chamber, or court of juſtice, among the eaſtern nations, particularly the Turks.

Divan-beghi, the ſuperintendant of juſtice in Perſia, whoſe place is the laſt of the ſix miniſters of the ſecond rank, who are all under the athemadauler, or firſt miniſter. To this tribunal of the divan-beghi he appeals from ſentences paſſed by the governors: he has a fixed ſtipend of 50,000 crowns for adminiſtring juſtice: all the ſerjeants, uſhers, &c. of the court, are in his ſervice: he takes cognizance of the criminal cauſes of the chams, governors, and other great lords of Perſia, when accuſed of any fault. There are divan-beghis not only at court and in the capital, but alſo in the provinces and other cities of the empire. The alcoran is the ſole rule of his adminiſtration of juſtice, which alſo he interprets at pleaſure. He takes no cognizance of civil cauſes, but all differences ariſing between the officers of the king's houſhold, and between foreign miniſters, are determined by him.

DIVANDUROW, the name of ſeven iſlands which lie a league north of the Maldives, and twenty-four from the coaſt of Malabar, almoſt oppoſite to Cananor.

DIVER, in ornithology. See Colymbus.

DIVERGENT, or **Diverging lines**, in geometry, are thoſe which conſtantly recede from each other.

Divergent rays, in optics, are thoſe which going from a point of the viſible object, are diſperſed, and continually depart one from another, in proportion as they are removed from the object: in which ſenſe it is oppoſed to convergent. See Optics.

DIVERSION, in military affairs, is, when an enemy is attacked in one place where they are weak and unprovided, in order to draw off their forces from another place where they have made or intend to make an irruption. Thus the Romans had no other way in their power of driving Hanibal out of Italy, but by making a diverſion in attacking Carthage.

DIVESTING, or **Divestiture**, in law, is uſed for the act of ſurrendering one's effects.

DIVIDEND, in arithmetic, the number propoſed to be divided into equal parts. See Arithmetic.

Dividend *of ſtocks*, is a ſhare or proportion of the intereſt of ſtocks erected on public funds, as the ſouth-ſea, &c. divided among and paid to the adventurers half yearly.

DIVINATION, the knowledge of things obſcure, or future, which cannot be attained by any natural means.

It was a received opinion among the heathens, that the gods were wont to converſe familiarly with ſome men, whom they endowed with extraordinary powers, and admitted to the knowledge of their councils and deſigns. Plato, Ariſtotle, Plutarch, Cicero, and others, divide divination into two ſorts or ſpecies, *viz.* natural and artificial. The former was ſo called, becauſe not attained by any rules or precepts of art, but infuſed or inſpired into the diviner, without his taking any further care about it, than to purify and prepare himſelf for the reception of the divine afflatus. Of this kind were all thoſe who delivered oracles, and foretold future events by inſpiration, without obſerving external ſigns or accidents. The ſecond ſpecies of divination was called artificial, becauſe it was not obtained by immediate inſpiration, but was the effect of experience and obſervation. Such was ſouthſaying, as depending upon human art and invention, which however was ſuppoſed not to be altogether deſtitute of divine direction and concurrence, and ſuch was divination by lots. Of this ſort there were various kinds, as by ſacrifices, entrails, flame, cakes, flour, wine, water, augury, birds, lots, verſes, omens, *&c.*

DIVINE, ſomething relating to God.

DIVING, the art of deſcending under water, to conſiderable depths, and abiding there a competent time; the uſes of which are conſiderable, particularly in fiſhing for pearls, corals, ſponges, wrecks of ſhips, *&c.* See PNEUMATICS.

DIVINITY, properly ſignifies the nature, quality, and eſſence of God.

DIVINITY is alſo uſed in the ſame ſenſe with theology.

DIVISIBILITY, that property by which the particles of matter in all bodies are capable of ſeparation or diſunion from each other. See MECHANICS.

DIVISION, in general, is the ſeparating a thing into two or more parts.

DIVISION, in arithmetic. See Vol. I. p. 376.

DIVISION, in algebra. See Vol. I. p. 82.

DIVISOR, in arithmetic. See Vol. I. p. 376.

DIUL, a port-town of Aſia, ſituated on the Indian ocean, weſtward of the river Indus, and ſixty miles weſt of the city of Tatta: E. long. 67°, and N. lat. 25° 15′.

DIVORCE, is the legal diſſolution of a marriage which can be obtained at the ſuit of the injured party, upon the grounds of adultery or wilful deſertion proved againſt the other. See SCOTS LAW, title 6.

DIURESIS, in medicine, an excretion of urine: whence,

DIURETICS, in pharmacy, ſuch ſimples as increaſe the diſcharge of urine; or which are ſuppoſed to have a power of removing obſtructions in the urinary paſſages.

DIURNAL, in aſtronomy, ſomething relating to the day; in oppoſition to nocturnal, which regards the night.

DIZIER, or St DIZIER, a city of Champaign in France, ſituated on the river Marne, about forty-five miles north-eaſt of Troyes: E. long. 5°, and N. lat. 48° 32′.

DIZOSTOS, in botany. See EUPHORBIA.

DIZZINESS, in medicine, See VERTIGO.

DO, in muſic, a note of the Italian ſcale, correſponding to *ut* of the common gamut. See MUSIC.

DOB-CHICK, in ornithology. See COLYMBUS.

DOBLAC, a town of the Tyroleſe, in Germany, ſituated at the foot of the Alps, about two miles north of the frontiers of the ſtate of Venice.

DOCIMASIA, in Greek antiquity, a probation of the magiſtrates and perſons employed in public buſineſs at Athens. It was performed publicly in the forum, where they were obliged to give account of themſelves and their paſt life before certain judges. Among ſeveral queſtions propoſed to them, we find the following, whether they had been dutiful to their parents, had ſerved in the wars, and had a competent eſtate.

DOCK, in botany. See LAPATHUM.

DOCK, in maritime affairs, is a pit, great pond, or creek, by the ſide of an harbour, made convenient either for the building or repairing of ſhips.

DOCK-YARDS, in ſhip-building, are magazines of all ſorts of naval ſtores. The principal ones in England are thoſe of Chatham, Portſmouth, Plymouth, Woolwich, Deptford, and Sheerneſs. In time of peace, ſhips of war are laid up in theſe docks; thoſe of the firſt-rates moſtly at Chatham, where, and at other yards, they receive from time to time ſuch repairs as are neceſſary. Theſe yards are generally ſupplied from the northern crowns with hemp, pitch, tar, roſin, *&c.* but as for maſts, particularly thoſe of the larger ſize, they are brought from New England.

DOCTOR, a perſon who has paſſed all the degrees of a faculty, and is impowered to teach or practiſe the ſame: thus we ſay, doctor in divinity, doctor in phyſic, doctor of laws.

The title of doctor ſeems to have been created in the XIIth century, inſtead of *maſter*, and eſtabliſhed with the other ſcholaſtic degrees of batchelors and licentiates, by Peter Lombard and Gilbert Porreus, then the chief divines of the univerſity of Paris. Gratian did the ſame thing, at the ſame time, in the univerſity of Bologna.

DOCTOR *of the law*, a title of honour among the Jews. The inveſtiture, if we may ſo ſay, of this order was performed by putting a key and table-book in their hands, which is what ſome authors imagine our Saviour had in view, Luke xi. 52. when ſpeaking of the doctors of the law, he ſays, "Wo unto you, doctors of the law, for you have taken away the key of knowledge: you entered not in yourſelves, and them that were entering you hindered."

DOCTORS-COMMONS. See COLLEGE *of civilians*.

DOCUMENT, in law, ſome written monument produced in proof of any thing aſſerted.

DODARTIA, in botany, a genus of the didynamia angioſpermia claſs. The calix has five teeth; the inferior labium is much leſs than the ſuperior; and the capſule is roundiſh, and has two cells. There are two ſpecies, none of them natives of Britain.

DODDER, in botany. See CUSCUTA.

DODECAGON, in geometry, a regular polygon conſiſting of twelve equal ſides and angles.

DODECAHEDRON, in geometry, one of the platonic bodies, or regular ſolids, contained under twelve equal and regular pentagons.

DODECANDRIA, in the Linnæan ſyſtem of botany. See Vol. I. p. 635.

DODO, in ornithology. See DIDUS.

DODONÆA, in botany. See PTELEA.

DODRANS, in antiquity, three fourths of the as. See AS.

DOESBURG, a town of the United Netherlands, in the province of Guelderland, ſituated on the river Yſſel, about nine miles ſouth of Zutphen: E. long. 6°, and N. lat. 52°.

DOG, in zoology. See CANIS.

DOG'S BANE, in botany. See APOCYNUM.

Dog-days. See Canicular.

Dog's fennel, in botany. See Cotula.

Dog's mercury, in botany. See Mercurialis.

Dog's roſe. See Roſa.

Dog's ſtones, in botany. See Orchis.

Dog's tail, in botany. See Cynoſurus.

Dog's tongue, in botany. See Cynogloſſum.

Dog's tooth, in botany. See Erythronium.

DOGE, the chief magiſtrate in the republics of Venice and Genoa.

This dignity is elective in both places; at Venice it continues for life; at Genoa, it is only for two years. His title is Serenity: he is chief of the council, and mouth of the republic, he being to anſwer for her. The Venetians do not go into mourning at his death, being only the phantom of majeſty, as all the authority is veſted in the republic; the doge only lends his name to the ſenate; the power is diffuſed through the whole body; though anſwers to foreign ambaſſadors, &c. are made in the name of the doge. The money is ſtruck in his name, but does not bear his arms. All the magiſtrates riſe and ſalute him when he comes into the council: but he riſes to none but foreign ambaſſadors. He muſt not ſtir out of Venice, without leave of the counſellors, &c.

DOGGERS, a name uſed for fiſhing veſſels; whence, in ſome of our old ſtatutes, we meet with dogger-men, denoting the fiſhermen of thoſe veſſels.

DOGMA, a principle, maxim, tenet, or ſettled opinion, particularly with regard to matters of faith and philoſophy.

DOGMATICAL, ſomething belonging to a doctrine or opinion. A dogmatical philoſopher is one who aſſerts things poſitively; in oppoſition to a ſceptic, who doubts of every thing.

DOGMATISTS, a ſect of ancient phyſicians, of which Hippocrates was the firſt author. They are alſo called *logici*, logicians, from their uſing the rules of logic in ſubjects of their profeſſion. They laid down definitions and diviſions reducing diſeaſes to certain genera, and thoſe genera to ſpecies, and furniſhing remedies for them all; ſuppoſing principles, drawing concluſions, and applying thoſe principles and concluſions to particular diſeaſes under conſideration: in which ſenſe the dogmatiſts ſtand contradiſtinguiſhed from empirics and methodiſts. They reject all medicinal virtues that they think not reducible to manifeſt qualities: but Galen hath long ago obſerved of ſuch men, that they muſt either deny plain matter of fact, or aſſign but very poor reaſons and cauſes of many effects they pretend to explain.

DOLE, in our ancient cuſtoms, ſignified a part or portion, moſt commonly of a meadow, where ſeveral perſons have ſhares. It alſo ſtill ſignifies a diſtribution or dealing of alms, or a liberal gift made by a great man to the people.

Dole, in Scots law, ſignifies a malevolent intention. It is eſſential in all crimes that it be committed intentionally, or by an act of the will; hence the rule, *Crimen dolo contrahitur*. See Scots Law, title 33.

DOLICHOS, in botany, a genus of the diadelphia decandria claſs of plants, the corolla of which is papilionaceous; the vexillum is roundiſh, large, emarginated, and wholly reflected; the fruit is a large, acuminated, oblong pod, compoſed of two valves, and containing two cells; the ſeeds are numerous, elliptical, and frequently compreſſed. There are twenty-five ſpecies, none of them natives of Britain.

DOLLAR, a ſilver coin current in ſeveral parts of Germany and Holland. There are various ſpecies of dollars, as the rix-dollar, the ſemi-dollar, the quarter-dollar, &c.

DOLPHIN, in ichthyology. See Delphinus.

DOM, or Don, a title of honour, invented and chiefly uſed by the Spaniards, ſignifying, ſir, or lord.

This title, it ſeems, was firſt given to Pelayo, in the beginning of the VIIIth century. In Portugal no perſon can aſſume the title of don, without the permiſſion of the king, ſince it is looked upon as a mark of honour and nobility.

DOMAIN, the inheritance, eſtate, or poſſeſſion of any one. See Demesne.

DOME, in architecture, a ſpherical roof, or a roof of a ſpherical form, raiſed over the middle of a building, as a church, hall, pavillion, veſtible, ſtair-caſe, &c. by way of crowning.

Dome, or Doom, ſignifies alſo a ſentence, judgment, or decree.

DOMESDAY, or Doomsday-book, a very ancient record made in the time of William the Conqueror, which now remains in the exchequer, and conſiſts of two volumes, a greater and a leſs; the greater contains a ſurvey of all the lands in moſt of the counties in England, and the leſs comprehends ſome counties that were then ſurveyed. The book of domeſday was begun by five juſtices, aſſigned for that purpoſe in each county, in the year 1081, and finiſhed in 1086. It was of that authority, that the conqueror himſelf ſubmitted, in ſome caſes wherein he was concerned, to be determined by it. Camden calls this book the tax-book of king William; and it was farther called Magna rolla.

There is likewiſe a third book of Domeſday, made by command of the conqueror; and alſo a fourth, being an abridgment of the other books.

DOMESTIC, any man who acts under another, ſerving to compoſe his family; in which he lives, or is ſuppoſed to live, as a chaplain, ſecretary, &c. Sometimes domeſtic is applied to the wife and children, but very ſeldom to ſervants, ſuch as footmen, lacquies, porters, &c.

DOMICILE, in Scots law, is the dwelling place where a perſon lives with an intention to remain. See Scots Law, title 2.

DOMIFYING, in aſtrology, the dividing or diſtributing the heavens into twelve houſes, in order to erect a theme, or horoſcope, by means of ſix great circles, called circles of poſition.

There are various ways of domifying: that of regiomontanus, which is the moſt common, makes the circles of poſition paſs through the interſections of the meridian and the horizon: others make them paſs through the poles of the zodiac.

DOMINATION, in theology, the fourth order of angels, or bleſſed ſpirits, in the hierarchy, reckoning from the ſeraphim.

DOMINGO, or St Domingo, the capital of the iſland of Hiſpaniola, the ſee of an archbiſhop, and the moſt ancient royal audience in America: W. long. 70°, N. lat. 18° 20′.

DOMINICA, one of the Caribbee-iſlands, ſubject to Britain: W. long. 61° 20′, N. lat. 16°.

DOMINICAL letter. See Astronomy, p. 495.

DOMINICANS, an order of religious, called in France Jacobins, and in England Black-friers, or preaching-friers. This order founded by St Dominic, a native of Spain, was approved of by Innocent III. in 1215, and confirmed by a bull of Honorius III. in 1216. The deſign of their inſtitution was to preach the goſpel, convert heretics, defend the faith, and propagate Chriſtianity. They embraced the rule of St Auguſtine, to which they added ſtatutes and conſtitutions, which had formerly been obſerved either by the Carthuſian or Præmonſtratenſes. The principal articles enjoined perpetual ſilence, abſtinence from fleſh at all times, wearing of woollen, rigorous poverty, and ſeveral other auſterities. This order has ſpread into all the parts of the world. It has produced a great number of martyrs, confeſſors, biſhops; and they reckon three popes, ſixty cardinals, 150 archbiſhops, and 800 biſhops of their order, beſides the maſters of the ſacred palace, who have always been Dominicans. They are inquiſitors in many places.

DOMINION, in the civil law, ſignifies the power to uſe or diſpoſe of a thing as we pleaſe.

DOMINIUM *eminens*, in Scots law, that power which the ſtate or ſovereign has over private property, by which the proprietor may be compelled to ſell it for an adequate price where public utility requires. See Scots Law, title 8.

DOMINIUM *directum*, in Scots law, the right which a ſuperior retains in the lands, notwithſtanding the feudal grant to his vaſſal. See Scots Law, title 12.

DOMINIUM *utile*, in Scots law, the right which the vaſſal acquires in the lands by the feudal grant from his ſuperior. See Scots Law, title 13.

DON, the name of two rivers; one very large, which, after dividing Aſia from Europe, falls into the Palus Meotis; the other in the county of Aberdeen in Scotland.

DONATION, in Scots law, ſignifies a voluntary gift. Donation betwixt huſband and wife; ſee Scots Law, title 6.—When revocable; Not preſumed *in dubio*;—Donations *mortis cauſa*: See title 22.

DONATISTS, Chriſtian ſchiſmatics in Africa, who took their name from their leader Donatus. A ſecret hatred againſt Cæcilian, elected biſhop of Carthage about the year 311, excited Donatus to form this ſect. He accuſed Cæcilian of having delivered up the ſacred books to the Pagans, and pretended that his election was void, and all his adherents heretics. He taught that baptiſm adminiſtered by heretics was null, that every church but the African was become proſtituted, and that he was to be the reſtorer of religion. Some accuſe the Donatiſts of Arianiſm. Conſtantius and Honorius made laws for their baniſhment, and Theodoſius and Honorius condemned them to grievous mulcts.

DONATIVE, a gratuity, or preſent made to any perſon.

Donative among the Romans was properly a gift made to the ſoldiers, as congiarium was that made to the people.

DONATORY, in Scots law, that perſon to whom the king beſtows his right to any forfeiture that has fallen to the crown.

DONAWERT, a city of Bavaria in Germany, forty miles north-weſt of Ulm: E. long. 10° 40′, N. lat. 48° 40′.

DONAX, a genus of inſects belonging to the order of vermes teſtacea. It is an animal of the oyſter kind; and the ſhell has two valves, with a very obtuſe margin in the fore-part. There are ten ſpecies, principally diſtinguiſhed by the figure of their ſhells.

DONCASTER a market-town of Yorkſhire, thirty miles ſouth of York. See York.

DONOR, in law, the perſon who gives lands or tenements to another in tail, *&c.* as he to whom ſuch lands, *&c.* are given is the donee.

DONZY, a town of France in the Orleannois: E. long. 3° 16′, N. lat. 47° 17′.

DOOR, in architecture. See Architecture, p. 356.

DORCHESTER, the capital of Dorſetſhire, ſituated on the river Froom, ſix miles north of Weymouth: W. long. 2° 35′, and N. lat 50° 40′. It gives the title of marquis to the noble family of Pierpoint, dukes of Kingſton, and ſends two members to parliament.

DORDONNE, a river of France, which runs through the province of Guienne, and falls into the Garonne, twelve miles below Bourdeaux.

DOREE, or John Doree, in ichthyology. See Zeus.

DORIA, in botany. See Solidago.

DORIC, in general, any thing belonging to the Dorians, an ancient people of Greece, inhabiting near mount Parnaſſus.

Doric order in architecture. See Vol. I. p. 351.

Doric dialect, one of the five dialects, or manners of ſpeaking which were principally in uſe among the Greeks.

It was firſt uſed by the Lacedemonians, particularly thoſe of Argos; afterwards it paſſed into Epirus, Lybia, Sicily, and the iſlands of Rhodes, Crete, *&c.*

Doric mode, in muſic, the firſt of the authentic modes of the ancients; its character is to be ſevere, tempered with gravity and joy; and is proper upon religious occaſions, as alſo to be uſed in war. It begins *D, la, ſol, re*. Plato admires the muſic of the doric mode, and judges it proper to preſerve good manners, as being maſculine; and on this account allows it in his commonwealth. The ancients had likewiſe their ſubdoric or hypodoric mode, which was one of the plagal modes. Its character was to be very grave and ſolemn: it began with *re*, a fourth lower than the doric.

DORMANT, in heraldry, is uſed for the poſture of a lion, or any other beaſt, lying along in a ſleeping attitude, with the head on the fore-paws; by which it is diſtinguiſhed from the couchant, where though the beaſt be lying, yet he holds up his head.

DORMER, in architecture, ſignifies a window made in the roof of an houſe, or above the entablature, being raiſed upon the rafters.

DORMITORY, a gallery in convents or religious houſes, divided into ſeveral cells, in which the religious ſleep or lodge.

DORONICIS AFFINIS, in botany. See GERBERA.

DORONICUM, LEOPARD'S BANE, in botany, a genus of the ſyngeneſia polygamia ſuperflua claſs. The receptacle is naked; the pappus is ſimple; the ſcales of the calix are equal, and longer than the diſc; and the ſeeds in the radius are naked, and have no pappus. There are three ſpecies, none of them natives of Britain.

DORPT, or DORPAT, a city of Livonia, about fifty miles ſouth of Narva: E. long. 27° 25′, and N. lat. 58°.

DORSAL, an appellation given to whatever belongs to the back. See DORSUM.

DORSAL MUSCLES. See ANAT. Part. II.

DORSIFEROUS PLANTS, among botaniſts, ſuch as are of the capillary kind, without ſtalks, and which bear their ſeeds on the back-ſide of their leaves.

DORSTENIA, in botany, a genus of the tetrandria monogynia claſs. The common receptacle conſiſts of one fleſhy leaf, in which the ſolitary ſeeds are contained. There are four ſpecies, none of them natives of Britain.

DORSUM, BACK, in anatomy, comprehends all the poſterior part of the trunk of the body, from the neck to the buttocks. See ANATOMY.

DORT, a city of the United Provinces, ſituated in that of Holland, on an iſland in the river Maeſe, about ten miles eaſt of Rotterdam: E. long. 4° 40′, and N. lat. 51° 47′.

DORTMONT, a city of Weſtphalia in Germany, about thirty miles north-eaſt of Duſſeldorp: E. long 6° 50′, and N. lat. 51° 25′. It is an imperial city, and conſtitutes a ſovereign ſtate.

DORTMANNA, in botany. See LOBELIA.

DORYCNIUM, in botany. See CONVOLVULUS.

DORYPHORI, in antiquity, an appellation given to the life guard men of the Roman emperors.

DOSITHEANS, in church-hiſtory, a ſect among the Hebrews, being one of the branches of the Samaritans. See SAMARITANS.

They abſtained from eating any creature that had life, and were ſo ſuperſtitious in keeping the ſabbath, that they remained in the ſame place and poſture wherein that day ſurpriſed them, without ſtirring till the next day. They married but once, and a great number never married. Doſitheus, their founder, being diſſatiſfied among the Jews, retired to the Samaritans, who were reputed heretics, and invented another ſect; and to make it more authentic, he went into a cave, where, by too long abſtinence, he killed himſelf. The name of Doſitheans was alſo given to ſome of the diſciples of Simon Magus.

DOTTEREL, in ornithology. See CHARADRIUS.

DOUAY, a fortified city of the French Netherlands, ſituated on the river Scrape, about fifteen miles ſouth of Liſle: E. lon. 3°, and N. lat. 50° 25′.

DOUBLE FICHY, or FICHE′, in heraldry, the denomination of a croſs, when the extremity has two points, in contradiſtinction to fiché, where the extremity is ſharpened away to one point. See Plate LXVIII. fig. 8.

DOUBLETS, a game on dice within tables: the men, which are only fifteen, being placed thus; upon the ſice, cinque, and quater points, there ſtand three men a-piece; and upon the trey, duce, and ace, only two. He that throws higheſt hath the benefit of throwing firſt, and what he throws he lays down, and ſo doth the other: what the one throws, and hath not, the other lays down for him, but on his own account; and thus they do till all the men are down, and then they bear. He that is down firſt bears firſt, and will doubtleſs win the game, if the other throws not doublets to overtake him; which he is ſure to do, ſince he advances or bears as many as the doublets make, *viz.* eight for two fours.

DOUBLING, in the military art, is the putting two ranks or files of ſoldiers into one. Thus, when the word of command is, *double your ranks*, the ſecond, fourth, and ſixth ranks march into the firſt, third, and fifth, ſo that the ſix ranks are reduced to three, and the intervals between the ranks become double what they were before.

DOUBLING, among hunters, who ſay that a hare doubles, when ſhe keeps in plain fields, and winds about to deceive the hounds.

DOUBLING, in the menage, a term uſed of a horſe, who is ſaid to double his reins, when he leaps ſeveral times together, to throw his rider: thus we ſay, the ramingue doubles his reins, and makes pontlevis.

DOUBLING *a cape or point*, in navigation, ſignifies the coming up with it, paſſing by it, and leaving it behind the ſhip.

DOUBLINGS, in heraldry, the linings of robes and mantles of ſtate, or of the mantlings in atchievments.

DOUBLON, or DUBLOON, a Spaniſh and Portugueſe coin, being the double of a piſtole. See PISTOLE.

DOUBTING, the act of with-holding our aſſent from any propoſition, on ſuſpicion that we are not thoroughly appriſed of the merits thereof; or from not being able peremptorily to decide between the reaſons for and againſt it.

DOUCINE, in architecture, a moulding concave above and convex below, ſerving commonly as a cymatium to a delicate corniche. It is likewiſe called gula.

DOVE, in ornithology. See COLUMBA.

DOVE, in geography, the name of a river dividing Derbyſhire from Staffordſhire: alſo of a town of the Orleanois, in France, about twenty miles ſouth-eaſt of Angers.

Dove-tailing, in carpentry, is the manner of faſtening boards together by letting one piece into another, in the form of the tail of a dove. The dove-tail is the ſtrongeſt of the aſſemblages or jointings, becauſe the tenon, or piece of wood which is put into the other, goes widening to the extreme, ſo that it cannot be drawn out again, by reaſon the extreme or tip is bigger than the hole.

DOVER, a borough and port-town of Kent, ſituated on a rock, oppoſite to Calais in France, with a ſtrong caſtle: E. long. 25′, and N. lat. 51° 10′.

Dover gives the title of duke to the dukes of Queenſbury, a branch of the noble family of Douglas; and ſends two members to parliament, ſtyled barons of the cinque ports, whereof Dover is the chief.

DOUGLAS, a port-town, and the beſt harbour in the Iſle of Man: W. long. 4° 25′, and N. lat. 54° 7′.

DOWAGER, a widow endowed, is a title applied to the widows of princes, dukes, earls, and perſons of high rank only.

DOWER, that portion which the law allows a widow out of the lands of her huſband, after his deceaſe.

DOWN, in geography, the capital of a county of the ſame name in the province of Ulſter, in Ireland: W. long. 5° 56′, and N. lat. 54° 23′.

DOWNETON, or Dunkton, a borough-town of Wiltſhire, five miles ſouth of Saliſbury. It ſends two members to parliament.

DOWNHAM, a market-town of Norfolk, ten miles ſouth of Lynn, famous for its good butter; there being a thouſand, and ſometimes two thouſand firkins bought here every Monday, and ſent up the river Ouſe to Cambridge, from whence it is conveyed to London, in the Cambridge waggons.

DOWNS, a famous road near Deal, in Kent, where both the outward and homeward bound ſhips frequently make ſome ſtay; and ſquadrons of men of war rendezvous in time of war.

It affords excellent anchorage, and is defended by the caſtles of Deal, Dover, and Sandwich.

DOWRY, the money or fortune which the wife brings her huſband in marriage: It is otherwiſe called *maritagium*, marriage-goods, and differs from dower.

DOXOLOGY, an hymn uſed in praiſe of the Almighty, diſtinguiſhed by the title of greater and leſſer.

The leſſer doxology was anciently only a ſingle ſentence, without reſponſe, running in theſe words, *Glory be to the Father, and to the Son, and to the Holy Ghoſt, world without end, amen.* Part of the latter clauſe, *As it was in the beginning, is now, and ever ſhall be,* was inſerted ſome time after the firſt compoſition. Some read this ancient hymn, *Glory be to the Father, and to the Son with the Holy Ghoſt.* Others, *Glory be to the Father in or by the Son, and by the Holy Ghoſt.* This difference of expreſſion occaſioned no diſputes in the church, till the riſe of the Arian hereſy; but when the followers of Arius began to make uſe of the latter as a diſtinguiſhing character of their party, it was entirely laid aſide by the catholics, and the uſe of it was enough to bring any one under ſuſpicion of heterodoxy. The doxology was uſed at the cloſe of every ſolemn office. The weſtern church repeated it at the end of every pſalm, and the eaſtern church at the end of the laſt pſalm. Many of their prayers were alſo concluded with it, particularly the ſolemn thankſgiving, or conſecration prayer at the euchariſt. It was alſo the ordinary concluſion of their ſermons.

The greater doxology, or angelic hymn, was likewiſe of great note in the ancient church. It began with theſe words, which the angels ſung at our Saviour's birth, *Glory be to God on high,* &c. It was chiefly uſed in communion ſervice, and in mens private devotions. Both the doxologies have a place in the church of England, the former being repeated after every pſalm, and the latter uſed in the communion ſervice.

DRABA, in botany, a genus of the tetradynamia ſiliculoſa claſs. The pod is entire and ſomewhat oval, with plain valves, and a parallel diſſepimentum; it has no ſtylus. There are ſix ſpecies, three of them natives of Britain, *viz.* the verna, or common whitlow-graſs; the muralis, or ſpeedwell-leaved whitlow-graſs; and the incana, or wreathen-poded whitlow-graſs.

DRABS, in the ſalt-works, a kind of wooden boxes for holding the ſalt when taken out of the boiling pan, the bottoms of which are made ſhelving or inclining forwards, that the briny moiſture of the ſalt may drain off.

DRACHM, a Grecian coin of the value of ſeven-pence three-farthings.

DRACO, the dragon, in zoology, a genus belonging to the order of amphibia reptilia. The characters of which are theſe: It has four legs, a cylindrical tail, and two membranaceous wings, radiated like the fins of a fiſh, by which he is enabled to fly, but not to any great diſtance at a time There are two ſpecies, 1. The volans, or flying dragon, with the wings entirely diſtinct from the fore-legs; it is found in Africa and the Eaſt Indies. 2. The præpos, with the wings fixed to the fore-legs; it is a native of America. They are both harmleſs creatures, and feed upon flies, ants, and ſmall inſects.

Draco volans, in meteorology, a fiery exhalation, frequent in marſhy and cold countries.

It is moſt common in ſummer, and though principally ſeen playing near the banks of rivers, or in boggy places, yet ſometimes mounts up to a conſiderable height in the air, to the no ſmall terror of the amazed beholders; its appearance being that of an oblong, ſometimes roundiſh, fiery body, with a long tail. It is entirely harmleſs, frequently ſticking to the hands and cloaths of people without injuring them in the leaſt.

Draco, in aſtronomy, a conſtellation of the northern hemiſphere. See Astronomy, p 486.

DRACOCEPHALUM, dragon's head, in botany, a genus of the didynamia gymnoſpermia claſs. The faux of the corolla is inflated, and the ſuperior labium is concave. There are 13 ſpecies, none of them natives of Britain.

DRACONTIC **month**, the time of one revolution of the moon, from her aſcending node, called caput draconis, to her return thither.

DRACONTIUM, **dragons**, in botany, a genus of the gynandria polyandria claſs. The ſpatha is ſhaped like a boat; the ſpadix is covered; it has no calix; the corolla conſiſts of five petals; and the berry contains many ſeeds There are five ſpecies, all natives of the Indies.

DRACUNCULI, in medicine, ſmall long worms, which breed in the muſcular parts of the arms and legs, called Guinea worms See **Medicine**.

DRACUNCULUS, in botany. See **Arum**.

Dracunculus, in ichthyology. See **Callionymus**.

DRAGOMAN, **Drogman**, or **Druggerman**, a name given in the Levant to the interpreters kept by the ambaſſadors of Chriſtian nations, reſiding at the Porte, to aſſiſt them in treating of their maſter's affairs.

DRAGON, in zoology. See **Draco**.

Dragon's blood, in pharmacy, a reſin brought from the Eaſt-Indies, either in oval drops, wrapped up in flag leaves, or in large maſſes compoſed of ſmaller tears. The fine dragon's blood of either ſort breaks ſmooth, free from any viſible impurities, of a dark red colour, which changes upon being powdered into an elegant bright crimſon. It diſſolves in pure ſpirit, and tinges a large quantity of the menſtruum of a deep red colour; it is alſo ſoluble in oils. It is uſually looked upon as a gentle aſtringent, and is ſometimes preſcribed againſt ſeminal gleets, the fluor albus, and other fluxes.

Dragon-fly. See **Libella**.

Dragon shell. See **Patella**.

Dragons, in botany. See **Dracontium**.

DRAGONNE'E, in heraldry; a lion dragonnée is where the upper half reſembles a lion, the other half going off like the hinder part of a dragon. The ſame may be ſaid of any other beaſt as well as a lion.

DRAGOON, in military affairs, a muſqueteer, mounted on horſeback, who ſometimes fights or marches on foot, as occaſion requires.

Dragoons are divided into brigades, as the cavalry, and each regiment into troops; each troop having a captain, lieutenant, cornet, quarter-maſter, two ſerjeants, three corporals, and two drums. Some regiments have hautboys: they are very uſeful on any expedition that requires diſpatch, for they can keep pace with the cavalry, and do the duty of infantry: they encamp generally on the wings of the army, or at the paſſes leading to the camp; and ſometimes they are brought to cover the general's quarters: they do duty on the generals of horſe and dragoons, and march in the front and rear of the army.

DRAGS, in the ſea-language, are whatever hangs over the ſhip in the ſea, as ſhirts, coats, or the like; and boats, when towed, or whatever elſe that, after this manner, may hinder the ſhip's way when ſhe ſails, are called drags.

DRAINS, a name given, in the fen countries, to certain large cuts or ditches of twenty, thirty, nay ſometimes forty foot wide, carried through the marſhy ground to ſome river or other place capable of diſcharging the water they carry out of the fen-lands. See **Agriculture**.

DRAKE, in ornithology, the male of the duck-kind. See **Anas**.

DRAMA, a poem containing ſome certain action, and repreſenting a true picture of human life, for the delight and improvement of mankind.

The principal ſpecies of the drama are two, comedy and tragedy. Some others there are of leſs note, as paſtoral, ſatire, tragi-comedy, opera, *&c.* See **Composition**.

DRAMATIC, an epithet given to pieces written for the ſtage. See **Composition**.

DRANK, among farmers, a term uſed to denote wild oats, which never fail to infeſt worn-out lands; ſo that when plowed lands run to theſe weeds and thiſtles, the farmer knows it is high time to fallow them, or elſe to ſow them with hay-ſeed, and make paſture of them.

DRAPERY, in ſculpture and painting, ſignifies the repreſentation of the clothing of human figures, and alſo hangings, tapeſtry, curtains, and moſt other things that are not carnations or landſcapes. See **Painting**.

DRAUGHT, in trade, called alſo **Cloff** or **Clouch**, is a ſmall allowance on weighable goods, made by the king to the importer, or by the ſeller to the buyer, that the weight may hold out when the goods are weighed again.

The king allows 1 ℔ draught for goods weighing no leſs than 1 Cwt. 2 ℔ for goods weighing between 1 and 2 Cwt. 3 ℔ for goods weighing between 2 and 3 Cwt. 4 ℔ from 3 to 10 cwt. 7 ℔ from 10 to 18 Cwt. 9 ℔ from 18 to 30, or upwards.

Draugt hooks, are large hooks of iron, fixed on the cheeks of a cannon-carriage, two on each ſide, one near the trunnion hole, and the other at the train, diſtinguiſhed by the name of fore and hind draught-hooks. Large guns have draught-hooks near the middle tranſum, to which are fixed the chains that ſerve to keep the ſhafts of the limbers on a march. The fore and hind hooks are uſed for drawing a gun backwards or forwards, by men with ſtrong ropes, called draught-ropes, fixed to theſe hooks.

Draught-horse, in farming, a ſort of coarſe-made horſe, deſtined for the ſervice of a cart or plough. See **Equus**.

DRAW, in the ſea-language. A ſhip is ſaid to draw ſo much water, according to the number of feet ſhe ſinks into it; ſo that if a ſhip ſink into the water eighteen feet perpendicularly, ſhe is ſaid to draw eighteen feet water; and according as ſhe draws more or leſs, ſhe is ſaid to be of more or leſs draught.

Draw-back, in commerce, certain duties, either of the cuſtoms or of the exciſe, allowed upon the exportation of ſome of our own manufactures; or upon certain foreign merchandiſe, that have paid duty on importation.

The oaths of the merchants importing and exporting are required to obtain the drawback of foreign goods, affirming the truth of the officer's certificate of the entry, and the due payment of the duties: and theſe may be made by the agent or huſband of any corporation or company, or by the known ſervant of any merchant uſually employed in making his entries and paying his cuſtoms. In regard to foreign goods entered outward, if leſs quantity or value be fraudulently ſhipped out than is expreſſed in the exporter's certificate, the goods therein mentioned, or their value, are forfeited, and no drawback to be allowed for the ſame. Foreign goods exported by certificate, in order to obtain the drawback, not ſhipped or exported, or re-landed in Great Britain, unleſs in caſe of diſtreſs, to ſave them from periſhing, are to loſe the benefit of the drawback, and are forfeited, or their value, with the veſſels, horſes, carriages, *&c.* employed in the re-landing thereof; and the perſons employed in the re-landing them, or by whoſe privity they are re-landed, or into whoſe hands they ſhall knowingly come, are to forſeit double the amount of the drawback. Officers of the cuſtoms conniving at, or aſſiſting in any fraud relating to certificate-goods, beſides other penalties, are to forfeit their office, and to ſuffer ſix months impriſonment, without bail or mainprize; as are alſo maſters, or perſons belonging to the ſhips employed therein. Bonds given for the exportation of certificate-goods to Ireland, muſt not be delivered up, nor drawback allowed for any goods, till a certificate under the hands and ſeals of the collector or comptroller, *&c.* of the cuſtoms be produced, teſtifying the landing.

The computation of what is to be drawn back upon the exportation of foreign goods, may be ſeen under their reſpective heads.

Draw-bridge, a bridge made after the manner of a floor, to draw up, or let down, as occaſion ſerves, before the gate of a town or caſtle.

DRAWING, in general, denotes the action of pulling out, or haling along: thus, we read of tooth-drawing, wire-drawing, *&c.*

Drawing, the art of repreſenting the appearances of objects by imitation, or copying without the aſſiſtance of mathematical rules.

The general precepts for drawing are as follow: 1. Begin with plain geometrical figures, as lines, angles, triangles, polygons, arches, circles, ovals, cones, cylinders, and the like, being the foundation of all other proportions. The circle is of uſe in the ſeveral orbicular forms, as the ſun, moon, globes, *&c.* the oval, in giving a juſt proportion to the face and mouth; and the ſquare confines a picture you are to copy, *&c.* the triangle is of uſe in drawing a ſide or half face; angles and arches, in perſpective; and the polygon, in ground-plots, fortifications, *&c.* the cone, in ſpires, ſteeples, tops of towers, *&c.* the cylinder, in columns, pillars, pilaſters, *&c.* See Perſpective.

2. Having brought your hand to be fit and ready in general proportions, accuſtom yourſelf to give every object its due ſhade, according to its concavity or convexity, and to elevate or depreſs the ſame, as the object appears either nearer or farther off the light.

3. The ſecond practice of drawing, conſiſts in forming fruits, as apples, pears, cherries, *&c.* with their leaves; the imitation of flowers, as roſes, tulips, carnations, *&c.* herbs, trees, *&c.* of different kinds.

4. The third, in the imitation of beaſts, fowls, fiſhes, *&c.*

5. The fourth practice of drawing conſiſts in the imitation of the body of man, with all its lineaments, as head, noſe, eyes, ears, cheeks, arms, and ſhadows, all exactly proportioned both to the whole and to one another.

6. The fifth is in the drapery, in the imitation of cloathing, and artificially ſetting off the outward coverings, habit, and ornaments of the body, either of cloth, ſtuff, ſilk, or linen, in their natural and proper folds.

7. In drawing of all the forms before-mentioned, it is requiſite to be firſt perfect in the laying down the exact proportions; ſecondly, in the general or outward lines, before you proceed to ſhadowing, or trimming the work within.

8. In mixed and uncertain forms, where the circle, ſquare, *&c.* will be of no uſe, but only in the idea thereof in your own fancy, as horſes, oxen, and the like, you muſt do it by judgment, and ſo gain the true proportions by aſſiduous practice: thus having the ſhape of the thing in your mind, firſt draw it rudely with a coal; then, with more exactneſs, with a lead or pencil; then peruſe it well, and mend it in thoſe parts you have erred in, according to the idea you carry in your mind. When it is mended by your own judgment, compare it with ſome good pattern of the ſame kind, and amend it by that.

9. Having good copies to draw after, learn to reduce them to other proportions, either larger or ſmaller; and this by frequent practice.

10. Let a perfection in drawing be attained by diligent exerciſe, and the inſtruction of a good maſter, before there be any attempts as to colouring and painting; for the former being attained, the reſt will be eaſily underſtood, and gained by frequent practice.

Particular obſervations with regard to Drawing, *are as follows.* 1. If you draw after a print or picture, place it in ſuch a light, that the gloſs of the colours may not interrupt your light, and that the light and your eye may equally and obliquely fall upon the piece, which ſhould be placed at ſuch a diſtance, that, upon opening your eye, you may view it at once: the larger the picture is, the greater diſtance off it ſhould be placed: it ſhould alſo be right before you, and a little reclining.

2. Draw your out-lines at firſt very faint, and with a coal; and let them be drawn agreeable to the pattern, before you begin to ſhadow any part of it. When you have drawn one feature, it ſhould, in ſome meaſure, be a direction for you to draw the other, by obſerving the diſtance from that to the next feature; making a ſmall mark at the place with your coal, then draw it, and ſo to the next, till you have drawn the whole figure.

3. Then obſerve the middle of the picture you would copy, and touch upon the paper with the point of your coal: afterwards, obſerve the more conſpicuous and uppermoſt figures, if there are more than one, which you are to touch lightly in their proper places: thus, running over the whole draught, you will ſee, as it were, the ſkeleton of the piece to draw.

4. Having made out theſe ſketches, view them diligently, if they anſwer your pattern or not; for the geſtures of the life ought to ſhew themſelves eminently in the firſt and rudeſt draughts thereof: correct and mend whatever you perceive amiſs, adding and diminiſhing as it varies from the pattern; by which method it will be brought nearer and nearer to the life.

5. Obſerve the diſtance of one limb, joint, or muſcle, from another, and the ſame in all other accidents of the figure, their length, breadth, turnings, *&c.* ſhadow next to the light very faintly; and where you ſee bold and free touches, be not timorous in expreſſing the ſame. In drawing a head by the life, or otherwiſe, take care to place the features exactly right upon the croſs-lines, whether it be a full face, or three-quarter face. In fore-ſhortening you muſt make the croſs-lines to fly upwards, where they look upwards; but where the aſpect is downwards, they muſt be made downwards, in a circular manner. Having drawn the out-lines true, with a coal, you are to proceed to trace the ſame lines again with a pen, Indian ink, *&c.* drawing them with more exactneſs, and by imitating all the hatches with their exact diſtances one from another, their croſſings, turnings and windings, with more boldneſs and freedom perfect your deſign.

6. In drawing after a naked body, all the muſcles are not to be ſo plainly expreſſed as in anatomical figures; but that ſide whoſe parts are moſt apparent, and of ſignification in the performance of any action, muſt be made to appear more or leſs, according to the force of that action.

7. In drawing young perſons, the muſcles muſt not appear manifeſtly ſo hard as in older and full-grown perſons: the ſame is to be obſerved as to fat and fleſhy perſons, and ſuch as are very delicate and beautiful; and in women, ſcarce any muſcles at all are to be expreſſed, or but very little, unleſs it be in ſome very terrible action, and then too they are to be repreſented very faintly; the like is alſo to be obſerved as to little children.

8. The motion of the whole body muſt be conſidered in drawing of the muſcles; as in the riſing and falling of the arms, the muſcles of the breaſt do appear more or leſs; the hips do the like according as they are bent outward or inward; and it is the ſame chiefly in the ſhoulders, ſides, and neck, according to the ſeveral actions of the body.

9. The proportion of the figure ought to be multiplied by degrees, in proportion of one to two, three, four, *&c.* for herein the chief ſkill conſiſts: the diameter of the biggeſt place, between the knee and the foot, is double to the leaſt; and the largeſt part of the thigh, triple.

DRAY, a kind of cart uſed by brewers, for carrying barrels of beer, or ale; alſo a ſledge drawn without wheels.

Dray, among ſportſmen, denotes ſquirrel-neſts, built in the tops of trees.

DRYATON, a market-town of Shropſhire, fourteen miles north-eaſt of Shrewſbury.

DREDGE, or **Dreg**, among farmers, denotes oats and barley mingled together.

DREDGERS, the term uſed in the admiralty-court for the oiſter-fiſhers.

DREIN, in the military art, a trench made to draw the water out of a moat, which is afterwards filled with hurdles and earth, or with faſcines or bundles of ruſhes and planks, to facilitate the paſſage over the mud. See Trench.

DRENCH, among farriers, a phyſical potion for horſes. The ingredients for this purpoſe are to be beat coarſely, and either mingled with a decoction, or with wine. Then let all infuſe about a quarter of an hour, and give it to the horſe with a horn, after he has been tied up two hours to the rack.

DRESDEN, the capital of Upper Saxony, in Germany, ſituated on the river Elbe, ſixty-five miles north-weſt of Prague, and eighty-five ſouth of Berlin: E. long. 13° 36′, N. lat. 51°.

It is one of the largeſt and ſtrongeſt towns in Germany, and is the uſual reſidence of the elector of Saxony.

DREUX, a town of Orleanois, in France, ſeventeen miles north of Chartres, and thirty-five weſt of Paris.

DRIFT, a term uſed at ſea. Thus, any thing that floats upon the water, is ſaid to run a-drift.

Drift-sail, a ſail uſed under water, veered out right a-head by ſheets, as other ſails are. It ſerves to keep the ſhip's head right upon the ſea in a ſtorm, and to hinder her driving too faſt in a current.

DRILL, in mechanics, a ſmall inſtrument for making ſuch holes as punches will not conveniently ſerve for. Drills are of various ſizes, and are chiefly uſed by ſmiths and turners.

Drill, or **Drill-box**, a name given to an inſtrument for ſowing land in the new method of horſe-hoeing huſbandry. See Ariculture.

DRINK, a part of our ordinary food in a liquid form, ſerving to dilute and moiſten the dry meat.

The drinks in different countries are different. The common drink in England is either water, malt-liquor, wine, or mixtures of theſe.

The firſt drinks of mankind were certainly water and milk, but the love of luxury and debauchery ſoon introduced the art of preparing intoxicating and inebriating drinks out of vegetables. The vine gave the firſt of theſe liquors; after this, wheat, barley, millet, oats, rice, apples, pears, and pomegranates; and after thoſe the juices drained from the pine, ſycamore, and mapple, were brought to this uſe: in latter times, roots, berries, and the pith of the ſugar-cane, have been employed for the ſame purpoſes.

DRIVERS, among ſportſmen, a machine for driving pheaſant-powts, conſiſting of good ſtrong ozier-wands, ſuch

ſuch as the baſket-makers uſe; theſe are to be ſet in a handle, and twiſted or bound with ſmall oziers in two or three places.

With this inſtrument, the ſportſman drives whole eyes of young powts into his nets. See the next article.

DRIVING, among ſportſmen, a method of taking pheaſant-powts. It is thus: the ſportſman finds out the haunts of theſe birds; and having fixed his nets there, he calls them together by a pheaſant-call, imitating the voice of the dam: after this he makes a noiſe with his driver, which will make them run a little way forward in a cluſter; and this he is to repeat till he has made ſure of them, which an expert ſportſman never fails to do, by driving them into his nets.

Driving, in metallurgy, is ſaid of ſilver, when in the operation of refining, the lead being burnt away, the remaining copper riſes upon its ſurface in red fiery bubbles.

Driving, in the ſea-language, is ſaid of a ſhip when an anchor being let fall will not hold her faſt, nor prevent her ſailing away with the tide or wind. The beſt help in this caſe is to let fall more anchors, or to veer out more cable; for the more cable ſhe has out, the ſafer ſhe rides. When a ſhip is a-hull, or a-try, they ſay ſhe drives to leeward.

DROGHEDA, a port-town of Ireland, twenty-three miles north of Dublin.

DROGMAN. See Dragoman.

DROITWICH, a borough ſix miles north of Worceſter, which ſends two members to parliament.

DROMEDARY. See Camelus.

DRONE, in the hiſtory of inſects. See Apis.

Drone-fly, a two-winged inſect, extremely like the common drone-bee, whence alſo the name.

DROPS, in meteorology, ſmall ſpherical bodies which the particles of fluids ſpontaneouſly form themſelves into when let fall from any height.

Drops, in medicine, a liquid remedy, the doſe of which is eſtimated by a certain number of drops.

DROPSY, in medicine, an unnatural collection of watry humours in any part of the body. See Medicine.

DROP-WORT, in botany. See Filipendula.

Water **Drop-wort**, in botany. See Oenanthe.

DROSERA, Sun-dew, in botany, a genus of the pentandria pentagynia claſs of plants, with a funnel-faſhioned flower, conſiſting of five obtuſely-ovated petals: the fruit is an unilocular ſuboval capſule, containing a great many very ſmall ſeeds.

DROWNING, the act of ſuffocating, or being ſuffocated, by water.

Naturaliſts and phyſicians furniſh us with divers well atteſted inſtances of ſurpriſing recoveries of perſons drowned. It is certain from repeated diſſections made on perſons drowned, that they generally have leſs water in their ſtomachs than if they had voluntarily drunk a conſiderable quantity: whence it does not ſeem expedient to hang the drowned perſon by the heels, a poſition that muſt prove uneaſy as ſoon as the humours of the body ſhould reſume their ordinary motion. In order to know whether the perſon has ſwallowed too much water or not, and to make him vomit it up if he has, it is proper to put him in a tun, open at both ends, which is to be rolled in different directions: or the bearded end of a feather ſhould be introduced into the œſophagus. After taking off the cloaths of the drowned perſon, we ought, with the utmoſt expedition, to ſhelter him from the impreſſions of the cold air, and begin to warm him, by wrapping him up with cloaths and coverings: to do this more effectually, he is afterwards to be put into a pretty warm bed, applying alſo to his body hot napkins and cloths. A hot ſcorching ſun, to which drowned perſons have been expoſed, and hot baths, have produced the ſame happy effects.

The great intention to be purſued is, to put the ſolid parts of the machine in action, that thus they may reſtore the motion of the fluids: in order to this, the drowned perſon ſhould be agitated in various directions, in a bed, in the arms of perſons of ſufficient ſtrength.

Spirituous liquors ſhould be poured into his mouth, or warm urine; and ſome perſons preſcribe a decoction of pepper and vinegar, as a gargariſm: we muſt alſo attempt to irritate the internal fibres of the noſe, either by volatile ſpirits, and by the liquors uſed in apoplectic caſes; or by tickling the nerves of the noſtrils with a bearded feather; or by blowing, through a quill, ſnuff, or ſome other more powerful ſternutatory. One of the means frequently uſed with ſucceſs, is to blow warm air, by means of a pipe, into their mouths; or to introduce it by a pair of bellows; or, by injecting warm clyſters, to irritate the inteſtines: the ſmoke of tobacco conveyed into the inteſtines, by means of a tobacco pipe, is much recommended. Venæſection is by no means to be neglected; and perhaps moſt ſucceſsfully in the jugular vein.

DRUG, a general term for goods of the druggiſt and grocery kinds, eſpecially for thoſe uſed in medicine and dying.

DRUGGET, in commerce, a ſtuff ſometimes all wool, and ſometimes half wool half thread, ſometimes corded, but uſually plain.

Thoſe that have the woof of wool, and the warp of thread, are called threaded-druggets; and thoſe wrought with the ſhuttle on a loom of four marches, as the ſerges of Moui, Beauvois, and other like ſtuffs corded, are called corded druggets. As to the plain, they are wrought on a loom of two marches, with the ſhuttle, in the ſame manner as cloth, camlets, and other like ſtuffs not corded.

DRUIDS, the prieſts or miniſters of religion of the ancient Britons and Gauls. The druids were choſen out of the beſt families; and were held, both by the honours of their birth, and their office, in the greateſt veneration. They are ſaid to have underſtood aſtrology, geometry, natural hiſtory, politics, and geography: they had the adminiſtration of all ſacred things, were the interpreters of religion, and the judges of all affairs indifferently.

Whoever refuſed obedience to them, was declared impious and accurſed: they held the immortality of the ſoul, and the tranſmigration of ſouls. They are divided by ſome into ſeveral claſſes, as the vaceni, bardi, bubagis, ſemothii. They had a chief, or arch-druid, in every nation: he was a ſort of high-prieſt, having an abſolute authority over the reſt, and was ſucceeded by the moſt conſiderable among his ſurvivors. The youth uſed to be inſtructed by them, retiring with them to caves and deſolate foreſts, where they were ſometimes kept twenty years. They preſerved the memory and actions of great men by their verſes; but are ſaid to have ſacrificed men to Mercury. Cæſar imagined that the druids came from Britain into Gaul, but ſeveral among the modern writers are of a different opinion.

DRUM, is a martial muſical inſtrument in form of a cylinder, hollow within, and covered at the two ends with vellum, which is ſtretched or ſlackened at pleaſure by the means of ſmall cords or ſliding knots: It is beat upon with ſticks. Some drums are made of braſs, but they are commonly of wood.

Kettle **Drums**, are two ſorts of large baſons of copper or braſs, rounded in the bottom, and covered with vellum, or goat-ſkin, which is kept faſt by a circle of iron, and ſeveral holes faſtened to the body of the drum, and a like number ſcrews to ſcrew up and down. They are much uſed among the horſe, as alſo in operas, oratorios, concerts, *&c.*

Drum, or **Drummer**, he that beats the drum; of whom each company of foot has one, and ſometimes two. Every regiment has a drum-major, who has the command over the other drums. They are diſtinguiſhed from the ſoldiers, by cloaths of a different faſhion: their poſt, when a battalion is drawn up, is on the flanks, and on a march it is betwixt the diviſions.

Drum *of the ear*, in anatomy. See Vol. I. p. 299.

DRUMLANERK, a town of Scotland, fifteen miles north of Dumfries.

DRUNKENNESS, a well known diſorder in the brain, occaſioned by drinking too freely of ſpirituous liquors. Drunkenneſs appears in different ſhapes, in different conſtitutions: ſome it makes gay, ſome ſullen, and ſome furious.

DRUPE, among botaniſts. See Vol. I. p. 637.

DRUSENHEIM, a town of Alſace, in Germany, four miles ſouth-eaſt of Hagenau.

DRYADÆA, in botany. See Dryas.

DRYADS, in the heathen theology, a ſort of deities, or nymphs, which the ancients thought inhabited groves and woods. They differed from the Hamadryades, theſe latter being attached to ſome particular tree, with which they were born, and with which they died; whereas the Dryades were goddeſſes of trees and woods in general

DRYAS, in botany, a genus of the icoſandria polygynia claſs. The calix conſiſts of eight ſegments, and the corolla of eight petals; and the ſeeds are tailed and hairy. There are two ſpecies, both natives of Britain, *viz.* the pentapetula, or cinquefoil avens; and the octopetala, or mountain avens.

DUBLIN, the capital of the province of Leinſter, and of all Ireland, ſituated at the mouth of the river Liffee, ſixty miles weſt of Holyhead in Wales: W. lon. 6° 25′, N. lat. 53° 16′.

It is a large and beautiful city, pleaſantly ſituated; having a view of the ſea on one ſide, and of a fine country on the other. It is the ſeat of the courts of juſtice, and an archbiſhop's ſee; and has a noble college, which is an univerſity of itſelf.

DUCAL, in general, ſomething belonging to a duke. See Duke.

DUCAT, a coin current in Germany and other countries abroad, of different values.

DUCATOON, a ſilver coin, likewiſe frequent in ſeveral parts of Europe.

DUCENARIUS, in Roman antiquity, a military officer who had the command of two hundred men.

DUCK, in ornithology. See Anas.

DUCKER. See Colymbus.

DUCKING, plunging in water, a diverſion anciently practiſed among the Goths, by way of exerciſe; but among the Celtæ, Franks, and ancient Germans, it was a ſort of puniſhment for perſons of ſcandalous lives.

They were ſhut up, naked to the ſhift, in an iron cage, faſtened to the yard of a ſhaloop, and ducked ſeveral times.

Ducking *at the main-yard*, among ſeamen, is a way of puniſhing offenders on board a ſhip; and is performed by binding the malefactor, by a rope, to the end of the yard, from whence he is violently let down into the ſea, once, twice, or three times, according to his offence: and if the offence be very great, he is drawn underneath the keel of the ſhip, which they call keel-haling.

DUCKUP, at ſea, is a term uſed by the ſteer's-man, when the main-ſail, fore-ſail, or ſprit-ſail, hinders his ſeeing to ſteer by a land-mark: upon which he calls out, *Duckup the clew-lines of theſe ſails*, that is, hale the ſails out of the way. Alſo when a ſhot is made by a chace-piece, if the clew of the ſprit-ſail hinders the ſight, they call out, *Duckup*, &c.

DUCT, in general, denotes any tube or canal. It is a term much uſed by anatomiſts.

Air-**Duct**, among ichthyologiſts, a canal reaching from the air-bladder in fiſhes to their ſtomach.

DUCTILITY, in phyſics, a property of certain bodies, whereby they are capable of being expanded, or ſtretched forth, by means of a hammer, preſs, *&c.* See Chemistry, and Mechanics.

DUDERSTAT, a town of Upper Saxony, thirty-five miles north-eaſt of Caſſel.

DUEL, a ſingle combat, at a time and place appointed, in conſequence of a challenge. This cuſtom came originally from the northern nations, among whom it was uſual to decide all their controverſies by arms. Both the accuſer and the accuſed gave pledges to the judges on their reſpective behalf; and the cuſtom prevailed ſo far amongſt the Germans, Danes, and Franks, that none were excuſed from it but women, ſick people, cripples, and ſuch as were under twenty-one years of age, or above ſixty. Even eccleſiaſtics, prieſts, and monks, were obliged to find champions to fight in their ſtead. The puniſhment of the vanquiſhed was either death, by hanging or beheading; or, mutilation of members, according to the circumſtances of the caſe. Duels were at firſt admitted not only on criminal occaſions, but on ſome civil ones for the maintenance of rights to eſtates, and the like: in latter times, however, before they were intirely aboliſhed, they were reſtrained to theſe four caſes. 1. That the crime ſhould be capital. 2. That it ſhould be certain the crime was perpetrated. 3. The accuſed muſt, by common fame, be ſuppoſed guilty. And, 4. The matter not capable of proof by witneſſes. At preſent it is uſed for a ſingle combat on ſome private quarrel, and muſt be premeditated, otherwiſe it is called a rencounter. If a perſon be killed in a duel, both the principals and ſeconds are guilty of murder, whether the ſeconds engage or not. It is alſo a very high offence to challenge a perſon, either by word or letter, or to be the meſſenger of a challenge. The ſevere edicts made by Lewis XIV. againſt duels have, in a great meaſure, put a ſtop to the cuſtom in France.

DUELLING, in Scots law. See title 33.

DUERO, or Duro, a large river, which, riſing in Old Caſtile in Spain, runs from eaſt to weſt, croſſes the province of Leon, and, after dividing Portugal from Spain by a ſoutherly courſe, turns weſtward, croſſes Portugal, and falls into the Atlantic Ocean at Porto-Port.

DUKE is either the title of a ſovereign prince, as the duke of Savoy, Parma, *&c.* the grand duke of Tuſcany, Muſcovy, *&c.* or it is the title of honour and nobility next below princes. The commanders of armies in time of war, the governors of provinces and wardens of marches in times of peace, were called *duces* under the later emperors. The Goths and Vandals divided all Gaul into dutchies and counties, the governors of which they ſometimes call *duces*, and ſometimes *comites*. In France, under the ſecond race of kings, though they retained the name and form of ducal government, there were ſcarce any dukes except thoſe of Burgundy, Aquitain, and France. In England, among the Saxons, the commanders of armies, *&c.* were called dukes, *duces*, without any addition, till Edward III. made his ſon, the Black Prince, duke of Cornwal; after whom there were more made in the ſame manner, the title deſcending to their poſterity. Duke then, at preſent, is a mere title of dignity, without giving any domain, territory, or juriſdiction over the place from whence the title is taken. A duke is created by patent, cincture of ſword, mantle of ſtate, impoſition of a cap and coronet of gold on his head, and a verge of gold put into his hand. His title is Grace; and, in the ſtyle of the heralds, Moſt high, potent, high-born, and noble prince.

DULCIFYING, in chemiſtry, is the ſweetening any matter impregnated with ſalts, by frequently waſhing it in pure water.

DULL, in the menage. The marks of a dull horſe, called by the French marquis de ladre, are white ſpots round the eye and on the tip of the noſe, upon any general colour whatſoever. Though the vulgar take theſe ſpots for ſigns of ſtupidity, it is certain they are great marks of the goodneſs of a horſe; and the horſes that have them are very ſenſible and quick upon the ſpur.

DULWICH, a village near London, remarkable for its mineral waters, which are ſaid to contain a bitter cathartic ſalt, but no iron.

DUMBLAIN, a town of Scotland, about five miles north of Stirling.

DUMBNESS, the privation of the faculty of ſpeech. The moſt general, or rather the ſole cauſe of dumbneſs, is the want of the ſenſe of hearing. The uſe of language is originally acquired by imitating articulate ſounds. From this ſource of intelligence, deaf people are intirely excluded: they cannot acquire articulate ſounds by the ear: unleſs, therefore, articulation be communicated to them by ſome other medium, theſe unhappy people muſt for ever be deprived of the uſe of language; and as language is the principal ſource of knowledge, whoever has the misfortune to want the ſenſe of hearing, muſt remain in a ſtate little ſuperior to that of the brute creation. Deafneſs has in all ages been conſidered as ſuch a total obſtruction to ſpeech, or written language, that an attempt to teach the deaf to ſpeak or read has been uniformly regarded as impracticable, till Dr Wallis and ſome others have of late ſhewn, that although deaf people cannot learn to ſpeak or read by the direction of the ear, there are other ſources of imitation, by which the ſame effect may be produced. The organs of hearing and of ſpeech have little or no connection. Perſons deprived of the former generally poſſeſs the latter in ſuch perfection, that nothing further is neceſſary, in order to make them articulate, than to teach them how to uſe theſe organs. This indeed is no eaſy taſk; but experience ſhews that it is practicable. Mr Thomas Braidwood, of Edinburgh, is perhaps the firſt who ever brought this ſurpriſing art to any degree of perfection. For theſe ſome years paſt, he has taught many people born beaf, to ſpeak diſtinctly, to read, to write, to underſtand figures, the principles of religion and morality, *&c.* This, at firſt ſight, may appear to be altogether incredible; but the fact is certain. Mr Braidwood has, at preſent, ten or a dozen of deaf pupils, ſome of them above twenty years of age, all making a rapid and amazing progreſs in thoſe uſeful branches of education.

Mr Braidwood's principal difficulty, after he had diſcovered this art, was to make people believe in the practicability of it. He advertiſed in the public papers; he exhibited his pupils to many noblemen and gentlemen; ſtill he found the generality of mankind unwilling to believe him. A remarkable inſtance of this incredulity occurred ſome years ago. A gentleman in England ſent a deaf girl of his to Mr Braidwood's care. A year or two afterwards, Mr Braidwood wrote to the father, that his daughter could ſpeak, read, and write diſtinctly. The father returned an anſwer, begging Mr Braidwood's excuſe, as he could not believe it; however, he deſired a friend of his, who was occaſionally going to Edinburgh, to call at Mr Braidwood, and inquire into the truth of what he had wrote him: he did ſo; converſed with Mr Braidwood, ſaw the young lady, heard her read, ſpeak, and anſwer any queſtions he put to her. On his return, he told the father the ſurpriſing progreſs his child had made; but ſtill the father thought the whole an impoſition: the girl herſelf wrote to her father, but he looked upon the letter as a forgery. About this time the father died, and the mother ſent an uncle and couſin of the deaf lady's from Shrewſbury, in order to be ſatisfied of the truth. When they arrived, Mr Braidwood told the girl her uncle and couſin were in the parlour, and deſired her to go and aſk them how they did, and how her mother and other friends did. The friends were aſtoniſhed, and could hardly credit their own ears and eyes.

We have converſed with Mr Braidwood, concerning the nature and method of teaching this wonderful art: he ſeems to be very deſirous of communicating and tranſmitting his diſcovery to poſterity: but ſays, and, from the nature of the thing, we believe it to be true, that he cannot communicate it ſo fully in writing as to enable any other perſon to teach it. The firſt thing in the method is, to teach the pupil to pronounce the ſimple ſounds of the vowels and conſonants. We have even ſeen him performing this operation; but are unable to give a clear idea of it. He pronounces the ſound of *a* ſlowly, pointing out the figure of the letter at the ſame time; makes his pupil obſerve the motion of his mouth and throat; he then puts his finger into the pupil's mouth, depreſſes or elevates the tongue, and makes him keep the parts in that poſition; then he lays hold of the outſide of the windpipe, and gives it ſome kind of ſqueeze, which it is impoſſible to deſcribe; all the while he is pronouncing *a*, the pupil is anxiouſly imitating him, but at firſt ſeems not to underſtand what he would have him to do. In this manner he proceeds, till the pupil has learned to pronounce the ſounds of the letters. He goes on in the ſame manner to join a vowel and a conſonant, till at length the pupil is enabled both to ſpeak and read.

It is altogether in vain for us to attempt to ſay any more concerning the mode of operation. Mr Braidwood undertakes every deaf perſon, who is not at the ſame time fooliſh or idiotical. The greateſt misfortune is, that this art is confined to a ſingle man, and that his pupils muſt live in the houſe with him for ſome years. The expence neceſſarily attending education of this kind, excludes all but people in opulent circumſtances from deriving any advantage from it. Mr Braidwood ſays, that the only way for preſerving the art, and communicating it to a number, is to take people in the way of apprentices: this he is unable to do at his own expence. What a pity, that ſuch a curious and uſeful art ſhould live and die with a ſingle man! There are many ſums mortified in this kingdom, both by government and private perſons, for leſs important purpoſes, than the preſervation and extenſion of the art of raiſing a great number of our fellow-creatures from the rank of brutes, to that of reaſonable beings, and uſeful members of ſociety.

DUMFERMLINE, a parliament-town of Scotland, ſituated in the county of Fife, fifteen miles north-weſt of Edinburgh: W. long. 30° 20′, and N. lat. 56° 15′. Here was formerly a magnificent abbey and palace of the kings of Scotland, in which the princeſs Elizabeth, daughter of king James VI. and mother of the princeſs Sophia, from whom the preſent royal family are deſcended, was born.

DUMFRIES, the capital of a county of the ſame name, in Scotland, lying northwards of the Solway frith: W. long. 3° 20′, and N. lat. 54° 45′.

DUNBAR, a parliament and port-town of Scotland, about twenty-five miles eaſt of Edinburgh.

DUNBARTON, the capital of a county of the ſame name in Scotland, called by ſome Lenox: it is a parliament-town, ſituated at the confluence of the rivers Clyde and Leven; ſixteen miles north-weſt of Glaſgow.

DUNCANNON, a town of the county of Wexford, in Ireland, ſix miles eaſt of Waterford.

DUNDALK, a port-town of Ireland, eighteen miles north of Drogheda.

DUNDEE, a large parliament-town of Angus, in Scotland, ſituated on the north ſide of the frith of Tay, fourteen miles north-weſt of St Andrews: W. lon. 2° 42′, and N. lat. 56° 32′.

DUNG, in huſbandry, is of ſeveral ſorts, as that of horſes, cows, ſheep, hogs, pigeons, geeſe, hens, *&c.* See AGRICULTURE.

DUNGANNON, a town of Ireland, eleven miles north of Armaugh.

DUNGING of lands. See AGRICULTURE.

DUNKELD, a town of Perthſhire in Scotland, formerly a biſhop's ſee, ſituated about twelve miles north of Perth.

DUNG-MEERS, in huſbandry, places where ſoils and dungs are mixed and digeſted together. For this purpoſe it is uſual to dig a pit ſufficient to hold the ſtock of ſoil the huſbandman is capable of making; and to prepare it at the bottom with ſtone and clay, that it may hold water, or the moiſture of the dung; and beſides, it ſhould be ſo ſituated that the ſinks and drips of the houſes and barns may run into it. Into this pit they caſt refuſe fodder, litter, dung, weeds, *&c.* where they lie and rot together, till the farmer have occaſion for it.

DUNKIRK, a port-town of the French Netherlands: E. lon. 2° 28′, and N. lat. 51°.

DUNNEGAL, the capital of a county of the ſame name in Ireland, ſituated on a bay, to which it likewiſe gives name: W. lon. 8° 22′, and N. lat. 54° 35′.

DUNNINGTON, a market-town of Lincolnſhire, about twenty-three miles ſouth-eaſt of Lincoln.

DUNS, a market-town of Scotland, twelve miles weſt of Berwick upon Tweed.

DUNSTABLE, a market-town, fifteen miles ſouth of Bedford, and thirty north-weſt of London.

DUNWICH, a borough of Suffolk, forty miles eaſt of Bury. It ſends two members to parliament.

DUO, in muſic, a ſong or compoſition to be performed in two parts only, one ſung, the other played on an inſtrument, or by two voices.

Duo is alſo when two voices ſing different parts, as accompanied with a third, which is a thorough baſe. It is ſeldom that uniſons and octaves are uſed in duos, except at the beginning and end.

DUODECIMA, in muſic, is the twelfth or the fifth doubled. See Fifth.

DUODENUM, in anatomy. See Vol. I. p. 259.

DUPLE, among mathematicians, denotes the ratio of 2 to 1. Thus the ratio of 8 to 4 is duple, or as 2 to 1.

Sub-Duple ratio is juſt the reverſe of the former, or as 1 to 2. Such is 4 to 8, or 6 to 12.

DUPLICATE, among lawyers, denotes a copy of any deed, writing, or account. It is alſo uſed for the ſecond letters patent, granted by the lord chancellor in a caſe wherein he had before done the ſame. Alſo a ſecond letter written and ſent to the ſame party and purpoſe as a former, for fear of the firſt's miſcarrying, is called a duplicate.

Duplicate proportion, or ratio. See Algebra and Arithmetic.

DUPLICATION, in general, ſignifies the doubling of any thing, or multiplying of it by 2: alſo the folding of any thing back again on itſelf.

DUPLICATURE, among anatomiſts, a term uſed to denote the folds of any membrane, or veſſel: thus we ſay, the duplicatures of the inteſtines, peritonæum, *&c.*

DUPONDUS, in antiquity, the weight of two pounds: alſo a piece of money equal to two aſes in value.

Dura mater, in anatomy. See Vol. I. p. 284.

DURANCE, a river of France, which falls into the Rhone, a little below Avignon.

DURANTA, in botany, a genus of the didynamia angioſpermia claſs. The calix is above the fruit, and divided into five ſegments; and the berry contains four ſeeds. There are two ſpecies, both natives of America.

DURATION, an idea which we get by attending to the fleeting and perpetually periſhing part of ſucceſſion; the idea of ſucceſſion being acquired by reflecting on that train of ideas which conſtantly follow one another in our minds, as long as we are awake. The ſimple modes of duration are any different lengths of it whereof we have diſtinct ideas, as hours, days, years, time, eternity, *&c.*

Duration, as marked by certain periods amd meaſures, is what we moſt properly call time. See Time.

Duration *of action*, according to Ariſtotle, is confined to a natural day in tragedy; but the epopea, according to the ſame critic, has no fixed time.

DURESSE, in law, is where a perſon is wrongfully impriſoned, or reſtrained of his liberty, contrary to law; or is threatened to be killed, wounded, or beaten, till he executes a bond, or other writing.

DURHAM, a city and county, in the north of England, ſituated on the river Were, fourteen miles ſouth of Newcaſtle: W. lon. 1° 12′, and N. lat. 54° 50′. It is the ſee of a biſhop, and ſends two members to parliament.

DUSSELDORP, a city of Germany, ſituated on the eaſtern ſhore of the Rhine, twenty miles north of Cologn: E. lon. 6° 20′, and N. lat. 51° 15′.

DUTCHY, in geography, an appellation given to the dominions of a duke.

Dutchy-court, a court of the dutchy-chamber of Lancaſter, held at Weſtminſter, before the chancellor of the ſame, for matters concerning the lands and franchiſes of that dutchy.

DUTY, in general, denotes any thing that one is obliged to perform.

Duty, in polity and commerce, ſignifies the impoſt laid on merchandizes, at importation or exportation, commonly called the duties of cuſtoms; alſo the taxes of exciſe, ſtamp-duties, *&c.* See Customs, Excise, *&c.*

The principles on which all duties and cuſtoms ſhould be laid on foreign merchandizes, which are imported into theſe kingdoms, are ſuch as tend to cement a mutual friendſhip and traffic between one nation and another; and therefore due care ſhould be taken in the laying of them, that they may anſwer ſo good an end, and be reciprocal in both countries: they ſhould be ſo laid as to make the exports of this nation at leaſt equal to our imports from thoſe nations wherewith we trade, ſo that a balance in money ſhould not be iſſued out of Great Britain, to pay for the goods and merchandizes of other countries; to the end that no greater number of our landholders and manufacturers ſhould be deprived of their revenues ariſing from the product of the lands, and the labour of the people, by foreign importations, than are maintained by exportations to ſuch countries. Theſe are the national principles on which all our treaties of commerce with other countries are to be grounded.

DUTY, in the military art, is the exerciſe of thoſe functions that belong to a ſoldier; with this diſtinction, that mounting guards and the like, where there is no enemy directly to be engaged, is called duty; but their marching to meet and fight an enemy is called going on ſervice.

DUUMVIRATE, the office or dignity of the duumviri. See the next article.

The duumvirate laſted till the year of Rome 388, when it was changed into a decemvirate.

DUUMVIRI, in Roman antiquity, a general appellation given to magiſtrates, commiſſioners, and officers, where two were joined together in the ſame functions.

Duumviri capitales were the judges in criminal cauſes: from their ſentence it was lawful to appeal to the people, who only had the power of condemning a citizen to death. Theſe judges were taken from the body of the decuriones; they had great power and authority, were members of the public council, and had two lictors to walk before them.

Duumviri municipales, were two magiſtrates in ſome cities of the empire, anſwering to what the conſuls were at Rome: they were choſen out of the body of the decuriones; their office laſted commonly five years, upon which account they were frequently termed *quinquinales magiſtratus*. Their juriſdiction was of great extent: they had officers walking before them, carrying a ſmall ſwitch in their hands; and ſome of them aſſumed the privilege of having lictors, carrying axes and the faſces, or bundles of rods, before them.

Duumviri navales were the commiſſaries of the fleet, firſt created at the requeſt of M. Decius, tribune of the people, in the time of the war with the Samnites. The duty of their office conſiſted in giving orders for the fitting of ſhips, and giving their commiſſions to the marine officers, *&c.*

Duumviri sacrorum were magiſtrates created by Tarquinius Superbus, for the performance of the ſacrifice, and keeping of the ſybils books. They were choſen from among the patricians, and held their office for life: they were exempted from ſerving in the wars, and from the offices impoſed on the other citizens, and without them the oracles of the ſybils could not be conſulted.

DUYVELAND, or **Diveland**, one of the iſlands of Zealand, in the United Provinces, lying eaſtward of Schonen, from which it is only ſeparated by a narrow channel.

DWAL, in heraldry, the herb nightſhade uſed by ſuch as blazon with flowers and herbs, inſtead of metals and colours, for ſable or black.

DWARF, in general, an appellation given to things greatly inferior in ſize to that which is uſual in their ſeveral kinds: thus there are dwarfs of the human ſpecies, dwarf-dogs, dwarf-trees, *&c.*

The Romans were ſo paſſionately fond of dwarfs, that they often uſed artificial methods to prevent the growth of boys deſigned for dwarfs, by incloſing them in boxes, or by the uſe of tight bandages. In Italy, even at preſent, they waſh young puppies every day with aſtringent liquors, in order to prevent their growth by hardening the parts.

DWINA, the name of two large rivers, one of which riſes in Lithuania, and, dividing Livonia from Courland, falls into the Baltic ſea a little below Riga: the other gives name to the province of Dwina, in Ruſſia, diſcharging itſelf into the White ſea, a little below Archangel.

DYE, in architecture, any ſquare body, as the trunk or notched part of a pedeſtal: or it is the middle of the pedeſtal, or that part included between the baſe and the corniche, ſo called becauſe it is often made in the form of a cube or dye. See **Architecture**.

DYER, a perſon who profeſſes the art of dyeing all manner of colours. See **Dyeing**.

Dyer's weed, in botany. See **Reseda**.

DYEING, the art of giving a laſting colour to ſilks, cloths, and other ſubſtances, whereby their beauty is much improved, and value enhanced.

This art depends chiefly on three things, *viz.* 1. Diſpoſing the ſurface of the ſtuffs to receive and retain the colours; which is performed by waſhing them in different lyes, digeſting, beating them, *&c.* in which human urine putrified, a ſharp ſalt of aſhes, divers ſoaps, and galls of animals, are of principal uſe; by means whereof the viſcous gluten of the ſilk-worms naturally adhering to their threads, is waſhed and cleanſed from them, and thus they become fitted gradually to imbibe the colours. By theſe alſo the greaſy foulneſs adhering to wool and flax is ſcoured off.

2. To grind the colours, as that they may enter the body duly prepared, and preſerve their brightneſs undiminiſhed.

3. The third conſiſts in having beautiful colours.

According to Sir W. Petty's account of what is done in particular trades by the art of dyeing, 1. There is a whitening of wax, and ſeveral ſorts of linen and cotton cloths, by the ſun, air, and reciprocal effuſions of water. 2. Colouring of wood and leather, by lime, ſalt and liquors, as in ſtoves, canes, and marble leathers. 3. Colouring of paper, *viz.* the marbled paper, by diſtempering the colours with ox-gall, and applying them upon a ſtiff gummed liquor. 4. Colouring, or rather diſcolouring, the colours of ſilks, tiffanies, *&c.* by brimſtone. 5. Colouring of ſeveral iron and copper-works into black with oil. 6. Colouring of leather into gold-colour, or rather ſilver-leaves into gold by varniſhes, and in other caſes by urine and ſulphur. 7. Dyeing of marble and alabaſter, with heat and coloured oils. 8. Colouring ſilver into the braſs-colour, with brimſtone or urine. 9. Colouring the barrels and locks of guns into blue and purple, with the temper of ſmall-coal heat. 10. Colouring of glaſs (made of ſands, flints, *&c.*) as alſo of cryſtals and earthen ware, with the ruſts and ſolutions of metals. 11. The colouring of live hair, as in Poland, horſe and man's hair: as alſo the colouring of furs. 12. Enameling and annealing. 13. Applying colours, as in the printing of books and pictures, and as in making of playing cards, being each of them performed in a different way. 14. Gilding and tinning with mercury, block-tin, ſal armoniac. 15. Colouring of metals, as copper with calamy, into braſs, and with zinc or ſpelter into a golden colour, or into a ſilver one with arſenic; and of iron into a reſemblance of copper with Hungarian vitriol. 16. Making painters colours by preparing of earth, chalk, and ſlates; as in umber, ochre, cullen-earth, *&c.* as alſo out of calces of lead, as ceruſe and minium; by ſublimates of mercury and brimſtone, as in vermilion; by tinging whole earths variouſly, as in verdeter, and ſome of the lakes; by concrete juices, or fæculæ, as in gambogium, indigo, pinks, ſap-green, and lakes; as alſo by ruſts, as in verdigreaſe, *&c.* 17. The applying theſe colours by the adheſion of ox-gall, as in the marbled paper aforeſaid; or by gum-water, as by limning; or by clammy drying oils, ſuch as the oils of lintſeed, nuts, *&c.* 18. The watering of tabbies. 19. The colouring of wool, linen, cotton, ſilk, hair, feathers, horn, leather, and the threads and webs of them with woods, roots, herbs, ſeeds, leaves, ſalts, limes, lixiviums, waters, heats, fermentations, macerations, and other great variety of management: an account of all which is a ſhort hiſtory of dyeing.

The materials uſed in the art of DYEING, are iron and ſteel, or what is produced from them in all true blacks, called Spaniſh blacks, though not in Flanders blacks, *viz.* they uſe copperas, ſteel-filings, and ſlippe; they alſo uſe pewter for Bow-dye ſcarlet, *viz.* they diſſolve bars of pewter in aquafortis; litharge is alſo uſed by ſome, though acknowledged by few to add weight to dyed ſilk. Antimony is much uſed to the ſame purpoſe. Arſenic is uſed in crimſon upon pretence of giving luſtre, although thoſe who pretend not to be wanting in giving luſtre to their ſilks diſown its uſe. Verdigreaſe is alſo uſed by linen-dyers in their yellow and greeniſh colours; though, of itſelf, it ſtrikes no deeper colour than that of a pale ſtraw. Of mineral ſalts uſed in dyeing, the chief is alum; the true uſe whereof ſeems to be in regard to the fixation of colours. The next mineral ſalt is ſaltpetre, not uſed by ancient dyers, and but by few of the modern: nor is it yet uſed but to brighten colours, by back-boiling of them, for which argol is more commonly uſed: lime is much uſed in working blue-vats.

Of the animal tribes are uſed cochineal, urine of labouring men kept till it be ſtale and ſtinking, honey, yolks of eggs, and ox-gall; the uſe of the urine is to ſcour, and help the fermenting and heating of woad; and is uſed alſo in blue-vats inſtead of lime: it diſchargeth the yellow, and therefore is uſed to ſpend weld withal.

Dyers uſe two ſorts of water, *viz.* river and well-water; the laſt, which is harſh, they uſe in reds and other colours wanting reſtringency, and in dyeing materials of the ſlacker contextures, as in callicoe, fuſtian, and the ſeveral ſpecies of cotton-works; but is not good for blues, and makes yellows and greens look ruſty. River-water is more fat and oily, and is therefore uſed in moſt caſes, and muſt be had in great quantities for waſhing and rinſing their cloths after dyeing. Water is called by dyers white liquor; but a mixture of one part bran, and five of river-water, boiled an hour and put into leaden ciſterns to ſettle, is what they call liquor abſolutely.

Gums have been uſed by dyers about ſilk, *viz.* gum arabic, tragacanth, maſtic, dragon's blood. Theſe tend little to the tincture, any more than gum in writing-ink, which only gives it a conſiſtence; ſo gum may give the ſilk a gloſſineſs; and, laſtly, to increaſe the weight.

The three peculiar ingredients for black are copperas, filings of ſteel, and ſlippe: the reſtringent binding materials are alder-bark, pomegranate-peels, walnut-rinds and roots, oakenſapling bark, and ſaw-duſt of the ſame, crab-tree bark, galls, and ſumac.

The ſalts are alum, ſalt-petre, ſal armoniac, pot-aſhes, and ſtone-lime; among which urine may be enumerated as a liquid ſalt.

The liquors are well and river water, urine, aquavitæ, vinegar, lemon juice, aquafortis, honey, and molaſſes.

Ingredients of another claſs are bran, wheaten-flour, yokes of eggs, leaven, cummin ſeed, fenugreek ſeed, agaric, and ſenna.

The ſmectics, or abſterſives, are fuller's earth, ſoap, linſeed-oil, and ox-gall.

The metals and minerals are pewter, verdigreaſe, antimony, litharge, and arſenic.

The colourings are of three ſorts, *viz.* blue, yellow, and red; of which logwood, old fuſtic, indigo, and madder, are the chief.

General obſervations upon DYEING.

1. All materials which of themſelves do give colour are either red, yellow, or blue; ſo that out of them, and the primitive fundamental colour white, all that great variety which we ſee in dyed ſtuffs doth ariſe.

2. That few of the colouring materials, as cochineal, ſoot, wood-wax, woad, *&c.* are in their outward and firſt appearance of the ſame colour, which by the ſlighteſt diſtempers and ſolutions in the weakeſt menſtrua, they dye upon cloth, ſilk, *&c.*

3. That many of them will not yield their colours without much grinding, ſteeping, boiling and fermenting, or corroſion by powerful menſtrua, as redwood, weld, woad, arnotto, *&c.*

4. That many of them will of themſelves give no colouring at all, as copperas or galls, or with much diſadvantage, unleſs the cloth or other ſtuff to be dyed be as it were firſt covered, or incruſtated with ſome other matter, though colourleſs aforehand, as madder, weld, brazil, with alum.

5. That ſome of them, by the help of other colourleſs ingredients, do ſtrike different colours from what they would of themſelves, as cochineal, brazil, *&c.*

6. That ſome colours, as madder, indigo, and woad, by reiterated tinctures, will at laſt become black.

7. That although green be the moſt frequent and the moſt common of natural colours, yet there is no ſimple ingredient now uſed alone to dye green with upon any material; ſap-green being the neareſt, which is uſed by country people.

8. There is no black thing in uſe which dyes black, though both the coal and ſoot of moſt things burnt or ſcorched be of that colour, and the blacker, by how much the matter before being burnt was whiter, as in ivory black.

9. The tincture of ſome dyeing ſtuffs will fade even with lying, or with the air, or will ſtain with water only, but very much with urine, vinegar, *&c.*

10. Some of the dyeing materials are uſed to bind and ſtrengthen a colour; ſome to brighten it; ſome to give luſtre to the ſtuff; ſome to diſcharge and take off the colour, either in whole or in part; and ſome out of fraud, to made the material dyed, if coſtly, heavier.

11. That ſome dyeing ingredients, or drugs, by the coarſeneſs of their bodies, make the thread of the dyed ſtuff ſeem coarſer; and ſome, by ſhrinking them, ſmaller; and ſome, by ſmoothing them, finer.

12. Many of the ſame colours are dyed upon ſeveral ſtuffs with ſeveral materials, as red-wood is uſed in cloth, not in ſilks; arnotto in ſilks, not in cloth, and may be dyed at ſeveral prices.

13. That ſcouring and waſhing of ſtuffs to be dyed, is done with ſpecial materials, as ſometimes with ox-galls, ſometimes with fullers-earth, and ſometimes ſoap; this latter being, in ſome caſes, pernicious, where pot-aſhes will ſtain, or alter the colour.

14. Where great quantities of ſtuffs are to be dyed together, or where they are to be done with any ſpeed, and where the pieces are very long, broad, thick, or otherwiſe, they are to be differently handled, both in reſpect to the veſſels and ingredients.

15. In ſome colours and ſtuffs the tingent liquor muſt be boiling, in other caſes blood-warm, and in ſome it may be cold.

16 Some tingent liquors are fitted for uſe by long keeping, and in ſome the virtues wear away by the keeping.

17. Some colours or ſtuffs are beſt dyed by reiterated dippings in the ſame liquor, ſome by continuing longer, and others a leſſer time therein.

18. In ſome caſes, the matter of the veſſel wherein the liquors are heated, and the tincture prepared, muſt be regarded, as the kettles muſt be pewter for Bow-dye.

19. There is little reckoning made how much liquor is uſed in proportion to the dyeing drugs, it being rather adjuſted to the bulk of the ſtuffs, as the veſſels are to their breadth; the quantity of dyeing drugs being proportioned both to the colour, higher or lower, and to the ſtuffs; as likewiſe the ſalts are to the dyeing drugs. Concerning the weight that colours give to ſilk, (in which it is moſt taken notice of, being ſold by weight, and a commodity of great price) it is obſerved, that one pound of raw ſilk loſeth four ounces by waſhing out the gums and the natural ſordes; that the ſame ſcoured ſilk may be raiſed to above thirty ounces from the remaining twelve, if it be dyed black with ſome materials.

Of a thing very uſeful in dyeing, eſpecially of black, nothing increaſes weight ſo much as galls, by which black ſilks are reſtored to as much weight as they loſt by waſhing out their gum: nor is it counted extraordinary that blacks ſhould gain about four or ſix ounces in the dyeing upon each pound. Next to the galls, old fuſtic increaſes the weight about 1½ in 12; madder, about one ounce; weld, half an ounce. The blue vats in deep blues of the fifth ſtall, give no conſiderable weight; neither doth logwood, cochineal, nor even copperas, where galls are not: ſlippe adds much to the weight, and giveth a deeper black than copperas itſelf, which is a good excuſe for the dyers that uſe it.

Dyeing *of wooll and woollen manufactures.*

For black in woollen manufactures, it is begun with a ſtrong decoction of woad and indigo, that communicate a deep blue; after which the ſtuffs being boiled with alum and tartar, or pot-aſh, are to be maddered with common madder, then dyed black with Aleppo galls, copperas, and ſumac, and finiſhed by back-boiling in weld. Woolls for tapeſtry are only to be woaded, and then put in black. For ſcarlet, wooll and woollen manufactures are dyed with kermes and cochineal, with which may alſo be uſed agaric and arſenic. Crimſon ſcarlet is dyed with cochineal, maſtic, aquafortis, ſal armoniac, ſublimate, and ſpirit of wine. Violet ſcarlet, purple, amaranth, and panſy-ſcarlets, are given wth woad, cochineal, indigo, braziletto, brazil, and orchal. Common reds are given with pure madder, without any other ingredient. Crimſon reds, carnations, flame and peach-colours, are given, according to their ſeveral hues, with cochineal, maſtic, without madder, or the like. Crimſon red is prepared with Roman alum, with cochineal. Orange aurora, brick-colour, and onion-peel colour, are dyed with woad and madder, mixed according to their ſeveral ſhades. For blues, the dark are dyed with a ſtrong tincture of woad; the brighter with the ſame liquor, as it weakens in working. Dark browns, minims, and tan colours, are given with woad, weaker in decoction than for black, with alum and pot-aſhes, after which they are maddered higher than black: for tan-colours, a little cochineal is added. Pearl-colours are given with galls and copperas; ſome are begun with walnut-tree roots, and finiſhed with the former; though to make them more uſeful, they generally dip them in a weak tincture of cochineal. Greens are begun with woad, and finiſhed with weld. Pale-yellows lemon-colour, and ſulphur colour, are given with weld alone. Olive colours of all degrees are firſt put in green, and taken down with ſoot, more or leſs, according to the ſhade that is required. Feulemort, hair-colour, muſk, and cinnamon colour, are dyed with weld and madder. Nacaret, or bright orange, is given with weld and goats-hair boiled with pot-aſhes.

Dyeing *of ſilks*, is begun by boiling them in ſoap, *&c.* then ſcouring and waſhing them in water, and ſteeping them in cold alum-water. For crimſon, they are ſcoured a ſecond time, before they are put into the cochineal vat. Red crimſon is given with pure cochineal, maſtic, adding galls, turmeric, arſenic, and tartar, all mixed in a copper of fair water, almoſt boiling: with theſe the ſilk is to be boiled an hour and a half, after which it is allowed to ſtand in the liquor till next day. Violet crimſon is given with pure cochineal, arſenic, tartar, and galls; but the galls in leſs proportion than in the former: when taken out, it is waſhed and put in a vat of indigo. Cinnamon crimſon is begun like the violet, but finiſhed by back-boiling; if too bright, with copperas; and if dark, with a dip of indigo. Light blues are given in a back of indigo. Sky-blues are begun with orchal, and finiſhed with indigo. For citron colours, the ſilk is firſt alumed, then welded with indigo. Pale yellows, after aluming, are dyed in weld alone. Pale and brown aurora's, after aluming, are welded ſtrongly, then taken down with rocou and diſſolved with pot-aſhes. Flame-colour is begun with rocou, then alumed, and afterwards dipped in a vat or two of brazil. Carnation and roſe colours are firſt alumed, then dipt in brazil. Cinnamon colour, after aluming, is dipt in brazil and braziletto. Lead colour is given with fuſtic, or with weld, braziletto, galls and copperas. Black ſilks of the coarſer ſort, are begun by ſcouring them with ſoap, as for other colours; after which they are waſhed out, wrung, and boiled an hour in old galls, where they are ſuffered to ſtand a day or two: then they are waſhed again with fair water, wrung, and put into another vat of new galls: afterwards waſhed again, and wrung, and finiſhed in a vat of black. Fine black ſilks are only put once into galls of the new and fine ſort, that has only boiled an hour: then the ſilks are waſhed, wrung out, and dipped thrice in black, and afterwards taken down by back-boiling with ſoap.

The dyeing of thread is begun by ſcouring it in a lye of good aſhes: afterwards it is wrung, rinſed out in river water, and wrung again. A bright blue is given with braziletto and indigo: bright green is firſt dyed blue, then back-boiled with braziletto and verdeter, and laſtly woaded. A dark green is given like the former, only darkening more before woading. Lemon and pale yellow is given with weld mixed with rocou. Orange iſabella, with fuſtic, weld, and rocou. Red, both bright and dark, with flame-colour, *&c.* are given with brazil, either alone, or with a mixture of rocou. Violet, dry-roſe, and amaranth, are given with brazil, taken down with indigo. Feulemort and olive colour are given with galls and copperas, taken down with weld, rocou, or fuſtic. Black is given with galls and copperas, taken down and finiſhed with braziletto wood.

DYNASTY, among ancient hiſtorians, ſignifies a race or ſucceſſion of kings of the ſame line or family: ſuch were the dynaſties of Egypt.

The Egyptians reckon thirty dynaſties within the ſpace of 36525 years; but the generality of chronologers look upon them as fabulous. And it is very certain, that theſe dynaſties are not continually ſucceſſive, but collateral.

DYSCRACY, among phyſicians denotes an ill habit or ſtate of the humours, as in the ſcurvy, jaundice, *&c.*

DYSENTERY, in medicine, a diarrhœa or flux, wherein the ſtools are mixed with blood, and the bowels miſerably tormented with gripes. See MEDICINE.

DYSERT, a parliament-town of Scotland, in the county of Fife, ſituated on the northern ſhore of the frith of Forth, about eleven miles north of Edinburgh.

DYSOREXY, among phyſicians, denotes a want of appetite, proceeding from a weakly ſtomach.

DYSPEPSY, a difficulty of digeſtion.

DYSPNOEA, a difficulty of breathing, uſually called aſthma.

DYSURY, in medicine, a difficulty of making urine, attended with a ſenſation of heat and pain. See MEDICINE.

DYTISCUS, WATER-BEETLE, in zoology, a genus of inſects of the order of the coleoptera; the antennæ of which are ſlender and ſetaceous, and the hind feet are hairy, and formed for ſwimming. There are twenty-three ſpecies, diſtinguiſhed by their antennæ, the colour of the elytra, *&c.*

DYVOUR's HABIT, in Scots law, a party-coloured habit which fradulent bankrupts, or bankrupts who have been dealers in illicite trades, are directed to wear, as a mark of ignominy, upon their being liberate from priſon on a ceſſio bonorum. See SCOTS LAW, title 32.

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EAGLE, in ornithology. See FALCO.

EAGLE, in heraldry, is accounted one of the moſt noble bearings in armoury, and, according to the learned in this ſcience, ought to be given to none but ſuch as greatly excel in the virtues of generoſity and courage, or for having done ſingular ſervices to their ſovereigns; in which caſes they may be allowed a whole eagle, or an eagle naiſſant, or only the head or other parts thereof, as may be moſt agreeable to their exploits.

EAGLE, in aſtronomy. Vol. I. p. 487.

EAGLE-OWL. See BUBO.

EAGLE-STONE. See ÆTITES.

Black EAGLE, an order of knighthood, inſtituted by the elector of Brandenburgh, in 1701, on his being crowned king of Pruſſia.

The knights of this order wear an orange-coloured ribband ſuſpending a black eagle.

White EAGLE, a like order in Poland, inſtituted in 1325, by Uladiſlaus V. on occaſion of the marriage of his ſon Caſimir to the daughter of the great duke of Lithuania.

The knights of this order wear a chain of gold, ſuſpending a ſilver eagle crowned.

EAGLET, a diminutive of eagle, properly ſignifying a young eagle. In heraldry, when there are ſeveral eagles on the ſame eſcutcheon, they are termed eaglets.

EAR, in anatomy. See Vol. I. p. 295.

Ear-wig, in zoology. See Forficula.

EARING, in the ſea language, is that part of the bolt-rope which at the four corners of the ſail is left open, in the ſhape of a ring. The two uppermoſt parts are put over the ends of the yard-arms, and ſo the ſail is made faſt to the yard; and into the lowermoſt earings, the ſheets and tacks are ſeized or bent at the clew.

EARL, a Britiſh title of nobility, next below a marquis, and above a viſcount. Earls were anciently called comites, becauſe they were wont *comitari regem*, to wait upon the king for council and advice. The Germans call them graves, as landgrave, margrave, palſgrave, rheingrave; the Saxons ealdormen, unleſs that title might be more properly applied to our dukes; the Danes, eolras; and the Engliſh, earls. The title, originally, died with the man. William the conqueror firſt made it hereditary, giving it in fee to his nobles, and allotting them for the ſupport of their ſtate the third penny out of the ſheriff's court, iſſuing out of all pleas of the ſhire whence they had their title. But now the matter is quite otherwiſe; for whereas heretofore *comes* and *comitatus* were correlatives, and there was no comes or earl but had a county or ſhire for his earldom, of later years the number of earls increaſing, and no more counties being left, divers have made choice of ſome eminent part of a county, as Lindſey, Holland, Cleveland, *&c.* ſome of a leſſer part, as Stafford, *&c.* others have choſen for their title ſome eminent town, as Marlborough, Exeter, Briſtol, *&c.* and ſome have taken for their title the name of a ſmall village; their own ſeat or park, as Godolphin, Clarendon, *&c.* An earl is created by cincture of ſword, mantle of ſtate put upon him by the king himſelf, a cap and a coronet put upon his head, and a charter in his hand. All the earls of England are denominated from ſome ſhire, town or place, except three; two of whom, *viz.* earl Rivers, and earl Paulet, take their denomination from illuſtrious families: the third is not only honorary, as all the reſt, but alſo officiary, as the earl-marſhal of England.

Earl-*marſhal of England*, is a great officer who had anciently ſeveral courts under his juriſdiction, as the court of chivalry, and the court of honour. Under him is alſo the herald's office or college of arms. He hath ſome pre-eminence in the court of Marſhalſea, where he may ſit in judgment againſt thoſe who offend within the verge of the king's court. This office is of great antiquity in England, and anciently of greater power than now; and has been for ſeveral ages hereditary in the moſt noble family of Howard.

EARNEST, in Scots law, a piece of money ſometimes given by a buyer, in evidence that the ſale or contract is compleated. See tit. 22.

EARTH, a foſſile, or terreſtrial matter, whereof our globe partly conſiſts. See Vol. I. p. 67.

Earth, in aſtronomy and geography, one of the primary planets, being this terraqueous globe whereon we inhabit. See Astronomy and Geography.

EARTHQUAKE, in natural hiſtory, a violent agitation or trembling of ſome conſiderable part of the earth generally attended with a terrible noiſe like thunder, and ſometimes with an eruption of fire, water, wind, *&c.* See Pneumatics.

Easel-pieces, a denomination given by painters to ſuch pieces as are contained in frames, in contradiſtinction from thoſe painted on cielings, *&c.*

EASEMENT, in law, a privilege or convenience which one neighbour has of another, whether by charter or preſcription, without profit: ſuch are a way through his lands, a ſink, or the like. Theſe, in many caſes, may be claimed.

EASING, in the ſea-language, ſignifies the ſlackening a rope, or the like: thus, to eaſe the bow-line or ſheet, is to let them go ſlacker; to eaſe the helm, is to let the ſhip go more large, more before the wind, or more larboard.

EASLOW, a borough of Cornwal, twenty-two miles ſouth of Launceſton, which ſends two members to parliament.

EAST, one of the four cardinal points of the world; being that point of the horizon, where the ſun is ſeen to riſe when in the equinoctial.

EASTER, a feſtival of the chriſtian church, obſerved in memory of our Saviour's reſurrection.

The Greeks call it *paſga*, the Latins *paſcha*, an Hebrew word ſignifying *paſſage*, applied to the Jewiſh feaſt of the paſſover. It is called eaſter in the Engliſh, from the goddeſs Eoſtre, worſhipped by the Saxons with peculiar ceremonies in the month of April.

The Aſiatic churches kept their eaſter upon the very ſame day the Jews obſerved their paſſover; and others, on the firſt Sunday after the firſt full moon in the new year. This controverſy was determined in the council of Nice, when it was ordained that eaſter ſhould be kept upon one and the ſame day, which ſhould always be a Sunday, in all chriſtian Churches in the world. For the method of finding eaſter by calculation, ſee Vol. I. p. 492.

EASTERN, an appellation given to whatever relates to the eaſt: thus we ſay, eaſtern amplitude, eaſtern church, *&c.*

EATON, a town of Buckinghamſhire, ſituated on the north ſide of the Thames, oppoſite to Windſor, and famous for its collegial ſchool, founded by king Henry VI. being a ſeminary for king's college Cambridge, the fellows of which are all from this ſchool.

EAVES, in architecture, the margin or edge of the roof of an houſe; being the loweſt tiles, ſlates, or the like, that hang over the walls, to throw off water to a diſtance from the wall.

EBBING *of the tides*. See Vol. I. p. 473.

EBDOMARIUS, in eccleſiaſtical writers, an officer formerly appointed weekly to ſuperintend the performance of divine ſervice in cathedrals, and preſcribe the duties of each perſon attending in the choir, as to reading, ſinging, praying, *&c.*

EBENUS, the Ebony-tree, in botany, a genus of the diadelphia decandria claſs. The calix has a number of ſmall hairy teeth, as long as the corolla; the corolla has hardly any wings; and the pod is hairy, and contains but one ſeed. There is but one ſpecies, a native of Crete.

EBIONITES, in church-hiſtory, heretics of the firſt century, ſo called from their leader Ebion.

They held the ſame errors with the Nazarenes, united the ceremony of the Moſaic inſtitution with the precepts of the goſpel, obſerved both the Jewiſh ſabbath and Chriſtian Sunday, and in celebrating the euchariſt made uſe of unleavened bread. They abſtained from the fleſh of animals, and even from milk. In relation to Jeſus Chriſt, ſome of them held, that he was born like other men, of Joſeph and Mary, and acquired ſanctification only by his good works. Others of them allowed, that he was born of a virgin, but denied that he was the Word of God, or had any exiſtence before his human generation. They ſaid, he was indeed the only true Prophet; but yet a mere man, who, by his virtue, had arrived at being called Chriſt, and the Son of God. They alſo ſuppoſed, that Chriſt and the devil were two principles, which God had oppoſed to each other. Of the New Teſtament they only received the goſpel of St Matthew, which they called the goſpel according to the Hebrews.

EBRO, anciently IBERUS, a large river of Spain, which taking its riſe in Old Caſtile, runs through Biſcay and Arragon, paſſes by Saragoſa, and, continuing its courſe through Catalonia, diſcharges itſelf with great rapidity into the Mediterranean, about twenty miles below the city of Tortoſa.

EBULLITION. See BOILING.

EBULUS, in botany. See SYMBUCUS.

ECBOLIUM, in botany. See ADHATODA.

ECCHYMOSIS, in ſurgery, an extravaſation of the blood from a vein in the arm betwixt the fleſh and ſkin.

ECCLESIASTES, a canonical book of the Old Teſtament, the deſign of which is to ſhew the vanity of all ſublunary things.

It was compoſed by Solomon, who enumerates the ſeveral objects on which men place their happineſs, and then ſhews the inſufficiency of all worldly enjoyments.

The Talmudiſts make king Hezekiah to be the author of it; Grotius aſcribes it to Zorobabel, and others to Iſaiah; but the generality of commentators believe this book to be the produce of Solomon's repentance, after having experienced all the follies and pleaſures of life.

ECCLESIASTICAL, an appellation given to whatever belongs to the church: thus we ſay, eccleſiaſtical polity, juriſdiction, hiſtory, &c.

ECCLESIASTICUS, an apocryphal book, generally bound up with the ſcriptures, ſo called, from its being read in the church, *eccleſia*, as a book of piety and inſtruction, but not of infallible authority.

The author of this book was a Jew, called Jeſus the ſon of Sirach. The Greeks call it the wiſdom of the ſon of Sirach.

ECCOPE, in ſurgery. See AMPUTATION.

ECCOPROTICS, in pharmacy. See CATHARTICS, and EVACUANTS.

ECHAPE, in the menage, a horſe begot between a ſtallion and a mare of different breeds and countries.

ECHAPER, in the menage, a galliciſm uſed in the academies, implying to give a horſe head, or to put on at full ſpeed.

ECHENEIS, in ichthyology, a genus belonging to the order of thoracici. The head is fat, naked, depreſſed, and marked with a number of tranſverſe ridges: it has ten rays in the branchioſtege membrane; and the body is naked. There are two ſpecies, *viz.* 1. the remora, with a forked tail, and eighteen ſtriæ on the head. It is found in the Indian ocean. 2. The peucrates, with an undivided tail, and twenty-four ſtriæ on the head. It is likewiſe a native of the Indian ocean.

ECHEVIN, in the French and Dutch polity, a magiſtrate elected by the inhabitants of a city or town, to take care of their common concerns, and the decoration and cleanlineſs of the city.

At Paris, there is a prevôt, and four echevins; in other towns, a mayor and echevins. At Amſterdam, there are nine echevins; and, at Rotterdam, ſeven.

In France, the echevins take cognizance of rents, taxes, and the navigation of rivers, &c. In Holland, they judge of civil and criminal cauſes; and if the criminal confeſſes himſelf guilty, they can ſee their ſentence executed without appeal.

ECHINATE, or ECHINATED, an appellation given to whatever is prickly, thereby reſembling the hedgehog.

ECHINITES, in natural hiſtory, the name by which authors call the foſſile centronia, frequently found in our chalk-pits. See CENTRONIA.

ECHINOPHORA, in botany, a genus of the pentandria digynia claſs. The fruit has ſunk peduncles. There are two ſpecies, one of which, *viz.* the ſpinoſa, or prickly ſamphire, is a native of Britain.

ECHINOPS, GLOVE-THISTLE, in botany, a genus of the ſyngeneſia polygamia ſegregata claſs. The proper calix is erect, imbricated, and contains but a ſingle flower. There are three ſpecies, none of them natives of Britain

ECHINUS, in zoology, a genus of inſects belonging to the order of vermes molluſca. The body is roundiſh, covered with a bony cruſt, and often beſet with moveable prickles; and the mouth is below, and conſiſts of five valves. There are ſeventeen ſpecies, all natives of the ſea.

ECHINUS, in architecture, a member or ornament near the bottom of the Ionic, Corinthian, and compoſite capitals.

ECHIUM, VIPER'S BUGLOSS, in botany, a genus of the pentandria monogynia claſs. The corolla is irregular, with a naked faux. There are ſeven ſpecies, three of which are natives of Britain, *viz.* the vulgare, or viper's bugloſs; the anglicum, or Engliſh viper's bugloſs; and the italicum, or wall-viper's bugloſs.

ECHO, a ſound reverberated or reflected to the ear from ſome ſolid body. See PNEUMATICS.

ECHO, in architecture, a term applied to certain kinds of vaults and arches, moſt commonly of elliptical and parabolical figures, uſed to redouble ſounds, and produce artificial echos.

ECHOMETER, among muſicians, a kind of ſcale or rule, with ſeveral lines thereon, ſerving to meaſure the duration and length of ſounds, and to find their intervals and ratios.

ECLECTICS, ancient philoſophers, who, without attaching themſelves to any particular ſect, ſelected whatever appeared to them the beſt and moſt rational, from each.

Potamon of Alexandria was the firſt of the eclectics: he lived in the reigns of Auguſtus and Tiberius; and being tired with the ſcepticiſm of the Pyrrhonians, he reſolved upon a ſcheme that would allow him to believe ſomething, but without being ſo implicit as to ſwallow any entire hypotheſis.

ECLECTOS. See LINCTUS.

ECLIPSE, in aſtronomy, the deprivation of the light of the ſun, or of ſome heavenly body, by the interpoſition of another heavenly body between our ſight and it. See Vol. I. p. 476.

ECLIPTIC, in aſtronomy, a great circle of the ſphere, ſuppoſed to be drawn through the middle of the zodiac, making an angle with the equinoctial of about 23° 30′, which is the ſun's greateſt declination; or, more ſtrictly ſpeaking, it is that path or way among the fixed ſtars, that the earth appears to deſcribe to an eye placed in the ſun. See ASTRONOMY, and GEOGRAPHY.

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ECHOMETER, among muſicians, a kind of ſcale or rule, with ſeveral lines thereon, ſerving to meaſure the duration and length of ſounds, and to find their intervals and ratios.

ECLECTICS, ancient philoſophers, who, without attaching themſelves to any particular ſect, ſelected whatever appeared to them the beſt and moſt rational, from each.

Potamon of Alexandria was the firſt of the eclectics: he lived in the reigns of Auguſtus and Tiberius; and being tired with the ſcepticiſm of the Pyrrhonians, he reſolved upon a ſcheme that would allow him to believe ſomething, but without being ſo implicit as to ſwallow any entire hypotheſis.

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EDULCORATION, in chemiſtry, the ſeparating, by a waſhing or ſolution in water, the ſalt that any body may be impregnated with, or thoſe that may be left adhering to a body after any operation. See CHEMISTRY.

EEL, in ichthyology, a ſpecies of muræna. See MURÆNA.

EEL-SPEAR, a forked inſtrument with three or four jagged teeth, uſed for catching of eels: that with the four teeth is beſt, which they ſtrike into the mud at the bottom of the river, and if it ſtrike againſt any eels it never fails to bring them up.

EFFARE', or EFFRAYE', in heraldry, a term applied to a beaſt rearing on its hind-legs, as if it were frighted or provoked.

EFFECT, in a general ſenſe, is that which reſults from, or is produced by, any cauſe. See CAUSE.

EFFECTS, in commerce, law, *&c.* the goods poſſeſſed by any perſon, whether moveable or immoveable.

EFFERDING, a town of Upper Auſtria, about ten miles weſt of Lintz.

EFFERVESCENCE, in a general ſenſe, ſignifies a ſlight degree of ebullition in liquors expoſed to a due degree of heat: but the chemiſts apply it to that inteſtine motion excited in various fluids, either by the mixture of fluids with others of a different nature; or by dropping ſalts or powders of various kinds into fluids. See POWDERS.

EFFIGY, the portrait, figure, or exact repreſentation of a perſon.

EFFLORESCENCE, among phyſicians, the ſame with exanthema. See EXANTHEMA.

EFFLUVIUM, in phyſiology, a term much uſed by philoſophers and phyſicians, to expreſs the minute particles which exhale from moſt, if not all, terreſtrial bodies in form of inſenſible vapours.

EFFUSION, in a general ſenſe, the pouring out of any thing liquid, and that with ſome violence.

EFT, in zoology, the Engliſh name of the common lizard. See LACERTUS.

EGERMOND, a market-town of Cumberland, ten miles ſouth of Cockermouth.

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When the vitellus grows warm with incubation, it becomes more humid, and like melting wax, or fat; whence it takes up more ſpace; for as the fœtus increaſes, the albumen inſenſibly waſtes away, and condenſes: the vitellus, on the contrary, ſeems to loſe little or nothing of its bulk when the fœtus is perfected, and only appears more liquid and humid when the abdomen of the fœtus begins to be formed.

The chick in the egg is firſt nouriſhed by the albumen; and when this is conſumed, by the vitellus, as with milk. If we compare the chalazæ to the extremities of an axis paſſing through the vitellus, which is of a ſpherical form, this ſphere will be compoſed of two unequal portions, its axis not paſſing through its centre; conſequently, ſince it is heavier than the white, its ſmaller portion muſt always be uppermoſt in all poſitions of the egg.

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As to the preſervation of eggs, it is obſerved that the egg is always quite full when it is firſt laid by the hen, but from that time it gradually becomes leſs and leſs ſo, to its decay; and however compact and cloſe its ſhell may appear, it is nevertheleſs perforated with a multitude of ſmall holes, though too minute for the diſcernment of our eyes, the effect of which is a daily decreaſe of matter within the egg, from the time of its being laid; and the perſpiration is much quicker in hot weather than in cold.

To preſerve the egg freſh, there needs no more than to preſerve it full, and ſtop its tranſpiration; the method of doing which is, by ſtopping up thoſe pores with matter which is not ſoluble in watery fluids; and on this principle it is, that all kinds of varniſh, prepared with ſpirit of wine, will preſerve eggs freſh for a long time, if they are carefully rubbed all over the ſhell: tallow, or mutton fat, is alſo good for this purpoſe, for ſuch as are rubbed over with this will keep as long as thoſe coated over with varniſh.

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EDULCORATION, in chemiſtry, the ſeparating, by a waſhing or ſolution in water, the ſalt that any body may be impregnated with, or thoſe that may be left adhering to a body after any operation. See CHEMISTRY.

EEL, in ichthyology, a ſpecies of muræna. See MURÆNA.

EEL-SPEAR, a forked inſtrument with three or four jagged teeth. uſed for catching of eels: that with the four teeth is beſt, which they ſtrike into the mud at the bottom of the river, and if it ſtrike againſt any eels it never fails to bring them up.

EFFARE', or EFFRAYE', in heraldry, a term applied to a beaſt rearing on its hind-legs, as if it were frighted or provoked.

EFFECT, in a general ſenſe, is that which reſults from, or is produced by, any cauſe. See CAUSE.

EFFECTS, in commerce, law, *&c.* the goods poſſeſſed by any perſon, whether moveable or immoveable.

EFFERDING, a town of Upper Auſtria, about ten miles weſt of Lintz.

EFFERVESCENCE, in a general ſenſe, ſignifies a ſlight degree of ebullition in liquors expoſed to a due degree of heat: but the chemiſts apply it to that inteſtine motion excited in various fluids, either by the mixture of fluids with others of a different nature; or by dropping ſalts or powders of various kinds into fluids. See POWDERS.

EFFIGY, the portrait, figure, or exact repreſentation of a perſon.

EFFLORESCENCE, among phyſicians, the ſame with exanthema. See EXANTHEMA.

EFFLUVIUM, in phyſiology, a term much uſed by philoſophers and phyſicians, to expreſs the minute particles which exhale from moſt, if not all, terreſtrial bodies in form of inſenſible vapours.

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ELBE, a large river in Germany, which, riſing on the confines of Sileſia, runs through Bohemia, Saxony, and Brandenburg; and afterwards dividing the dutchy of Lunenburg from that of Mecklenburg, as alſo the dutchy of Bremen from Holſtein, it falls into the German ocean, about ſeventy miles below Hamburgh.

It is navigable for great ſhips higher than any river in Europe.

ELBOW, in anatomy, the juncture of the cubitus and radius; or the outer angle made by the flexure or bend of the arm. See Anatomy.

ELCESAITES, in church-hiſtory, ancient heretics, who made their appearance in the reign of the emperor Trajan, and took their name from their leader Elceſai. The elceſaites kept a mean between the Jews, Chriſtians, and Pagans; they worſhipped but one God, obſerved the Jewiſh ſabbath, circumciſion, and the other ceremonies of the law. They rejected the pentateuch, and the prophets; nor had they more reſpect for the writings of the apoſtles, particularly thoſe of St. Paul.

ELDERS, or Seniors, in Jewiſh hiſtory, were perſons the moſt conſiderable for age, experience, and wiſdom. Of this ſort were the ſeventy men whom Moſes aſſociated to himſelf in the government of his people; ſuch, likewiſe, afterwards were thoſe who held the firſt rank in the ſynagogue, as preſidents.

In the firſt aſſemblies of the primitive Chriſtians, thoſe who held the firſt place were called elders. The word preſbyter, often uſed in the New Teſtament, is of the ſame ſignification: hence the firſt councils of Chriſtians were called preſbyteria, or councils of elders.

Elder is alſo a denomination ſtill preſerved in the preſbyterian diſcipline. See Presbyterian.

Elder, or **Alder**, in botany. See Alnus.

ELECAMPANE, in botany. See Inula.

ELECT, among eccleſiaſtical writers, thoſe whom God has choſen, or predeſtinated to be ſaved.

ELECTION, the choice that is made of a perſon, or thing, in preference of any other; as in the election of an emperor, of a pope, of a biſhop, of members of parliament, *&c.*

Election, in theology, ſignifies the choice which God makes of angels and men for the objects of his grace and mercy. See Grace, and Predestination.

ELECTOR, a perſon who has a right to elect or chuſe another to an office, honour, *&c.*

Elector is particularly, and by way of eminence, applied to thoſe princes of Germany in whom lies the right of electing the emperor: being all ſovereign princes, and the principal members of the empire.

The electoral college, conſiſting of all the electors of the empire, is the moſt illuſtrious and auguſt body in Europe. Bellarmine and Baronius atribute the inſtitution of it to pope Gregory V. and the emperor Otho III. in the tenth century; of which opinion are the generality of hiſtorians, and particularly the canoniſts: however, the number of electors was unſettled, at leaſt, till the thirteenth century. In 1356 Charles IV. by the golden bull, fixed the number of electors to ſeven; three eccleſiaſtics, *viz.* the archbiſhops of Mentz, Treves, and Cologne; and four ſeculars, *viz.* the king of Bohemia, count Palatine of the Rhine, duke of Saxony, and marquis of Brandenburg. In 1648 this order was changed, the duke of Bavaria being put in the place of the count Palatine, who having accepted the crown of Bohemia was outlawed by the emperor; but being at length reſtored, an eighth electorate was erected for the duke of Bavaria. In 1692, a ninth electorate was created, by the emperor Leopold, in favour of the duke of Hanover, of the houſe of Brunſwic Lunenburg.

There is this difference between the ſecular and eccleſiaſtic electors, that the firſt have an active and paſſive voice, that is, may chuſe and be choſen; the laſt, an active only. The three archbiſhops are to be thirty years old, before they can be advanced to the dignity; the ſeculars, eighteen, before they can perform the office themſelves. Theſe laſt have each their vicars, who officiate in their abſence.

Beſides the power of chuſing an emperor, the electors have alſo that of capitulating with, and depoſing him; ſo that, if there be one ſuffrage wanting, a proteſt may be entered againſt the proceedings. By the right of capitulation, they attribute to themſelves great privileges, as making of war, coining, and taking care of the public intereſt and ſecurity of the ſtates; and the emperor promiſes, upon oath, to receive the empire upon theſe conditions.

The electors have precedence of all other princes of the empire, even of cardinals and kings; and are addreſſed under the title of electoral highneſs.

Their ſeveral functions are as follow: the elector of Mentz is chancellor of Germany, convokes the ſtates, and gives his vote before any of the reſt. The elector of Cologne is grand chancellor of Italy, and conſecrates the emperor. The elector of Treves is chancellor of the Gauls, and confers impoſition of hands upon the emperor. The count Palatine of the Rhine is great treaſurer of the empire, and preſents the emperor with a globe at his coronation. The elector of Bavaria is great maſter of the imperial palace, and carries the golden apple. The marquis of Brandenburg is grand chamberlain, and puts the ring on the emperor's finger. The elector of Saxony is grand marſhal, and gives the ſword to the emperor. The king of Bohemia is grand butler, and puts Charlemaign's crown on the emperor's head. Laſtly, the elector of Hanover, now king of Great Britain, is arch-treaſurer, though firſt erected under the title of ſtandard-bearer of the empire.

ELECTORATE, a term uſed as well to ſignify the dignity of, as the territories belonging to, any of the electors of Germany; ſuch are Bavaria, Saxony, *&c.*

ELEC-

ELECTRICITY.

THE word ELECTRICITY ſignifies, in general, the effects of a very ſubtile fluid matter, different in its properties from every other fluid we are acquainted with. This fluid is capable of uniting with almoſt every body, but unites more readily with ſome particular bodies than with others: its motion is amazingly quick, is regulated by peculiar laws, and produces a vaſt variety of ſingular phenomena, the principal of which ſhall be enumerated in this article.

As we are entirely ignorant of the nature of the electrical fluid, it is impoſſible to define it but by its principal properties: that of repelling and attracting light bodies, is one of the moſt remarkable. The ancients were only acquainted with this property in amber. William Gilbert, a native of Colcheſter, and phyſician at London, in his treatiſe *De Magnete*, in the year 1600, was the firſt perſon who diſcovered, that ſulphur, wax, reſinous ſubſtances, glaſs, and precious ſtones, when dried and rubbed a little, were endowed with the ſame property of attracting and repelling ſtraws and other light ſubſtances. Sir Francis Bacon, in his phyſiological remains, gives a catalogue of electrical bodies; but it differs in nothing worth mentioning from that of Gilbert. Mr Boyle, about the year 1670, made ſome addition to the catalogue of electric ſubſtances; but all his experiments on this ſubject relate only to a few circumſtances attending the ſimple property of electric attraction: he had never ſeen the electric light, and little imagined what aſtoniſhing effects would be afterwards produced by this wonderful power.

Cotemporary with Mr Boyle was Otto Guericke, burgomaſter of Magdeburg, and inventor of the air-pump, who was likewiſe one of the firſt improvers of electricity. He made his experiments with a globe of ſulphur, which he mounted on an axis, and whirled it in a wooden frame, rubbing it at the ſame time with his hand. He firſt diſcovered, that a body once attracted by an excited electric was repelled by it, and not attracted again till it had been touched by ſome other body: that bodies immerged in electric atmoſpheres are themſelves electrified: that threads ſuſpended within a ſmall diſtance of his excited globe, were often repelled by his finger brought near them: that a feather, repelled by the globe, always turned the ſame face towards it, like the moon with reſpect to the earth; and that the excitation of his globe produced both light and ſound, though in a very inconſiderable degree. A much finer electric light was afterwards obſerved by Dr Wall, and an account of it was publiſhed in the Philoſophical Tranſactions: Dr Wall likewiſe compares the light and the crackling of his excited amber to thunder and lightening.

Sir Iſaac Newton, in 1675, was the firſt who diſcovered that excited glaſs attracted light bodies on the ſide oppoſite to that on which it was rubbed.

After Gilbert, Boyle, and Otto Guericke, Mr Hawkſbee, in his Phyſico-mechanical Experiments, publiſhed in the year 1709, diſtinguiſhed himſelf by his experiments and diſcoveries in electricity. He firſt diſcovered the electric power of glaſs, the light proceeding from it, and the noiſe occaſioned by it, together with a variety of phænomena relating to electric attraction and repulſion: Indeed little was added to his obſervations, till the diſcovery of a plus and minus electricity by Dr Watſon and Dr Franklin about the year 1746, and the farther illuſtration of that doctrine by Mr Canton.

From the year 1730 to the 1746, the writers on electricity are ſo numerous, and their experiments ſo many and various, that a volume would be inſufficient for their hiſtory. We ſhall therefore endeavour, in the *firſt* place, To give a ſhort and connected view of the nature and principles of electricity, ſo far as they have hitherto been unfolded, without mentioning the perſons to whom we are indebted for any particular diſcovery: And, in the *ſecond* place, Give a deſcription of electrical machines; with a ſelection of a few of the moſt curious and uſeful experiments, which the reader may eaſily underſtand after having made himſelf acquainted with the general principles.

IT has been aſſerted, that all bodies, provided they be heated to a certain degree, and rubbed for a long time, will diſcover themſelves to be poſſeſſed of the property of attracting and repelling light ſubſtances. However, metals of all kinds, although ever ſo much heated, or rubbed, or poliſhed, never diſcover the leaſt ſigns of electrical attraction; and conſequently are excepted from the general rule, as well as water and other fluids, which cannot be ſubjected to the neceſſary treatment. Although moſt bodies, by being heated and rubbed, diſcover more or leſs of electrical attraction; yet, as ſome of them poſſeſs this property in a more eminent degree, and with leſs labour, this circumſtance has ſuggeſted a diviſion of bodies into two claſſes, according as they are more or leſs ſuſceptible of electricity.

The firſt claſs comprehends thoſe bodies which receive and collect the electrical matter moſt eaſily, and in greateſt quantity, after being a little rubbed and heated: theſe bodies are called *electrics*, or *non-conductors*; ſuch as,

1. Diamonds of all kinds; the ruby, the ſapphire, the emerald, the opal, the amethyſt, the topaz, the beryl, the granat, rock cryſtal, *&c.*
2. Glaſs, and all vitrified bodies, enamels of all colours, porcelain, glaſs of antimony, of lead, *&c.*
3. Balſams, reſins of all kinds, wax, *&c.*
4. Bituminous bodies, ſulphur, amber, aſphaltum, *&c.*
5. Certain animal productions; as ſilk, feathers, wool, hairs, and briſtles, *&c.*

The ſecond claſs comprehends thoſe bodies which either do not at all collect the electrical matter by friction, or in a very inconſiderable degree: ſuch bodies are called *non-electrics*, or *conductors*, viz.

1. Water, and all aqueous and ſpirituous liquors, which are incapable of being thickened, and ſubjected to friction.
2. All metals, perfect and imperfect, and the greateſt part of minerals; as, the load-ſtone, antimony, zinc, biſmuth, the agat, the jaſper, marble, free-ſtone, ſlate, &c.
3. All living creatures, excepting their hair. To which may be added moſt animal-ſuſtances; as leather, parchment, bone, ivory, horn, ſhells, &c.
4. Trees and plants of all kinds; thread, ropes, linen-cloth, paper, &c.

Theſe two claſſes of bodies have been called by the name of *electrics* and *non-electrics*: but as the electrical matter is not contained in the electrical bodies themſelves, but collected by them from the earth; and as non-electric allow the electrical matter to penetrate and flow through them, or to ſpread equally on their ſurfaces, the terms *conductor* and *non conductor* are more proper. Metals and water are the only perfect conductors; other bodies conducting only as they contain a mixture of theſe, without more or leſs of which they will not conduct at all.

Although conductors cannot be electrified by heat or friction, they may be charged with electricity, or made non-conductors, by an eaſy operation; but then they retain this property no longer than they are kept from communicating with other conductots. A bar of iron will become an electric or non-conductor, by being ſuſpended by a ſilk cord, or laid upon a piece of roſin or other non-conductor, and at the ſame time having one end of it in contact with a well-rubbed glaſs tube, or globe. In the ſame manner, water and metals of all kinds may be charged with electricity.

It is abſolutely neceſſary, in exciting electricity by friction, that the glaſs, or other body, be perfectly dry; the leaſt moiſture deſtroys, or at leaſt diminiſhes the effect. A moiſt atmoſphere, a burning candle, &c. are extremely unfavourable in making electrical experiments.

Hollow glaſs globes, of about a foot diameter, and the 16th part of an inch thick, are now uſed in place of tubes, becauſe it leſſens the labour of friction, and accumulates a greater quantity of electrical matter. This globe is turned rapidly by a large wheel like thoſe uſed by the cutlers. When the globe is rubbed, it ſoon acquires a conſiderable degree of electrical virtue, which is diſcovered by light bodies, at the diſtance of two or three feet, flying towards it. In approaching the globe with the hand or face, you will likewiſe feel the electric matter ſurrounding it like a gentle breeze of wind. Theſe ſubtile emanations continue to be diffuſed round the globe as long as the friction is continued; and, when the friction is ſtopped, they gradually diminiſh, till they are no longer perceptible. The application of non-conductors to the globe does not diminiſh the electrical matter: on the contrary, the application of conductors almoſt inſtantly annihilates the whole quantity previouſly collected by the friction. But this effect is not produced, unleſs when the conductor at the ſame time has a communication with the floor or earth where the machine ſtands. For, as above obſerved, if the conductor has no communication with the earth, it charges with electricity, and becomes a non-conductor. But non-conductors, as a piece of glaſs, ſulphur, or wax, though they do not diminiſh the virtue of the globe, yet they do not acquire, like iron, &c. the property of attraction or repulſion. Hence it appears, that the electrical matter paſſes freely along conductors, and diſſipates in the earth; but, on the contrary, that non-conductors do not receive any matter from the globe, and are incapable of tranſmitting it. The following experiments will make this more plain.

1. If a piece of iron be placed on a glaſs ſtandard, and unconnected with any other body, as ſoon as the electrical matter is communicated to it, it attracts and repels pieces of gold leaf or other light bodies, and preſerves this virtue even for ſome minutes after its communication with the globe is cut off. But, if a piece of glaſs, roſin, or any other non-conductor, be placed in the ſame circumſtances, they do not diſcover any ſuch effect.
2. If a perſon touches the piece of iron above mentioned with his hand, no friction is capable of making it attract or repel, or exhibit any marks of electricity. The ſame thing happens, if a chain of any metal touch the iron, and at the ſame time has a communication with the ground. In both theſe caſes, the electrical matter paſſes along the iron, and diſſipates in the earth.
3. In place of touching the piece of iron with the finger, if a piece of amber, wax, or any other non-conductor be applied to it, the communication with the earth being interrupted by the non-conductor, the iron, in that caſe, retains the electrical matter as before.

From theſe experiments we learn, that metals and other conductors receive the electrical matter, and tranſmit it to other conductors till it diffuſes and is loſt in the earth; but that, if wax, glaſs, or any other non-conductor, be applied to the conductor, the motions of the matter is inſtantly ſtopt, and accumulates and charges the conductor, at the ſame time that the non-conductor itſelf is not all affected. It is for this reaſon that conductors, as ſilk-cords, hair-ropes, &c. are always employed to ſuſpend or ſupport ſuch bodies as we want to charge with electricity.

The following experiments will throw further light on this ſubject.

I. If a man ſtands upon a piece of roſin about five inches in diameter, and ſeven or eight inches thick, touching ſoftly the globe, while the operator is rubbing it, his whole body, in a few ſeconds, will be charged with electrical matter; and the following phænomena will take place.

1. His looſe hand, and indeed every part of his body, will mutually attract and repel light bodies at the diſtance of three or four feet.
2. All conductors which he takes in his hand, will become electrified in the ſame manner with himſelf, provided they touch nothing elſe, or be ſupported upon non-conductors: and this communication to other conductors,

let their number and extenſion be ever ſo great, inſtead of diminiſhing the electrical virtue in the body of the man, will rather augment its ſtrength and quantity.

3. If this perſon gives his hand to another likewiſe ſtanding on a ſimilar piece of roſin, he too will be charged with electrical matter; and the ſame thing will happen to any number of perſons, provided they ſtand upon roſin, and communicate with one another by an iron chain or other conductor. But the whole company will inſtantaneouſly loſe the whole of their electrical virtue, if any non-electrified perſon touch a ſingle man, or if there be any communication between one of them and a conducting ſubſtance.

4. If the firſt man removes his hand from the globe, and at the ſame time keep his former ſtation, he and all the reſt will preſerve the power of attracting and repelling light ſubſtances for ſome time; but it gradually diminiſhes, till its effects totally diſappear.

5. If a non-electrified perſon puts his hand near the firſt man's face, he will feel a kind of atmoſphere ſurrounding the electrified perſon; if he advances his hand ſtill nearer any part of the face, for example the noſe, both the point of the finger and the noſe will appear luminous in the dark: Laſtly, if he touches the noſe, a ſpark of fire inſtantly explodes with a crack, and ſtrikes both parties equally with a ſhock more or leſs painful in proportion as the electrified perſon was charged. It is by the exploſion of this ſpark, that the electrical matter inſtantly tranſmits itſelf from one body to another.

6. When we approach near an electrified perſon, we perceive an extraordinary ſmell proceeding from his body, ſimilar to that of the phoſphorus of urine.

II. An iron wire, 12,000 feet in length, was ſuſpended about five feet from the ground by ſilk cords; one end of it was connected to the globe of an electrical machine, and at the other a lead ball was hung in order to perceive when the matter reached it.

1. After five or ſix turns of the wheel, the matter had paſſed along the whole wire, and communicated its virtue to the ball, which inſtantly attracted and repelled light bodies.

2. As this ball was equally electrified with every part of the wire, it is probable that the electric matter would inſtantly pervade a wire of a ſtill greater length, provided we had a proper apparatus for the purpoſe.

3. Several metals and other conductors were ſubſtituted in place of the ball, and all received the electricity in the ſame manner.

4. The ball and other non-conductors, when touched with the finger, gave a luminous ſpark and as ſmart a ſhock, as when the end of the wire next the globe was touched.

5. All theſe effects inſtantly ceaſed whenever any perſon not electrified touched any part of the wire, and commenced again a few ſeconds after his hand was withdrawn.

6. The ſame effects are produced, though with more difficulty, when hair or woolen ropes were ſubſtituted in place of the ſilk ones: But they were entirely ſtopt by hemp-ropes, or when the ſilk ones were wetted.

7. When a hempen rope was ſubſtituted in place of the wire, the ball at the end of it was electrified with greater difficulty than when it hung at the wire, eſpecially when the rope was dry; but when the rope was wet, the matter paſſed with more eaſe.

8. When, in place of the wire, a dry ſilk cord, or long glaſs tube, were uſed, they received but a very ſmall quantity of the matter, which was not perceivable in the glaſs tube above 12 feet, nor in the cord above 25, beyond the globe.

9. When the wire was cut in ſeveral places, and the cut ends kept at the diſtance of ſomewhat leſs than a foot from each, the electrical matter darted through all theſe interruptions, and appeared in the ball at the furtheſt end. A ſtrong blaſt made by a bellows acroſs one of the interruptions, did not obſtruct the paſſage of the matter; neither did the interpoſition of a piece of glaſs, wax, and other non-conductors: but all conductors, as the hand of a man, the point of a ſword, and even a moiſt vapour, obſtructed its courſe towards the ball.

10. When a man ſtood on a piece of roſin, and put a point of a ſword in one of the interruptions, he was inſtantly filled with the matter, although neither he nor the ſword touched the wire: neither was the courſe of the matter towards the ball obſtructed by the interpoſition of the ſword.

11. When a ring of braſs wire, about three feet in diameter, was ſuſpended in a vertical direction, and the iron wire was made to paſs nearly through its centre, without touching any part of the circumference, the ring, in whatever part of the wire it was tried, was ſenſibly electrified. This ſhows that the electrical matter expands to a conſiderable diſtance on all ſides of the electrified body.

12. The ſame iron wire ſuſpended by ſilk cords was extended 6000 feet, (juſt one half of its length), in a ſtraight line; the other half was turned back in a parallel direction towards the globe, leaving about nine or ten inches of interval between the two halves of the wire: Each extremity of the wire was ſupported by a dry ſilk cord about ſeven or eight feet from the globe, and the lead ball was hung at one of them. An iron chain was then fixed with another ſilk cord above the globe, in order to receive the matter at one of its extremities; the other end of the chain was fixed to a rod of glaſs about five feet long, in ſuch a manner that the matter received from the globe might be tranſmitted at pleaſure to the wire, by applying the end of the fixed chain to the glaſs rod. Matters being thus prepared, after five or ſix turns of the wheel, the chain was applied to one end of the wire; at the ſame inſtant the ball at the other end attracted and repelled bits of gold-leaf. The ſame experiment was repeated, and a finger applied to the ball, and a ſpark iſſued out, and a ſhock was received at the very inſtant that the chain was applied to the other end of the wire: A ſpark likewiſe proceeded from the chain, which afforded an eaſy opportunity of diſcovering that the two ſparks were perfectly ſynchronous.

From theſe experiments it appears,

1. That the electrical matter communicates itſelf to all non-electrics, or conductors, whatever be their bulk or extenſion.

2. That the quantity of this matter diffuſed is always in proportion to the magnitude and extenſion of the bodies into which it paſſes; and that it is uniformly diffuſed, no part of the body retaining more than any other part.

3. That, after being thus communicated to any body, it eſcapes with equal facility, as ſoon as it finds a communication with the earth.

4. That ſmall interruptions in the continuity of electrified bodies do not interrupt the motion of the electrical matter.

5. That the motion of the electrical matter is ſo amazingly ſwift, that it runs over a ſpace of 12,000 feet in an undefinable inſtant of time.

6. That it moves with equal rapidity either backward or forward, upon the application of a conductor.

7. Laſtly, That an indefinitely large quantity of this matter may be accumulated by applying the globe or tube to conducting bodies of very large dimenſions. Of late other methods of condenſing a large quantity of electrical matter into a ſmall ſpace have been invented, as will afterwards appear when we come to treat of the Leyden phial.

The attraction and repulſion of light bodies, is the firſt thing that diſcovers to us the preſence of the electrical matter. This motion is always reciprocal: If the electrified body be lighter than the conductor, and both are at liberty, the motion of the former is quicker than that of the latter; if the one be fixed, and the other at liberty, the unfixed one conſtantly goes to the one that is fixed, and, at the ſame, takes the ſhorteſt road. The following experiments will illuſtrate theſe motions.

1. Preſent an electrified tube to ſmall pieces of gold-leaf placed on a well-poliſhed plate of copper, they will inſtantly fly towards the tube.

2. Suſpend an electrified tube by two ſilk cords; take a piece of gold-leaf, and, holding it firm betwixt your fingers, bring it near the tube; and the tube will be attracted and move toward the leaf.

3. If an electrified perſon, ſtanding on a piece of roſin, holds in his hand a plate of copper, upon which pieces of gold-leaf are placed; and another perſon, who is not electrified, holds his finger above the plate; the gold-leaf will inſtantly riſe from the plate, and fly towards his finger.

4. Laſtly, If two balls of gilt paper be ſuſpended ſix inches aſunder, the one by a ſilk thread three feet in length, and the other by a ſmall ſilver wire of the ſame length; when the ball ſuſpended by the ſilk thread is electrified by the tube, both balls advance with equal quickneſs towards one another, though only one of them was electrified.

The moſt favourable circumſtances for exhibiting the attraction of light bodies are the following:

1. They ſhould be perfect conductors.
2. They ought to be of a ſmall ſize.
3. They ſhould be ſupported by a non-conductor, and raiſed four or five feet from the ground.
4. No other non-conductor ſhould be nearer the bodies than the tube with which the experiments are making; otherwiſe the attraction will be diſturbed.

Repulſion generally ſucceeds attraction; that is, a piece of gold-leaf is no ſooner attracted by the tube than it is repelled and driven off from it. This repulſion is not very perceptible when the tube is ſlightly electrified; but, when the electricity is briſk, the gold-leaf never fails to be repelled as ſoon as it has touched the tube. Again, if the electricity be very ſtrong, the gold-leaf, though ſtrongly attracted by the tube, never touches it; the repulſive power beginning to operate two or three inches before the leaf reaches the tube: from that inſtant the leaf is electrified; and, when it begins to be repelled, it has acquired as denſe an electrical atmoſphere as the tube: it then flies off, and remains ſuſpended above the tube until it loſes the electric virtue it had acquired, either by the moiſt vapours in the air, or till it loſes it ſuddenly by touching ſome conductor. Hence it appears, that attraction precedes repulſion, only becauſe it is neceſſary that the pieces of gold-leaf ſhould acquire as denſe an atmoſphere as that of the globe before they can be repelled by it.

When the tube has repelled a piece of gold-leaf, if another tube, nearly equally electrified, be ſuddenly ſubſtituted in place of the former tube, the leaf will continue to be repelled at an equal diſtance. But if the ſubſtituted tube be much leſs electrified than the original one, the leaf will be attracted by that tube.

When two or more pieces of gold-leaf are preſented at the ſame time to a well electrified tube, they are all equally attracted and repelled; but then they mutually repel one another, ſo that it is impoſſible to make any two of them join; and the diſtance at which they repel one another is equal to the diſtance to which each of them were repelled from the tube.

If a circular piece of gold-leaf, cut into ſmall fringes to near the centre of the leaf, be preſented to an electrified tube, it will firſt be attracted, and then repelled: in the time of repulſion, all the fringes repel each other, and diverge more or leſs in proportion to the ſtrength of electricity in the tube.

If a ſmall metal veſſel filled with water, and furniſhed with a capillary ſiphon, having the longer leg hanging over the outſide of the veſſel, be touched with an electrified iron rod; the water, which could not run out of the ſiphon but drop by drop, will inſtantly fly out a tone jet, and divide itſelf into very fine threads; and theſe threads continue ſometimes ſuſpended in the air, repelled from each other to a conſiderable diſtance.

From theſe inſtances of attraction and repulſion it appears,

1. That light bodies are attracted by electrified ſubſtances until they be equally electrified by communication, and until they acquire as denſe an atmoſphere as the electrified ſubſtances themſelves.
2. That, from the moment they acquire this atmoſphere, attraction ceaſes and repulſion begins.
3. That no repulſion takes place but betwixt bodies electrified.
4. That repulſion continues only as long as the denſity of the two atmoſpheres are equal; that it ceaſes whenever the one or the other is diminiſhed; that a new attraction

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Plate. LXX

Fig. 1. ELECTRICAL APPARATUS

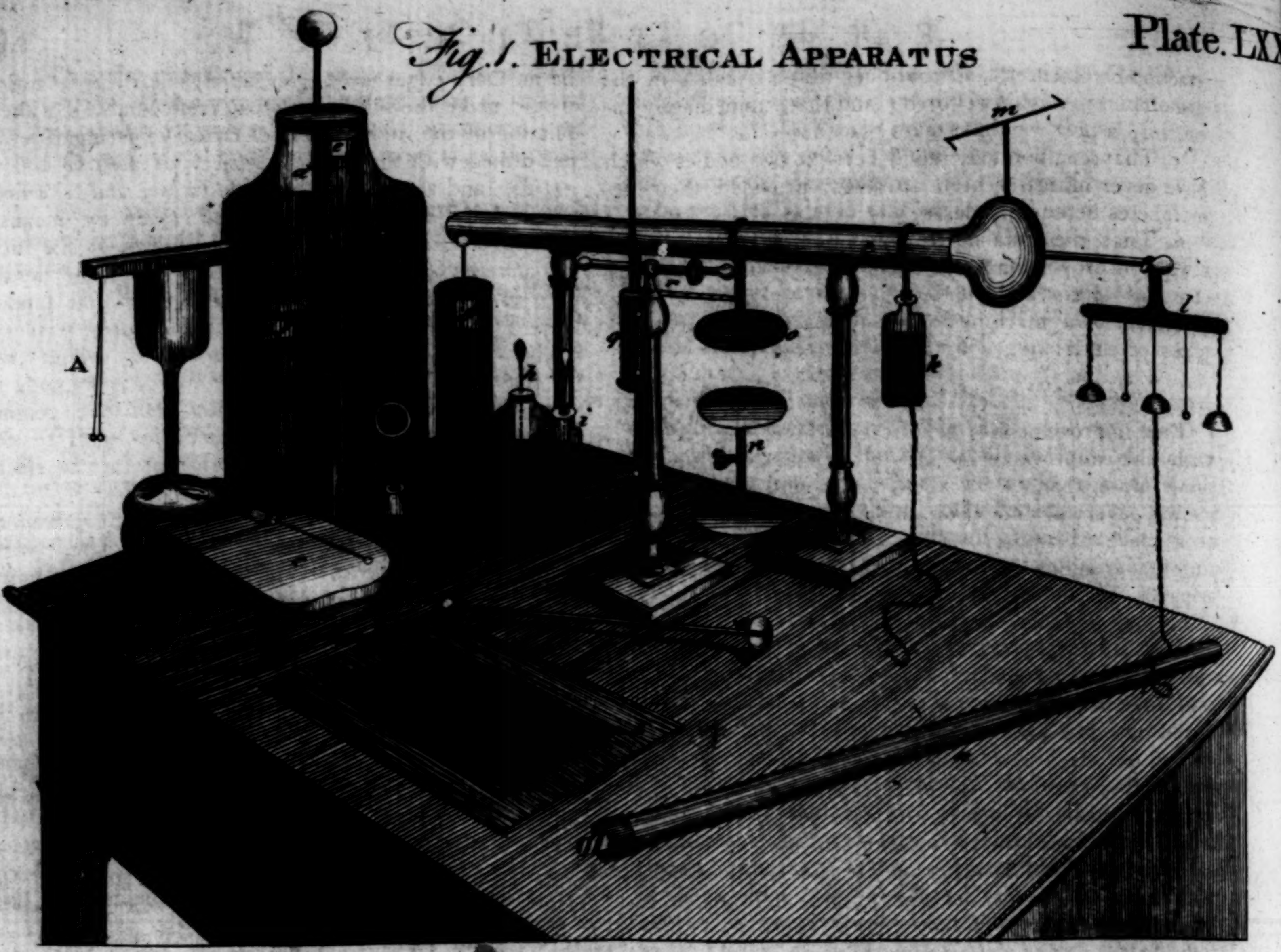
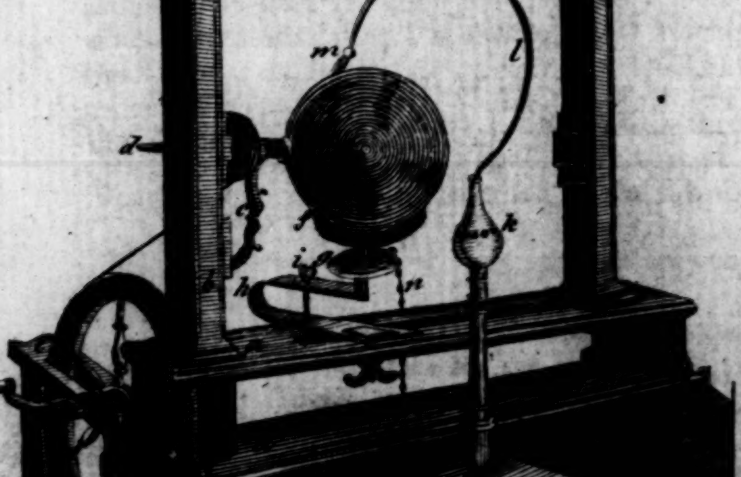


Fig. 2.
PRIESTLYS ELECTRICAL MACHINE


m
l
d
c
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k
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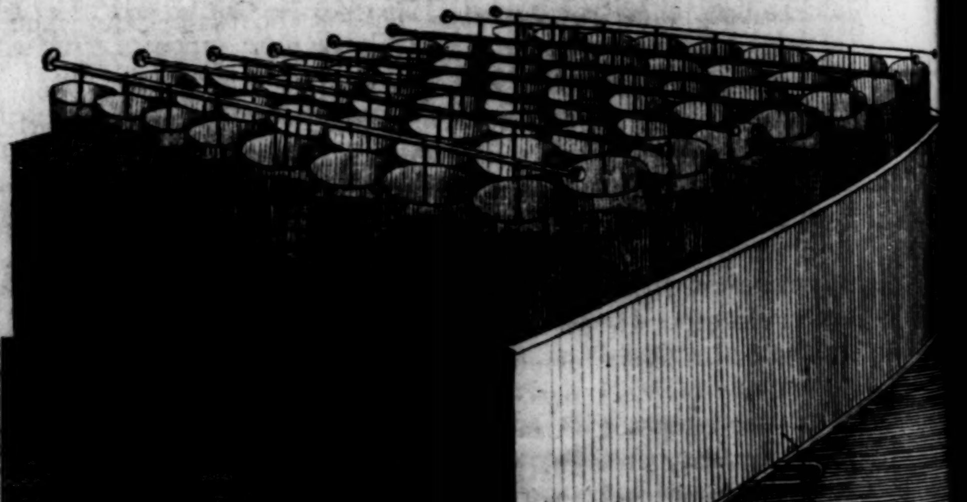
Fig. 3.
THE BATTERY



A.Bell sc.

traction commences, and continues till an equality in the atmoſpheres is again reſtored; and that, immediately upon this, a new repulſion takes place.

5. That repulſion may ſubſiſt betwixt two bodies which have never mutually been attracted, provided their atmoſpheres be equally denſe.

6. That the diſtance to which bodies are repelled is always in proportion to the ſtrength of the electricity they contain. This fact firſt ſuggeſted the notion of an electrometer, or a machine for meaſuring the different degrees of electricity.

Of Electrical Machines and Apparatus.

THE improvement of electrical machines has kept pace with the improvements in the ſcience. While nothing more than electrical attraction and repulſion was known, every phænomenon might be exhibited by means of a piece of amber, ſealing wax, or glaſs, which the philoſopher rubbed againſt his coat, and preſented to bits of paper, feathers, and other light bodies.

To give a greater degree of friction to electric ſubſtances, Otto Guericke and Mr Hawkeſbee contrived to whirl ſulphur and glaſs in a ſpherical form. The firſt conductors were nothing more than hempen-cords ſupported by ſilken lines. In place of theſe, bars of metal, or gun-barrels, were ſoon ſubſtituted; and a rubber was employed to ſupply the place of a human hand. The diſcovery of the Leyden bottle, (to be afterwards deſcribed) occaſioned more additions to the electrical apparatus; and the diſcoveries of Dr Franklin have made proportional additions neceſſary. No philoſopher can now be ſatisfied, if he be not able to ſupply a conductor from the clouds, as well as from the friction of his glaſs globes or tubes.

Although globes or cylinders are now of the moſt extenſive uſe in electrical experiments, glaſs-tubes are ſtill moſt convenient for ſeveral purpoſes; they ſhould be about three feet long, and as wide as a perſon can conveniently graſp, (Plate LXXIII. fig. 1. *a*.) The thickneſs of the glaſs is not material; perhaps the thinner they are the better, if they can bear ſufficient friction.

The beſt rubber for a ſmooth glaſs is the rough ſide of black oiled ſilk, eſpecially when a little amalgam of mercury or other metal is put upon it.

Glaſs-globes are in general preferable to cylinders. The globe ſhould have its neck incloſed in a pretty deep braſs cap, ending in a dilated brim, of about half an inch broad, if the globe be a large one. It has not been determined what kind of glaſs is the beſt; but flint is commonly uſed. Perhaps globes of twelve or thirteen inches diameter are the beſt ſize.

The beſt rubbers for globes are made of red baſil ſkins, particularly the neck-part of them, where the grain is more open, and the ſurface ſomewhat rougher. That the rubber may preſs the globe equally, it ſhould be put upon a plate of metal bent to the ſhape of the globe, and ſtuffed with any thing that is pretty ſoft: bran is good; and if the ſtuffing be a conductor, as flax, it will be better than if it be a non-conductor, as hair or wooll. It ſhould reſt upon a ſpring, to favour any inequality there may be in the form of the globe. There ſhould be no ſharp edges or angles about the rubber; for that would make the inſulation of it ineffectual. By the inſulation of the rubber every electrical experiment may be performed with the twofold variety of *poſitive* and *negative*, and a conductor be made to give and take fire at pleaſure. This inſulation is beſt made by means of baked wood, in the form of a plate, five or ſix inches in diameter, (*g*, fig. 2.) interpoſed between the metallic part of the rubber and the ſteel ſpring that ſupports it. When poſitive electricity is intended to be produced, a chain (*n*, fig. 2.) muſt connect the rubber with the floor; but, when negative electricity is wanted, the chain muſt be removed, and hung upon the common conductor, while another prime conductor muſt be connected with the rubber; which will therefore be electrified negatively.

The beſt method of collecting the electric fire from the globe ſeems to be by three or four pointed wires, (*m*, fig. 2.) two or three inches long, hanging lightly upon the globe, and ſuſpended on an open metallic ring.

The prime conductor ſhould be fixed very ſteady: Whatever be the ſize of the prime conductor, the extremity of it, or that part which is moſt remote from the globe, ſhould be much larger and rounder than the reſt, (*k*, fig. 2); for the effort of the electric matter to fly off is always greateſt at the greateſt diſtance from the globe.

The electrician ſhould be provided with METALLIC RODS (*s*, fig. 1.) to take ſparks from his conductor for various uſes. Theſe ſhould have knobs, larger or ſmaller in proportion to the curvature of the conductor. If the knob be too ſmall, it will not diſcharge the conductor at once, but by degrees, and with a leſs ſenſible effect; whereas the ſpark between broad ſurfaces is thick and ſtrong.

The moſt formidable part of an electrical apparatus conſiſts in the COATED GLASS that is uſed for the Leyden experiment. The form of the plate is immaterial with reſpect to the ſhock; and, for different experiments, both plates of glaſs, and jars of various forms and ſizes, muſt be uſed. For common uſes, the moſt commodious form is that of a jar, as wide as a perſon can conveniently hold in his hand by graſping, and as tall as it will ſtand without any danger of falling; perhaps about 3½ inches in diameter, and 8 inches in height. The mouth ſhould be pretty open, that it may be the more conveniently coated on the inſide, as well as the outſide, with tinfoil. A conſiderable variety of theſe jars may be ſeen in the above Plate, fig. 1. *c*, *d*, *e*, *f*, *g*, *h*, *i*, *j*, *k*.

The method of coating is much preferable to that of putting water or braſs-ſhavings into the jars, which both makes them heavy, and likewiſe incapable of being inverted, which is requiſite in many experiments. Braſs-duſt, however, or leaden-ſhot, is very convenient for ſmall phials. The tinfoil may be put on either with paſte, gum water, or bees-wax. To coat the inſides of veſſels which have narrow mouths, moiſten the inſide with gum-water, and then pour ſome braſs-duſt upon it: Enough will ſtick to make an exceeding good coating.

In the conſtruction of an ELECTRICAL BATTERY, a number of ſmall jars are preferable to large ones. If one of them ſhould break by an exploſion or any other accident, the loſs is leſs conſiderable; beſides, by means of narrow jars, a greater force (that is, a greater quantity of coated ſurface) may be contained in leſs room. The largeſt jars are about 17 inches in height, and ſhould not be more than 3 in diameter, and of the ſame width throughout. Thus they may be eaſily coated both within and without, and a box of a moderate ſize will contain a prodigious force; for the jars being coated within two inches of the top, each will contain a ſquare foot of coated glaſs. The battery (Plate LXXIII. fig. 3.) conſiſts of 64 jars, each 8 inches long, and 2½ in diameter, coated within an inch and a half of the top. The coated part of each is half a ſquare foot; ſo that the whole battery contains 32 ſquare feet. The wire of each jar has a piece of very ſmall wire twiſted about the lower end of it, to touch the inſide coating in ſeveral places; and it is put through a pretty large piece of cork within the jar, to prevent any part of it from touching the ſide, which would tend to promote a ſpontaneous diſcharge. Each wire is turned round, ſo as to make a hole or ring at the upper end; and through theſe rings a pretty thick braſs rod with knobs is put, one rod ſerving for one row of the jars. The communication between theſe rods is made by laying a chain over them all: this chain is not repreſented in the plate, leſt the figure ſhould appear confuſed. When only a part of the battery is to be uſed, the chain ſhould be laid over as many rods as you want rows of jars. The bottom of the box in which all the jars ſtand is covered with tinfoil and braſs-duſt; and a bent wire touching this tinfoil is put through the box, and appears on the outſide, as in the plate. To this wire is faſtened whatever is intended to communicate with the outſide of the battery, as the piece of ſmall wire in the figure; and the diſcharge is made by bringing the braſs knob to any of the knobs of the battery.

To diſcover the kind and degree of electricity, many forms of **Electrometers** have been thought of. Mr Canton's balls A, repreſented on a glaſs ſtanding on the ſtool *c*, (Plate LXXIII. fig. 1.) ſerve to diſcover ſmall degrees of electricity, to obſerve the changes of it from poſitive to negative, and to eſtimate the force of a ſhock before the diſcharge. Theſe balls are two pieces of cork, or pith of elder, nicely turned in a lath to about the ſize of a ſmall pea, and ſuſpended on ſmall linen threads. Theſe balls repell one another to diſtances exactly proportioned to the quantity of electricity contained in the veſſel or other ſubſtance with which they are connected; and by this work the operator knows pretty exactly the force of the charge, and the ſhock that will be given.

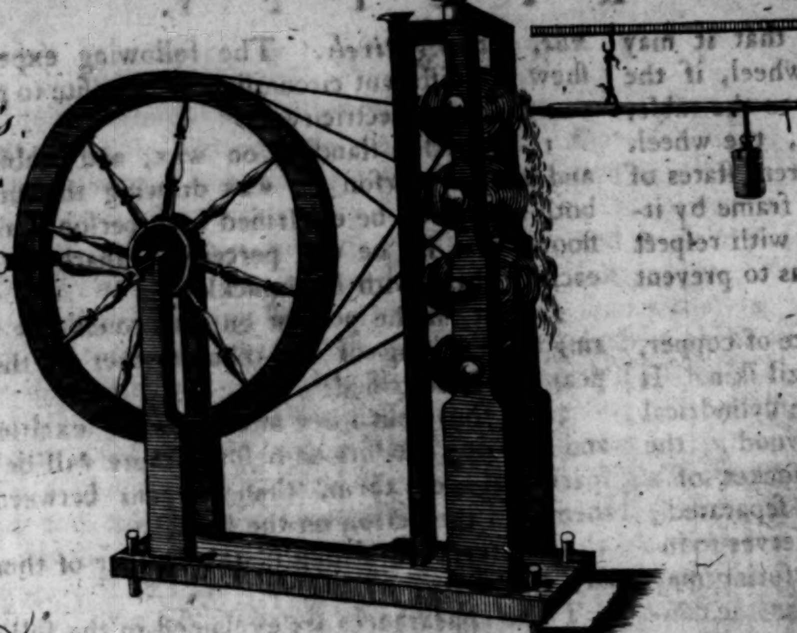
In order to repeat the experiment tending to ſhew that the electric fluid is the ſame with the matter of lightning, and to make obſervations on the electricity of the atmoſphere, the electrician ſhould be provided with **A machine for drawing electricity from the clouds.** The beſt conſtruction of which is the following: On the top of any building erect a pole *a*, (Plate LXXIV. fig. 2.) as tall as a man can well manage, having on the top of it a ſolid piece of glaſs, or baked wood, a foot in length. Let this be covered with a tin or copper veſſel (*b*) ſhaped like a funnel, to prevent its ever being wetted; above this, let there riſe a long ſlender rod *c*, terminating in a pointed wire, and having a ſmall wire twiſted round its whole length, the better to conduct the electricity to the funnel. From the funnel make a wire (*d*) deſcend along the building, about a foot diſtance from it, and conducted through an open ſaſh into any room that ſhall be moſt convenient for making the experiment. In this room, let a proper conductor be inſulated, and connected with the wire coming in at the window. This wire and conductor, being completely inſulated, will be electrified whenever there is a conſiderable quantity of electricity in the air. And notice will be given when it is properly charged, either by Mr Canton's balls hung to it, or by a ſet of bells diſpoſed in the following manner. Take three bells; ſuſpend the two outermoſt from the conductor by chains, and that in the middle by a ſilken ſtring, while a chain connects it with the floor; and hang two ſmall knobs of braſs by ſilken ſtrings, one between each two bells, to ſerve inſtead of clappers. In conſequence of this diſpoſition, when the two outermoſt bells, communicating with the conductor, are electrified, they will attract the clappers, and be ſtruck by them. The clappers being thus loaded with electricity, will be repelled, and fly to diſcharge themſelves upon the middle bell. After this, the clappers will be again attracted by the outermoſt bells; and thus, by ſtriking the bells alternately, a continual ringing may be kept up as long as the operator pleaſes. In the dark a continual flaſhing of light will be ſeen between the clappers and the bells. But when the electrification is very ſtrong, theſe flaſhes of light will be ſo large, that they will be tranſmitted by the clapper from one bell to the other, without its ever coming to actual contact with either of them, and the ringing will conſequently ceaſe.

With regard to the conſtruction of machines for electrical experiments in general, that of Dr Prieſtly, repreſented on Plate LXXIII. fig. 2. is perhaps the beſt. The **Frame** conſiſts of two ſtrong boards of mahogany, (*a a*), of the ſame length, parallel to one another, about four inches aſunder, and the lower one is an inch on each ſide broader than the upper: in the upper board is a groove reaching almoſt its whole length. One of the pillars *b*, which are of baked wood, is immoveable, being let through the upper board, and firmly fixed in the lower; while the other pillar ſlides in the groove abovementioned, in order to receive globes or cylinders of different ſizes; but it is only wanted when an axis is uſed. Both the pillars are perforated with holes at equal diſtances from the top to the bottom; by means of which, globes may be mounted higher or lower according to their ſize; and they are made tall, to admit the uſe of two or more globes at a time, one above another. Four of a moderate ſize may be uſed, if two be fixed on one axis; and the wheel has ſeveral grooves for that purpoſe.

If a globe with only one neck be uſed, as in the Plate, a braſs arm, with an open ſocket *c*, is neceſſary to ſupport the axis beyond the pulley; and this part is alſo contrived to be put higher or lower, together with the braſs ſocket in which the axis ſtands. The axis *d*

let

Fig. 1. *Dr Walson's* ELECTRICAL MACHINE



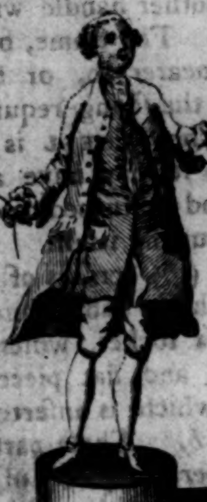


Fig. 2. CLOUD MACHINE

Fig. 3. ELEPHAS *or* ELEPHANT

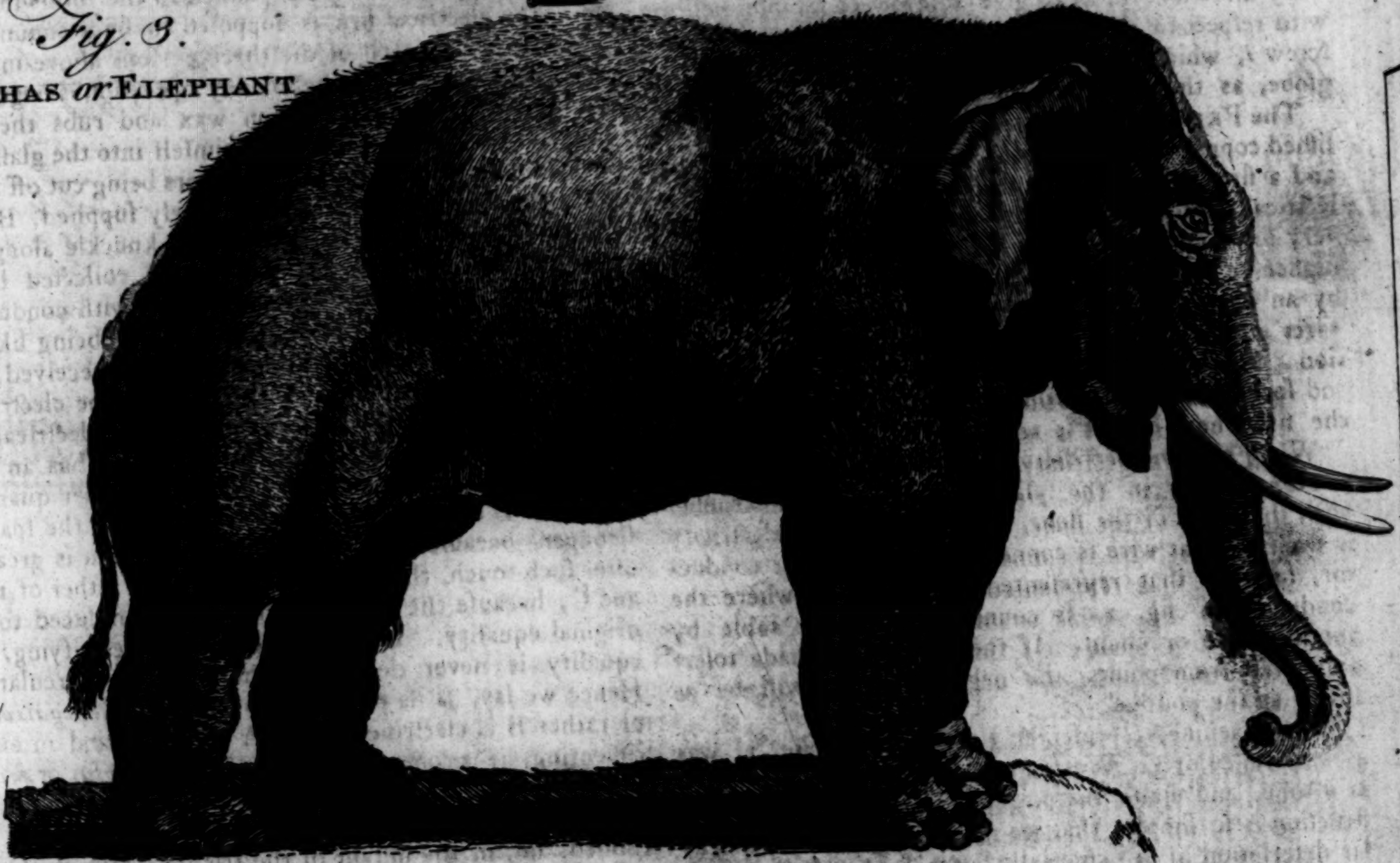


Fig. 5. ELATER

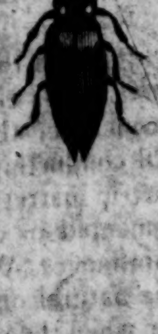


Fig. 7. ERMIN

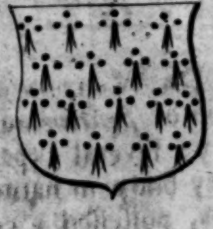


Fig. 4. ECHENEIS

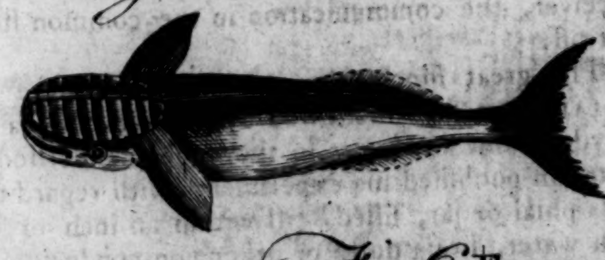


Fig. 8. ERMINE

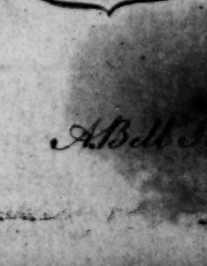
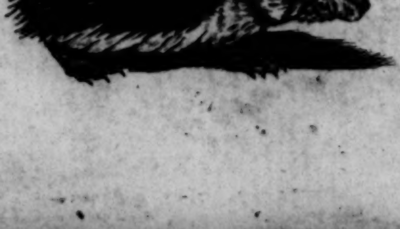


Fig. 6. ERINACEUS *or* HEDGEHOG



A. Bell Sculpt.

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is made to come quite through the pillar, that it may be turned by another handle without the wheel, if the operator chuſes. The frame, being ſcrewed to the table, may be placed nearer to, or farther from, the wheel, as the length of the ſtring requires in different ſtates of the weather. The Wheel is fixed in a frame by itſelf *e*, by which it may have any ſituation with reſpect to the pulley, and be turned to one ſide, ſo as to prevent the ſtring from cutting itſelf.

The Rubber (*f*) conſiſts of a hollow piece of copper, filled with horſe-hair, and covered with a bazil-ſkin. It is ſupported by a ſocket, which receives the cylindrical axis, of a round and flat piece of baked wood *g*, the oppoſite part of which is inſerted into the ſocket of a bent ſteel-ſpring *h*. Theſe parts are eaſily ſeparated; ſo that the rubber, or piece of wood that ſerves to inſulate it, may be changed at pleaſure. The ſpring may be either ſlipped along the groove, or moved in the contrary direction, ſo as to give it every deſirable poſition with reſpect to the globe. It is beſides furniſhed with a ſcrew *i*, which makes it preſs harder or lighter on the globe, as the operator chuſes.

The Prime Conductor (*k*) is a hollow veſſel of poliſhed copper in the form of a pear, ſupported by a pillar and a firm baſis of baked wood; and it receives the electrical matter by means of a long arched wire or rod of very ſoft braſs *l*, eaſily bent into any ſhape, and raiſed higher or lower as the globe requires. It is terminated by an open ring, in which are hung ſome ſharp-pointed wires *m*, playing lightly on the globe when it is in motion. The body of the conductor is furniſhed with holes and ſockets for the inſertion of metallic rods to convey the fire where-ever it is wanted.

When poſitive electricity is required, a wire or chain, as repreſented in the plate (*n*), connects the rubber with the table or the floor. When negative electricity is wanted, that wire is connected with another conductor, ſuch as that repreſented, in fig. 1. *t*; where the conductor in fig. 2. is connected with the table by another wire or chain. If the rubber be made tolerably free from points, the negative power will be as ſtrong as the poſitive.

The machine, repreſented Plate LXXV. fig. 1. was a contrivance of Dr Watſon's, to whirl four large globes at a time, and unite the power of them all. The conſtruction is ſo ſimple, that we need not give any particular deſcription of it, eſpecially after having ſo fully deſcribed that of Dr Prieſtly.

Of poſitive and negative Electricity, and the Leyden Phial.

Dr Watson and Dr Franklin firſt ſuggeſted the notion of *poſitive* and *negative*, or *plus* and *minus* electricity: ſeveral experiments led them to conclude, that every body in nature, and particularly all conducting bodies, poſſeſſed a certain quantity of electric matter, and that this natural quantity might be augmented or diminiſhed by being placed in particular circumſtances. When a body receives a larger quantity than the natural one, it is ſaid to be electrified *plus*, or *poſitively*; when the natural quantity is diminiſhed, it is ſaid to be electrified *minus*, or *negatively*. The following experiments will ſhew the different circumſtances requiſite to produce theſe two kinds of electricity.

1. A perſon ſtanding on wax, and rubbing the tube, and another perſon on wax drawing the fire, they will both appear to be electrified by a perſon ſtanding on the floor; that is, he will perceive a ſpark on approaching each of them with his knuckle.

2. But, if the perſons on wax touch one another during the exciting of the tube, neither of them will appear to be electrified.

3. If they touch one another after exciting the tube, and drawing the fire as before, there will be a ſtronger ſpark between them, than happens between either of them and the perſon on the floor.

4. After ſuch ſtrong ſpark, neither of them diſcover any electricity.

Theſe appearances are explained in the following manner: the electrical fire is ſuppoſed to be a common element, of which each of the three perſons above-mentioned has his equal ſhare, before any operation is begun with the tube. A, who ſtands on wax and rubs the tube, collects the electrical fire from himſelf into the glaſs; and his communication with all conductors being cut off by the wax, his body is not again immediately ſupplied. B, who ſtands likewiſe on wax, paſſing his knuckle along near the tube, receives the fire which was collected by the glaſs from A; and his communication with conductors, or the common ſtock of electrical matter, being likewiſe cut off, he retains the additional quantity received. To C, ſtanding on the floor, both appear to be electrified: for he having only the middle quantity of electrical fire, receives a ſpark upon approaching B who has an over quantity, but gives one to A who has an under quantity. If A and B approach to touch each other, the ſpark is ſtronger, becauſe the diſtance betwixt them is greater: after ſuch touch, there is no ſpark between either of them and C, becauſe the electrical fire in all is reduced to the original equality. If they touch while electriſying, the equality is never deſtroyed, the fire only circulating. Hence we ſay, B is electrified *poſitively*, A *negatively*; or rather B is electrified *plus*, A *minus*: and in experimenting, it is common to electrify bodies *plus* or *minus* at pleaſure. To electrify *plus* or *minus*, it is ſufficient to know, that the parts of the tube or ſphere that are rubbed, do, in the inſtant of the friction, attract the electrical fire, and therefore take it from the thing rubbing: the ſame parts immediately, as the friction upon them ceaſes, are diſpoſed to give the fire they have received to any body that has leſs. Thus you may circulate it or accumulate it upon, or ſubſtract it from any body, as you connect that body with the rubber, or the receiver, the communication in the common ſtock being cut off.

The great ſhock from what is called the Leyden phial, was firſt diſcovered by Mr Cunæus, a native of Leyden; but was never ſo thoroughly underſtood till Dr Franklin publiſhed his experiments with regard to it. A glaſs phial or jar, filled, till within an inch of the top, with water, braſs duſt, or other non-conducting ſubſtances, was firſt uſed; but coating the veſſel with tin-foil, or braſs-duſt, as mentioned above in the ſection concerning the electrical apparatus, was found to anſwer better.

We ſhall here give Dr Franklin's account of this phial nearly in his own words, together with the experiments confirming it.

1. While the wire and inſide of the bottle are electrified *poſitively* or *plus*, the outſide of the bottle is electrified *negatively* or *minus*, in exact proportion; *i. e.* whatever quantity of electrical fire is thrown into the inſide, an equal quantity goes out of the outſide. To underſtand this, ſuppoſe the natural quantity of electricity in the whole bottle, before the operation begins, is equal to 20; and, at every ſtroke of the tube, or turn of the globe, ſuppoſe a quantity equal to 1 is thrown in; then, after the firſt ſtroke, the quantity contained in the wire and inſide of the bottle will be 21, and in the outſide 19; after the ſecond ſtroke, the inſide will have 22, and the outſide 18; and ſo on, till, after 20 ſtrokes, the inſide will have a quantity of electrical fire equal to 40, and the outſide none at all; and then the operation ends: for no more can be thrown into the inſide, when no more can be driven out of the outſide. If more is attempted to be thrown in, it is ſpued back through the wire, or flies out in loud cracks through the ſides of the bottle.

2. The equilibrium of electric matter in the bottle being thus loſt, it cannot be reſtored by any *inward* communication or contact of the parts: but this muſt be done by a communication formed *without* the bottle between the inſide and the outſide, by ſome conductor touching or approaching both ſides at the ſame time; in which caſe the equilibrium is reſtored with an inexpreſſible violence and quickneſs: or, it may be done by touching each ſide alternately; in which caſe, the equilibrium is reſtored by degrees.

3. As no more electrical fire can be thrown into the inſide of the bottle, when all is driven from the outſide; ſo, in a bottle not yet electrified, none can be thrown into the inſide, when none can get out at the outſide; which happens, either when the glaſs is too thick, or when the bottle is placed in a non-conductor. Again, when the bottle is electrified, but little of the electrical fire can be drawn out from the inſide by touching the wire, unleſs an equal quantity can, at the ſame time, get in at the outſide. Thus, place an electrified bottle on clean glaſs, or dry wax, and you will not, by touching the wire, get out the fire from the inſide: place it on a conductor, and touch the wire, then you will get it out in a ſhort time; but ſooneſt when you form a direct communication as above.

4. The ſhock to the nerves, or rather convulſion, is occaſioned by the ſudden paſſage of the fire through the body, in its way from the inſide to the outſide of the bottle. The fire takes the ſhorteſt courſe; but it does not appear, that, in order to receive a ſhock, a communication with the floor is neceſſary; for he that holds the bottle with one hand, and touches the wire with the other, will be ſhocked as much, though his ſhoes be dry, or even ſtanding on wax. And on the touch of the wire (or of the prime conductor, which is the ſame thing,) the fire does not proceed from the touching finger to the wire, but from the wire to the finger, and paſſes through the body to the other hand, and ſo into the outſide of the bottle.

The following experiments will confirm this account of the Leyden phial.

1. Place an electrified phial on wax; a ſmall cork-ball held in your hand, ſuſpended by a dry ſilk thread, and brought near to the wire, will firſt be attracted and then repelled: When in a repelled ſtate, ſink your hand, that the ball may be brought towards the outſide of the bottle; it will be inſtantly attracted till it has parted with its fire.

If the outſide of the bottle had a poſitive electrical atmoſphere, as well as the inſide and the wire, an electrified cork would be repelled from the one as well as the other.

2. From a bent wire ſticking in the table, let a ſmall linen thread hang down within half an inch of the electrified phial; touch the wire of the phial repeatedly with your finger; and, at every touch, you will ſee the thread inſtantly attracted by the outſide of the bottle. As ſoon as you draw any fire from the inſide by touching the wire, the outſide draws in an equal quantity by the thread.

3. Fix a wire in the outſide coating of the bottle, ſo as that bending upwards its ring-end may be level with the top or ring-end of the wire in the cork of the bottle, and at three or four inches diſtance. Then electrify the bottle, and place it on wax. If a cork, ſuſpended by a ſilk thread, hang between theſe two wires, it will play inceſſantly from the one to the other, till the equilibrium betweed the inſide and the outſide of the bottle is reſtored.

4. Place a man on a cake of wax, and preſent him the wire of the electrified phial to touch, you ſtanding on the floor and holding it in your hand. As often as he touches it, he will be electrified *plus*; and any one ſtanding on the floor may draw a ſpark from him. The fire, in this experiment, paſſes out of the wire into him; and, at the ſame time, out of your hand into the outſide of the bottle. Give him the electrical phial to hold, and touch the wire; as often as you touch it, he will be electrified *minus*, and may draw a ſpark from any one ſtanding in the floor. The fire in this caſe paſſes from the wire to you, and from him into the outſide of the bottle.

5. Lay two books, or two glaſſes, back to back, two two or three inches diſtant, place the electrified phial; on one of them, and then touch the wire; that book will be electrified *minus*, the electrical fire being drawn out of it by the outſide of the bottle. Take off the bottle, and, holding it in your hand, touch the other with the wire; that book will be electrified *plus*, the fire paſſing into it from the wire, and the outſide of the bottle is at the ſame time ſupplied from your hand.

The ſame exploſion and ſhock happens, if the electrified phial is held in one hand by the hook of the wire, and the coating touched with the other, as when held by the coating and touched at the hook. To take the charged phial ſafely by the hook, and not at the ſame time diminiſh its force; it muſt firſt be ſet down on a con conductor. The phial will be electrified as ſtrongly, if held by the hook, and the coating applied to the globe or tube, as when held by the coating and the hook applied: but the *direction* of the electrical fire, being different in the charging, will alſo be different in the exploſion; the bottle charged through the hook will be diſcharged thro' the hook; the bottle charged thro' the coating will be diſcharged thro' the coating; becauſe the fire muſt come out the ſame way it went in.

6. To prove this, take two bottles that were equally charged thro' the hooks, one in each hand; bring their hooks near each other, and no ſpark or ſhock will follow; becauſe each hook is diſpoſed to give fire, and neither to receive it. Set one of the bottles on glaſs, take it up by the hook, and apply its coating to the hook of the other; then there will be an exploſion and ſhock, and both bottles will be diſcharged. [*N. B.* To charge a bottle commodiouſly thro' the coating; place it on a glaſs ſtand; form a communication from the prime conductor to the coating, and another from the hook to the wall or floor; when it is charged, remove the latter communication before you take hold of the bottle, otherwiſe great part of the fire will eſcape by it.]

When the terms of *charging* or *diſcharging* the phial are uſed, it is in compliance with cuſtom, and for want of better ones; ſince there is really no *more* electrical fire in the phial after what is called its *charging* than before, nor *leſs* after its *diſcharging*. Beſides, the phial will not ſuffer what is called a *charging*, unleſs as much fire can go out of it one way as is thrown in by another. A phial cannot be charged ſtanding on wax or glaſs, or hanging on the prime conductor, unleſs a communication be formed between its coating and the floor. But ſuſpend two or more phials on the prime conductor, one hanging to the tail of the other, and a wire from the laſt to the floor, an equal number of turns of the wheel will charge them all equally, and each as ſtrongly as a ſingle one would have been.

When a bottle is charged in the common way, its *inſide* and *outſide* ſurfaces ſtand ready, the one to give fire by the hook, the other to receive it by the coating: yet as the firſt will not give out, unleſs the other can at the ſame inſtant receive in; ſo neither will the latter receive in, unleſs the firſt can at the ſame inſtant give out. When both can be done at once, it is done with inconceivable quickneſs and violence.

Glaſs has within its ſubſtance the ſame quantity of electrical fire at all times, and that quantity is very great in proportion to the maſs of glaſs. This quantity it obſtinately retains; and will have neither more nor leſs, though it will allow a change to be made in its parts and ſituation; that is, we may take away part from one of the ſides, provided we throw an equal quantity into the other. Yet when the ſituation of the electrical fire is thus altered in the glaſs, it will not be at reſt, or in its natural ſtate, till it be reſtored to its original equality; and this reſtitution cannot be made through the ſubſtance of the glaſs, but muſt be done by a conducting communication formed without from ſurface to ſurface. Thus the whole force of the bottle, and power of giving a ſhock, reſides in the GLASS itſelf; the coatings, or conducting ſubſtances in contact with the two ſurfaces, ſerving only to give and receive to and from the ſeveral parts of the glaſs; that is, to give in one ſide, and take away from the other. This was diſcovered by Dr Franklin, and proved by the following experiment: 'Purpoſing, (ſays he,) to analize the electrified bottle, in order to find wherein its ſtrength lay, we placed it on glaſs; and drew out the cork and wire, which for that purpoſe had been looſely put in. Then taking the bottle in one hand, and bringing a finger of the other near its mouth, a ſtrong ſpark came from the water, and the ſhock was as violent as if the wire had remained in it, which ſhewed that the force did not lie in the wire. Then to find if it reſided in the water, being crowded into and condenſed in it, as confined by the glaſs, which had been our former opinion, we electrified the bottle again, and placing it on glaſs drew out the wire and cork as before; then taking up the bottle, we decanted all its water into an empty bottle, which likewiſe ſtood on glaſs; and taking up that other bottle, we expected, if the force reſided in the water, to find a ſhock from it; but there was none. We judged then that it muſt either be loſt in decanting, or remain in the firſt bottle. The latter we found to be true; for that bottle on trial gave the ſhock, though filled up as it ſtood with freſh unelectrified water from a tea-pot.——To find, then, whether glaſs had this property merely as glaſs, or whether the form contributed any thing to it; we took a pane of ſaſh-glaſs, and laying it on the hand, placed a plate of lead on its upper ſurface; then electrified that plate, and bringing a finger to it, there was a ſpark and ſhock. We then took two plates of lead of equal dimenſions, but leſs than the glaſs by two inches every way, and electrified the glaſs between them, by electrifying the uppermoſt lead; then ſeparated the glaſs from the lead; in doing which, what little fire might be in the lead was taken out, and the glaſs being touched in the electrified parts with a finger, afforded only very ſmall pricking ſparks, but a great number of them might be taken from different places. Then dexterouſly placing it again between the leaden plates, and compleating a circle between the two ſurfaces, a violent ſhock enſued.——Which demonſtrated the power to reſide in glaſs as glaſs; and that the non-electrics in contact ſerved only, like the armature of a loadſtone, to unite the force of the ſeveral parts, and bring them at once to any point deſired: it being the property of a non-electric, that the whole body inſtantly receives or gives what electrical fire is given to or taken from any one of its parts.——

'It is amazing to obſerve in how ſmall a portion of glaſs a great electrical force may lie. A thin glaſs bubble about an inch diameter, weighing only ſix grains, being half filled with water, partly gilt on the outſide, and furniſhed with a wire hook, gives, when electrified, as great a ſhock as a man can well bear. As the glaſs is thickeſt near the orifice, I ſuppoſe the lower half, which being gilt was electrified and gave the ſhock, did not exceed two grains; for it appeared, when broke, much thinner than the upper half.——If one of theſe thin bottles be electrified by the coating, and the ſpark

‘ taken out through the gilding, it will break the glaſs
‘ inwards, at the ſame time that it breaks the gilding out-
‘ wards. And ſince there is no more electrical fire in a
‘ bottle after charging than before, how great muſt be the
‘ quantity in this ſmall portion of glaſs! It ſeems as if it
‘ were of its very ſubſtance and eſſence. Perhaps if that
‘ due quantity of electrical fire ſo obſtinately retained by
‘ glaſs, could be ſeparated from it, it would no longer
‘ be glaſs; it might loſe its tranſparency, or its brittle-
‘ neſs, or its elaſticity.——Experiments may poſſibly be
‘ invented hereafter to diſcover this.’

Of the Similarity between Lightning and Electricity.

1. Flaſhes of lightning are generally ſeen crooked, and waving in the air. The electric ſpark has always the ſame direction when it is drawn from an irregular body at ſome diſtance, or through a ſpace in which the beſt conductors are diſpoſed in an irregular manner, which is always the caſe in the heterogeneous atmoſphere of our globe.

2. Lightning ſtrikes the higheſt and moſt pointed objects in its way preferable to others, as high hills, and trees, towers, ſpires, maſts of ſhips, points of ſpears, *&c.* In like manner, all pointed conductors receive or throw off the electric fluid more readily than thoſe which are terminated by flat ſurfaces.

3. Lightning is obſerved to take the readieſt and beſt conductor. So does electricity in the diſcharge of the Leyden phial. For this reaſon, it would be ſafer, during a thunder-ſtorm, to have one's cloaths wet than dry, as the lightning might then, in a great meaſure, be tranſmitted to the ground, by the water, on the outſide of the body. It is found, that a wet rat cannot be killed by the exploſion of the electrical bottle, but that a dry rat may.

4. Lightning burns. So does electricity. It will kindle hard dry roſin, ſpirits unwarmed, and even wood. It will fire gunpowder, by only ramming it hard in a cartridge, into each end of which pointed wires are introduced, and brought within half an inch of one another, and diſcharging a ſhock through them.

5. Lightning ſometimes diſſolves metals. So does electricity. The method in which Dr Franklin made electricity melt metals, was by putting thin pieces of them between two panes of glaſs, bound faſt together, and ſending an electric ſhock through them. Sometimes the pieces of glaſs, by which they were confined, would be ſhattered to pieces by the diſcharge, and be broken into a kind of coarſe ſand, which once happened with pieces of thick looking-glaſs; but if they remained whole, the pieces of metal would be miſſing in ſeveral places where it had lain between them, and inſtead of it a metallic ſtain would be ſeen on both the glaſſes, the ſtains on the under and upper glaſs being exactly ſimilar in the minuteſt ſtroke.

6. Lightning rends ſome bodies. So does electricity. The electric ſpark will ſtrike a hole through a quire of paper.—When wood, bricks, ſtone, *&c.* are rent by lightning, the ſplinters will fly off on that ſide where there is the leaſt reſiſtance. In like manner, when a hole is ſtruck through a piece of paſteboard by an electrified jar, if the ſurfaces of the paſteboard are not confined and compreſſed, there will be a bur raiſed all round the hole on both ſides of the paſteboard; but if one ſide be confined, ſo that the bur cannot be raiſed on that ſide, it will all be raiſed on the other ſide, which way ſoever the fluid was directed. For the bur round the outſide of the hole is the effect of the exploſion, which is made every way from the center of the electric ſtream, and not an effect of its direction.

7. Lightning has often been known to ſtrike people blind. And a pigeon, after a violent ſhock of electricity, by which it was intended to be killed, was ſtruck blind likewiſe.

8. In a thunder-ſtorm at Stretham, deſcribed by Dr Miles, the lightning ſtripped off ſome paint which had covered a gilded moulding of a pannel of wainſcot, without hurting the reſt of the paint. Dr Franklin imitated this, by paſting a ſlip of paper over the filleting of gold on the cover of a book, and ſending an electric flaſh through it. The paper was torn off from end to end, with ſuch force, that it was broken in ſeveral places; and in others there was brought away part of the grain of the Turkey leather in which the book was bound. This convinced the doctor, that if it had been paint, it would have been ſtripped off in the ſame manner with that on the wainſcot at Stretham.

9. Lightning deſtroys animal-life. Animals have likewiſe been killed by the ſhock of electricity. The largeſt animals which Dr Franklin and his friends had been able to kill were a hen, and a turkey which weighed about ten pounds.

10. Magnets have been obſerved to loſe their virtue, or to have their poles reverſed, by lightning. Dr Franklin did the ſame by electricity. By electricity he frequently gave polarity to needles, and reverſed them at pleaſure. A ſhock from four large jars, ſent through a fine ſewing needle, gave it polarity, ſo that it would traverſe when laid on water. What is moſt remarkable in theſe electrical experiments upon magnets is, that if the needle, when it was ſtruck, lay eaſt and weſt, the end which was entered by the electric blaſt pointed north; but that if it lay north and ſouth, the end which lay towards the north would continue to point north, whether the fire entered at that end or the contrary. He alſo obſerved, that the polarity was ſtrongeſt when the needle was ſtruck lying north and ſouth, and weakeſt when it lay eaſt and weſt. He takes notice, that, in theſe experiments, the needle, in ſome caſes, would be finely blued, like the ſpring of a watch, by the electric flame; in which caſe the colour given by a flaſh from two jars only might be wiped off, but that a flaſh from four jars fixed it, and frequently melted the needles. The jars which the doctor uſed held ſeven or eight gallons, and were coated and lined with tinfoil.

To demonſtrate, in the completeſt manner poſſible, the ſameneſs of the electric fluid with the matter of lightning, Dr Franklin contrived to bring lightning from the heavens, by means of an electrical kite, which he raiſed when a ſtorm of thunder was perceived to be coming on. This kite had a pointed wire fixed upon it, by which it drew the lightning from the clouds. This lightning deſcended by the hempen ſtring, and was received by a key tied to the extremity of it; that part of the ſtring which was held in the hand being of ſilk, that the electric virtue might ſtop when it came to the key. He found that the ſtring would conduct electricity even when nearly dry, but that when it was wet it would conduct it quite freely; ſo that it would ſtream out plentifully from the key at the approach of a perſon's finger.

At this key he charged phials, and from electric fire thus obtained he kindled ſpirits, and performed all other electrical experiments which are uſually exhibited by an excited globe or tube.

The firſt appearance of a thunder-ſtorm (which generally happens when there is little or no wind) is one denſe cloud, or more, increaſing very faſt in ſize, and riſing into the higher regions of the air. The lower ſurface is black, and nearly level; but the upper finely arched, and well defined. Many of theſe clouds often ſeem piled one upon another, all arched in the ſame manner; but they keep continually uniting, ſwelling, and extending their arches.

At the time of the riſing of this cloud, the atmoſphere is generally full of a great number of ſeparate clouds, motionleſs, and of odd and whimſical ſhapes. All theſe, upon the appearance of the thunder-cloud, draw towards it, and become more uniform in their ſhapes as they approach; till, coming very near the thunder-cloud, their limbs mutually ſtretch towards one another; they immediately coaleſce, and together make one uniform maſs. Theſe are called *adſcititious* clouds, from their coming in, to enlarge the ſize of the thunder-cloud. But, ſometimes the thunder-cloud will ſwell, and increaſe very faſt without the conjunction of any adſcititious clouds, the vapours in the atmoſphere forming themſelves into clouds where-ever it paſſes. Some of the adſcititious clouds appear like white fringes, at the ſkirts of the thunder-cloud, or under the body of it; but they keep continually growing darker and darker, as they approach to unite with it.

When the thunder-cloud is grown to a great ſize, its lower ſurface is often ragged, particular parts being detached towards the earth, but ſtill connected with the reſt Sometimes the lower ſurface ſwells into various large protuberances, bending uniformly towards the earth. And ſometimes one whole ſide of the cloud will have an inclination to the earth, and the extremity of it will nearly touch the earth. When the eye is under the thunder-cloud, after it is grown large, and well formed, it is ſeen to ſink lower, and to darken prodigiouſly; at the ſame time that a number of ſmall adſcititious clouds (the origin of which can never be perceived) are ſeen in a rapid motion, driving about in very uncertain directions under it. While theſe clouds are agitated with the moſt rapid motions, the rain generally falls in the greateſt plenty; and if the agitation be exceeding great, it commonly hails.

When the thunder-cloud is ſwelling, and extending its branches over a large tract of country, the lightning is ſeen to dart from one part of it to another, and often to illuminate its whole maſs. When the cloud has acquired a ſufficient extent, the lightning ſtrikes between the cloud and the earth, in two oppoſite places, the path of the lightning lying through the whole body of the cloud and its branches. The longer this lightning continues, the rarer does the cloud grow, and the leſs dark is its appearance; till, at length, it breaks in different places, and ſhows a clear ſky. When the thunder-cloud is thus diſperſed, thoſe parts which occupy the upper regions of the atmoſphere are equally ſpread, and very thin; and thoſe that are underneath are black, but thin too; and they vaniſh gradually, without being driven away with any wind.

That thunder-clouds were ſometimes in a poſitive as well as negative ſtate of electricity, Signior Beccaria had diſcovered, before he heard of its having been obſerved by Dr Franklin or any other perſon. The ſame cloud, in paſſing over his obſervatory, electrified his apparatus ſometimes poſitively, and ſometimes negatively. The electricity continued longer of the ſame kind, in proportion as the thunder-cloud was ſimple, and uniform in its direction; but when the lightning changed its place, there commonly happened a change in the electricity of his apparatus. It would change ſuddenly after a very violent flaſh of lightning, but the change would be gradual when the lightning was moderate, and the progreſs of the thunder-cloud ſlow.

It was an immediate inference from his obſervations of the lightning abroad, and his apparatus within, that the quantity of electric matter, in an uſual ſtorm of thunder, is almoſt inconceivably great; conſidering how many pointed bodies, as trees, ſpires, *&c.* are perpetually drawing it off, and what a prodigious quantity is repeatedly diſcharged to or from the earth.

Conſidering the vaſt quantity of electric fire that appears in the moſt ſimple thunder-ſtorms, he thinks it impoſſible that any cloud, or number of clouds, ſhould ever contain it all, ſo as either to diſcharge or receive it. Beſides, during the progreſs and increaſe of the ſtorm, though the lightning frequently ſtruck to the earth, the ſame clouds were the next moment ready to make a ſtill greater diſcharge, and his apparatus continued to be as much affected as ever. The clouds muſt, conſequently, have received at one place, the moment that a diſcharge was made from them in another. In many caſes, the electricity of his apparatus, and conſequently of the clouds, would inſtantly change from one kind to another ſeveral times; an effect which cannot be accounted for by any ſimple diſcharge or recruit. Both muſt have taken place in a very quick ſucceſſion.

The extent of the clouds doth not leſſen this difficulty: for, be it ever ſo great, ſtill the quantity ought to be leſſened by every diſcharge: and beſides, the points by which the ſilent diſcharges are made are in propotion to the extent of the clouds. Nor is the difficulty leſſened by ſuppoſing that freſh clouds bring recruits; for beſides that the clouds are not ripe for the principal ſtorm, till all the clouds, to a great diſtance, have actually coaleſced, and formed one uniform maſs, thoſe recruits bear no ſort of proportion to the diſcharge, and whatever it was, it would ſoon be exhauſted.

The fact, therefore, muſt be, that the electric matter is continually darting from the clouds in one place, at the ſame time that it is diſcharged from the earth in another. And it is a neceſſary conſequence from the whole, that the clouds ſerve as conductors to convey the electric fluid from thoſe places of the earth which are overloaded with it, to thoſe which are exhauſted of it.

That great quantities of electric matter do ſometimes ruſh out of particular parts of the earth, and riſe through the air into the higher regions of the atmoſphere, he thinks is evident from the great quantities of ſand, aſhes, and other light ſubſtances, which have often been carried up into the air, and ſcattered uniformly over a large tract of country. No other known efficient cauſe of this phenomenon can be aſſigned, except the wind; and it has been obſerved when there was no wind ſtirring; and the light bodies have even been carried againſt the wind. He ſuppoſes, therefore, that theſe light bodies are raiſed by a large quantity of electric matter, iſſuing out of the earth, where it was overcharged with it, and attracting and carrying with it every ſubſtance that could ſerve as a conductor in its paſſage. All theſe bodies, being poſſeſſed of an equal quantity of the electric fluid, will be diſperſed equally in the air, and conſequently over that part of the earth where the fluid was wanting, and whither they ſerve to convey it. Had theſe bodies been raiſed by the wind, they would have been diſperſed at random, and in heaps.

This comparatively rare phenomenon, he thinks, exhibits both a perfect image, and demonſtration, of the manner in which the vapours of the atmoſphere are raiſed to form thunder-clouds. The ſame electric matter, wherever it iſſues, attracts to it, and carries up into the higher regions of the air, the watery particles that are diſperſed in the atmoſphere. The electric matter aſcends to the higher regions of the atmoſphere, being ſolicited by the leſs reſiſtance it finds there than in the common maſs of the earth; which, at thoſe times, is generally very dry, and conſequently highly electric. The uniformity with which thunder-clouds ſpread themſelves, and ſwell into arches, muſt be owing to their being affected by ſome cauſe which, like the electric matter, diffuſes itſelf uniformly where-ever it acts, and to the reſiſtance they meet with in aſcending through the air. As a proof of this, ſteam, riſing from an electrified eolipile, diffuſes itſelf with the ſame uniformity, and in ſimilar arches, extending itſelf towards any conducting ſubſtance.

The ſame cauſe which firſt raiſed a cloud, from vapours diſperſed in the atmoſphere, draws it to thoſe that are already formed, and continues to form new ones; till the whole collected maſs extends ſo far, as to reach a part of the earth where there is a deficiency of the electric fluid. Thither too, will thoſe clouds, replete with electricity, be ſtrongly attracted, and there will the electric matter diſcharge itſelf upon the earth. A channel of communication being, in this manner, found, a freſh ſupply of electric matter will be raiſed from the overloaded part, and will continue to be conveyed by the medium of the clouds, till the equilibrium of the fluid, between the two places of the earth be reſtored. When the clouds are attracted in their paſſage by thoſe parts of the earth where there is a deficiency of the fluid, thoſe detached fragments are formed, and alſo thoſe uniform depending protuberances, which, in ſome caſes, are the cauſe of water-ſpouts, and hurricanes.

That the electric matter, which forms and animates the thunder-clouds, iſſues from places far below the ſurface of the earth; and that it buries itſelf there, is probable from the deep holes that have, in many places, been made by lightning. Flaſhes of lightning have, alſo, been ſeen to ariſe from ſubterraneous cavities, and from wells. Violent inundations have accompanied thunder-ſtorms, not occaſioned by rain, but by water burſting from the bowels of the earth, from which it muſt have been diſlodged by ſome internal concuſſion. Deep wells have been known to fill faſter in thunder-ſtorms, and others have conſtantly grown turbid at the approach of thunder.

This very riſe, as well as the whole progreſs of thunder-clouds, has ſometimes been in a manner viſible. Exhalations have been frequently ſeen to riſe from particular caverns, attended with a rumbling noiſe, and to aſcend into the higher regions of the air, with all the phenomena of thunder-ſtorms deſcribed above, according to the deſcription of perſons who lived long before the connection between electricity and lightning was ſuſpected.

The greateſt difficulty attending this theory of the origin of thunder-ſtorms relates to the collection and inſulation of electric matter within the body of the earth. With reſpect to the former, he has nothing particular to ſay. Some operations in nature are certainly attended with a loſs of the equilibrium in the electric fluid, but no perſon has yet aſſigned a more probable cauſe of the redundancy of electric matter which, in fact, often abounds in the clouds, than what we may ſuppoſe poſſible to take place in the bowels of the earth. And ſuppoſing the loſs of the equilibrium poſſible, the ſame cauſe that produced the effect would prevent the reſtoring of it; ſo that not being able to force a way, at leaſt one ſufficiently ready, through the body of the earth, it would iſſue at the moſt convenient vent into the higher regions of the air, as the better paſſage. His electrical apparatus, though communicating with the earth, has frequently, in violent thunder-ſtorms, given evident ſparks to his finger.

In the enumeration of the effects of thunder-ſtorms, he obſerves that a wind always blows from the place from which the thunder-cloud proceeds; that this is agreeable to the obſervations of all mariners, and that the wind is more or leſs violent in proportion to the ſuddenneſs of the appearance of the thunder-cloud, the rapidity of its expanſion, and the velocity with which the adſcititious clouds join it. The ſudden condenſation of ſuch a prodigious quantity of vapours muſt diſplace the air, and repel it on all ſides.

He, in ſome meaſure, imitated even this effect of thunder, at leaſt produced a circulation of all the air in his room, by the continued electrification of his chain.

Among other effects of lightning, he mentions the caſe of a man rendered exceeding ſtiff, preſently after he was ſtruck dead in a ſtorm of thunder. But the moſt remarkable circumſtance, in this caſe, was the lightning (chuſing the beſt conductor) having ſtruck one particular vein, near his neck, and followed it through its minuteſt ramifications: ſo that the figure of it appeared through the ſkin, finer than any pencil could have drawn it.

He cautions perſons not to depend upon the neighbourhood of a higher, or, in all caſes, a better conductor than their own body; ſince, according to his repeated obſervations, the lightning by no means deſcends in one undivided track, but bodies of various kinds conduct their ſhare of it, at the ſame time, in proportion to their quantity and conducting power.

A great number of obſervations, relating to the deſcent of lightning, confirm his theory of the manner of its aſcent: for, in many caſes, it throws before it the parts of conducting bodies, and diſtributes them along the reſiſting medium through which it muſt force its paſſage.

Upon this principle it is, that the longeſt flaſhes of lightning ſeem to be made by its forcing into its way part of the vapours in the air. One of the principal reaſons why thoſe flaſhes make ſo long a rumbling, is their being occaſioned by the vaſt length of a vacuum, made by the paſſage of the electric matter. For though the air collapſes the moment after it has paſſed, and the vibration (on which the ſound depends) commences at the ſame moment, through the whole length of the track; yet, if the flaſh was directed towards the perſon who hears the report, the vibrations excited at the nearer end of the track will reach his ear much ſooner than thoſe excited at the more remote end; and the ſound will, without any repercuſſion or echo, continue till all the vibrations have ſucceſſively reached him.

He thinks that the Aurora Borealis may be this electric matter performing its circulation, in ſuch a ſtate of the atmoſphere as renders it viſible, or approaching nearer to the earth than uſual.

Stones and bricks ſtruck by lightning are often vitrified. He ſuppoſes that ſome ſtones in the earth having been ſtruck in this manner firſt gave occaſion to the vulgar opinion of the thunder-bolt.

Signior Beccaria was very ſenſible that heat contributes much to the phenomena of thunder, lightning, and rain; but he could not find, by any experiment, that it tended to promote electricity. He therefore rather thought that heat operated, in this caſe, by exhaling the moiſture of the air, and thereby cutting off the communication of the electric fluid between one place and another, particularly between the earth and the higher regions of the air, whereby its effects were more viſible.

Method of ſecuring buildings and perſons from the effects of lightning.

EXPERIMENTS made in electricity firſt gave philoſophers a ſuſpicion that the matter of lightning was the ſame with the electric matter. Experiments afterwards made on lightning obtained from the clouds by pointed rods, received into bottles, and ſubjected to every trial, have ſince proved this ſuſpicion to be perfectly well founded; and that whatever properties we find in electricity, are alſo the properties of lightning.

This matter of lightning, or of electricity, is an extreme ſubtile fluid, penetrating other bodies, and ſubſiſting in them equally diffuſed.

When by any operation of art or nature, there happens to be a greater proportion of this fluid in one body than in another, the body which has moſt, will communicate to that which has leaſt, till the proportion becomes equal; provided the diſtance between them be not too great; or, if it is too great, till there be proper conductors to convey it from one to the other.

If the communication be through the air without any conductor, a bright light is ſeen between the bodies, and a ſound is heard. In our ſmall experiments we call this light and ſound the electric ſpark and ſnap; but in the great operations of nature, the light is what we call *lightning*, and the ſound (produced at the ſame time, though generally arriving later at our ears than the light does to our eyes) is, with its echoes, called *thunder*.

If the communication of this fluid is by a conductor, it may be without either light or ſound, the ſubtile fluid paſſing in the ſubſtance of the conductor.

If the conductor be good and of ſufficient bigneſs, the fluid paſſes through it without hurting it. If otherwiſe, it is damaged or deſtroyed.

All metals, and water, are good conductors.—Other bodies may become conductors by having ſome quantity of water in them, as wood, and other materials uſed in building, but not having much water in them, they are not good conductors, and therefore are often damaged in the operation by lightning.

Glaſs, wax, ſilk, wool, hair, feathers, and even wood, perfectly dry, are non-conductors: that is, they reſiſt inſtead of facilitating the paſſage of this ſubtile fluid.

When this fluid has an opportunity of paſſing through two conductors, one good and ſufficient, as of metal, the other not ſo good, it paſſes in the beſt, and will follow it in any direction.

The diſtance at which a body charged with this fluid will diſcharge itſelf ſuddenly, ſtriking through the air into another body that is not charged, or not ſo highly charged, is different according to the quantity of the fluid, the dimenſions and form of the bodies themſelves, and the ſtate of the air between them.——This diſtance, whatever it happens to be between any two bodies, is called their *ſtriking diſtance*, as till they come within that diſtance of each other, no ſtroke will be made.

The clouds have often more of this fluid in proportion than the earth; in which caſe as ſoon as they come near enough (that is, within the ſtriking diſtance) or meet with a conductor, the fluid quits them and ſtrikes into the earth. A cloud fully charged with this fluid, if ſo high as to be beyond the ſtriking diſtance from the earth, paſſes quietly without making any noiſe or giving light; unleſs it meets with other clouds that have leſs.

Tall trees, and lofty buildings, as the towers and ſpires of churches, become ſometimes conductors between the clouds and the earth; but not being good ones, that is, not conveying the fluid freely, they are often damaged.

Buildings that have their roofs covered with lead, or other metal, and ſpouts of metal continued from the roof in to the ground to carry off the water, are never hurt by lightning, as whenever it falls on ſuch a building, it paſſes in the metals and not in the walls.

When other buildings happen to be within the ſtriking diſtance from ſuch clouds, the fluid paſſes in the walls, whether of wood, brick or ſtone, quitting the walls only when it can find better conductors near them, as metal rods, bolts, and hinges of windows or doors, gilding on wainſcot, or frames of pictures; the ſilvering on the backs of looking-glaſſes; the wires for bells; and the bodies of animals, as containing watry fluids. And in paſſing thro' the houſe it follows the direction of theſe conductors, taking as many in its way as can aſſiſt it in its paſſage, whether in a ſtrait or crooked line, leaping from one to the other, if not far diſtant from each other, only rending the wall in the ſpaces where theſe partial good conductors are too diſtant from each other.

An iron rod being placed on the outſide of a building, from the higheſt part continued down into the moiſt earth, in any direction ſtrait or crooked, following the form of the roof or other parts of the building, will receive the lightning at its upper end, attracting it ſo as to prevent its ſtriking any other part; and, affording it a good conveyance into the earth, will prevent its damaging any part of the building.

A ſmall quantity of metal is found able to conduct a great quantity of this fluid. A wire no bigger than a gooſe quill has been known to conduct (with ſafety to the building as far as the wire was continued) a quantity of lightning that did prodigious damage both above and below it; and probably larger rods are not neceſſary, tho' it is common to make them of half an inch, ſome of three quarters, or an inch diameter.

The rod may be faſtened to the wall, chimney, *&c.* with ſtaples of iron.—The lightning will not leave the rod (a good conductor) to paſs into the wall (a bad conductor) through thoſe ſtaples.—It would rather, if any were in the wall, paſs out of it into the rod to get more readily by that conductor into the earth.

If the building be very large and extenſive, two or more rods may be placed at different parts, for greater ſecurity.

Small ragged parts of clouds ſuſpended in the air between the great body of clouds and the earth (like leaf-gold in electrical experiments), often ſerve as partial conductors for the lightning, which proceeds from one of them to another, and by their help comes within the ſtriking diſtance to the earth or a building. It therefore ſtrikes through thoſe conductors a building that would otherwiſe be out of the ſtriking diſtance.

Long ſharp points communicating with the earth, and preſented to ſuch parts of clouds, drawing ſilently from them the fluid they are charged with, they are then attracted to the cloud, and may leave the diſtance ſo great as to be beyond the reach of ſtriking.

It is therefore that we elevate the upper end of the rod ſix or eight feet above the higheſt part of the building, tapering it gradually to a fine ſharp point, which is gilt to prevent its ruſting.

Thus the pointed rod either prevents a ſtroke from the cloud, or, if a ſtroke is made, conducts it to the earth with ſafety to the building.

The lower end of the rod ſhould enter the earth ſo deep as to come at the moiſt part, perhaps two or three feet; and if bent when under the ſurface ſo as to go in a horizontal line ſix or eight feet from the wall, and then bent again downwards three or four feet, it will prevent damage to any of the ſtones of the foundation.

A perſon apprehenſive of danger from lightning, happening during the time of thunder to be in a houſe not ſo ſecured, will do well to avoid ſitting near the chimney, near a looking-glaſs, or any gilt pictures or wainſcot; the ſafeſt place is in the middle of the room, (ſo it be not under a metal luſtre ſuſpended by a chain), ſitting in one chair and laying the feet up in another. It is ſtill ſafer to bring two or three matraſſes or beds into the middle of the room, and folding them up double, place the chair upon them; for they not being ſo good conductors as the walls, the lightning will not chuſe an interrupted courſe through the air of the room and the bedding, when it can go thro' a continued better conductor, the wall. But where it can be had, a hamock or ſwinging bed, ſuſpended by ſilk cords equally diſtant from the walls on every ſide, and from the cieling and floor above and below, affords the ſafeſt ſituation a perſon can have in any room whatever; and what indeed may be deemed quite free from danger of any ſtroke by lightning.

In order to ſecure ſhips from ſuſtaining damage by lightning, a copper road, about the thickneſs of a gooſe quill, ſhould be connected with the ſpindles and iron work of the maſts, continued down to the deck, and from thence, in the moſt convenient direction, till the end of the rod be always in contact with the ſea-water.

With regard to powder-mills and magazines, the apparatus to conduct the lightning from them ſhould be detached from the buildings themſelves, and conveyed to the neareſt water.

Of Medical Electricity.

THE firſt application of electricity to the cure of diſeaſes was made by M. Jallabert, profeſſor of philoſophy at Geneva, on a lockſmith whoſe right arm had been paralytic fifteen years. He was brought to M. Jallabert on the 26th of December 1747, and was compleatly cured by the 28th of February 1748. In this interval he was frequently electrified, ſparks being taken from the arm, and ſometimes the electrical ſhock ſent through it.

The report of this cure at Geneva, engaged Mr Sauvages of the academy in Montpelier to attempt the cure of paralytics, in which he had conſiderable ſucceſs.

In the year 1757, Mr Patrick Bryden, in a few days, performed a compleat cure of a hemiplegia, and indeed an almoſt univerſal paralytic affection of two years continuance.

Dr Hart, Dr Wilſon, Mr Lovet, Mr Weſley, and many others, relate a number of caſes wherein the palſy was either cured or mitigated by electricity.

Dr Watſon cured an univerſal tetanus, in the year 1762, by electrifying the patient, at proper intervals, for three months.

Dr Franklin and others mention ſome paralytic caſes, in which electricity ſeemed rather to make the patient worſe than better.

Mr Wilſon cured a woman of a deafneſs of ſeventeen years ſtanding.—And Mr Lovet conſiders electricity as a ſpecific in all caſes of violent pains, obſtinate headachs, the ſciatica, and the cramp. The toothach, he ſays, is generally cured by it in an inſtant. He relates a caſe, from Mr Floyer ſurgeon at Dorcheſter, of a compleat cure of a gutta ſerena; and another of obſtinate obſtructions in two young women.

De Haen ſays, that he never failed to cure St Vitus's dance by electricity; and found it of uſe in ſome caſes of deafneſs.

Hitherto electricity has been generally applied to the human body either in the method of drawing ſparks, as it is called, or of giving ſhocks. But theſe operations are both violent, and though the ſtrong concuſſion may ſuit ſome caſes, it may be of diſſervice in others, where a moderate ſimple electrification might have been of uſe.

The great objection to this method is the tedioufneſs and expence of the application. But an electrical machine might be contrived to go by wind or water, and a convenient room might be annexed to it; in which a floor might be raiſed upon electrics, a perſon might ſit down, read, ſleep, or even walk about during the electrification. It were to be wiſhed, that ſome phyſician of underſtanding and ſpirit would provide himſelf with ſuch a machine and room. No harm could poſſibly be apprehended from electricity, applied in this gentle and inſenſible manner, and good effects are at leaſt poſſible, if not highly probable.

ELE

ELECTRUM, in natural hiſtory. See Amber.

ELECTUARY, in pharmacy, a form in which both officinal and extemporaneous medicines are frequently made.

It may be conſidered as a number of boluſes united together, but is made ſomewhat ſofter by an addition of a due proportion of preſerves or ſyrups. When the conſiſtence is very ſoft, it is called ſometimes by the name of opiata.

The principal conſideration in preſcribing officinal electuaries is, that ſuch things only be put together as will not, by any oppoſite qualities, deſtroy one another, or loſe their natural properties by lying long in this manner; and likewiſe that the whole be of a conſiſtence that will hold ingredients of different gravities in equal mixture.

ELEEMOSYNÆ, and Eleemosynarius. See Alms, and Almoner.

ELEGANCE, or Elegancy, an ornament of politeneſs and agreeableneſs ſhewn in any diſcourſe, with ſuch a choice of rich and happy expreſſions, as to riſe politely above the common manners, ſo as to ſtrike people of a delicate taſte.

It is obſerved that elegance, though irregular, is preferable to regularity without elegance: that is, by being ſo ſcrupulous of grammatical conſtruction, we loſe certain licences wherein the elegance of language conſiſts.

ELEGIAC, in ancient poetry, any thing belonging to elegy. See Elegy.

Elegiac verſes are alternately hexameter and pentameter, as in the following verſes of Ovid. See Hexameter.

Flebilis indignos, elegeia, ſolve capillos:
Ah nimis ex vero nunc tibi nomen erit.

Who was the inventor of elegiac poetry is not known. Horace profeſſes himſelf quite ignorant of it. The principal writers of elegiac verſe, among the Latins, were Propertius, Ovid, and Tibullus, the latter whereof Quinctilian eſteems the beſt elegiac poet; but Pliny the younger gives the preference to the firſt: the chief writers of elegy among the Greeks were Callimachus, Parthenius, and Euphorion.

ELEGIT, in law, a writ of execution, which lies for a perſon who has recovered debt or damages; or upon a recognizance in any court, againſt a defendant that is not able to ſatisfy the ſame in his goods.

ELEGY, a mournful and plaintive kind of poem. See Elegiac.

As elegy, at its firſt inſtitution, was intended for tears, it expreſſed no other ſentiments, it breathed no other accents but thoſe of ſorrow: with the negligence natural to affliction, it ſought leſs to pleaſe than to move; and aimed at exciting pity, not admiration. By degrees, however, elegy degenerated from its original intention, and was employed upon all ſorts of ſubjects, gay or ſad, and eſpecially upon love. Ovid's book of Love, the poems of Tibullus and Propertius, notwithſtanding they are termed elegies, are ſometimes ſo far from being ſad, that they are ſcarce ſerious. The chief ſubjects then to which elegy owes its riſe, are death and love: that elegy therefore ought to be eſteemed the moſt perfect in its kind which has ſomewhat of both at once; ſuch, for inſtance, where the poet bewails the death of ſome youth or damſel falling a martyr to love.

ELEMENT, a term uſed by philoſophers to denote the original component parts of bodies, or thoſe into which they are ultimately reſolvable. See Chemistry, Vol. II. p. 66.

Element, in a figurative ſenſe, is uſed for the principles and foundations of any art or ſcience, as Euclid's Elements, *&c.*

ELEMI, or Elemy, in the materia medica, a kind of reſin, very improperly called gum-elemi. There are two ſorts of it kept in the ſhops; the one genuine, and brought from Ethiopia; the other ſpurious, and the produce of America. The true kind is a yellowiſh reſin, with a caſt of green and white; its ſmell is acrid and pleaſant, and its taſte acrid and bitter. It is very inflammable, and readily diſſolves in oil and other fat ſubſtances over the fire; which two characters alone ſufficiently diſtinguiſh it from the gums: but this genuine elemi is very rare in Europe.

The ſpurious elemi is a whitiſh reſin, produced from a tall tree, with pinnated leaves, not unlike thoſe of the pear-tree. It is in ſome degree pellucid, and of a fragrant ſmell. It is only uſed externally, being greatly recommended for reſolving tumours, deterging ulcers, wounds, *&c.*

ELENCHUS, in logic, a ſophiſm, or fallacious argument, which deceives the hearer under the appearance of truth. See SOPHISM.

ELEPHANT, in zoology. See ELEPHAS.

Knights of the ELEPHANT, an order of knighthood in Denmark, conferred upon none but perſons of the firſt quality and merit. It is alſo called the order of St Mary. Its inſtitution is ſaid to have been owing to a gentleman among the Daniſh croiſees having killed an elephant, in an expedition againſt the Saracens, in 1184; in memory of which king Canutus inſtituted this order, the badge of which is a towered elephant, with an image of the holy virgin encircled with rays, and hung on a watered ſky-coloured ribbon, like the George in England.

ELEPHANTIASIS, called alſo the lepra of the Arabians, in medicine, a chronical diſeaſe, one of the two ſpecies of leproſy, which affects the whole body, where even the bones as well as the ſkin are covered with ſpots and tumours, which being red, at laſt turn black. See MEDICINE.

ELEPHANTINE, in Roman antiquity, an appellation given to the books wherein were regiſtered the tranſactions of the ſenate and magiſtrates of Rome, of the emperors or generals of armies, and even of the provincial magiſtrates; the births and claſſes of the people, and other things relating to the cenſus.

They are ſuppoſed to have been ſo called as being made of ivory; though ſome will have them to have been written on the inteſtines of elephants.

ELEPHANTOPUS, in botany, a genus of the ſyngeneſia polygamia ſegregata claſs. The receptacle is naked; the corolla is divided into five ſegments; the calix is imbricated; and the pappus has ſeveral ariſtæ. There are two ſpecies, both natives of the Indies.

ELEPHAS, or the ELEPHANT, in zoology, a genus of quadrupeds belonging to the order of bruta. The characters are theſe: The elephant has no fore-teeth in either jaw, and the dog-teeth are very long: The proboſcis, or trunk, is long, and capable of laying hold of any thing; and the body is ſomewhat naked.

The elephant is the largeſt of all land-animals. From the front to the origin of the tail he is generally about 16 feet long, from the end of the trunk 25 feet, and about 14 feet high. The circumference of the neck is 17 feet, and the circumference of the body at the groſſeſt part 25 feet 10 inches; the tail is about 6 feet long, and $2\frac{1}{2}$ in circumference. The circumference of the legs is about 6 feet. The eyes are ſmall in proportion to the ſize of the animal. The muzzle is very different from that of any other quadruped; it is nothing but the origin of a long trunk which hangs between the two large tuſks; the mouth appears behind the trunk, which ſerves in place of an upper lip, and the under lip terminates in a point. The tail is ſhort, and ſmall in compariſon of the trunk, which has the appearance of a long thick tail placed before. The feet are ſhort, round, clumſy, and only diſtinguiſhable by the toes. The trunk is, properly ſpeaking, the noſe extended, and terminated by a couple of noſtrils. But, beſides ſerving as an organ of ſmell, the trunk performs all the functions of a ſtrong and dextrous arm. The trunk of an elephant is about 8 feet long, $5\frac{1}{2}$ feet in circumference near the mouth, and one foot and a half near the extremity: It is a pipe of an irregular conical figure, and widened at the end: The ſuperior ſide of the trunk is convex, and furrowed tranſverſely; and the inferior ſide is flat, and has two longitudinal rows of ſmall protuberances reſembling the tentacula of the ſilk-worm and moſt other caterpillars. The upper part of the trunk correſponds with the extremity of the noſe in other quadrupeds, and anſwers the ſame intention; the inferior part ſerves as an upper lip, including the noſtrils at the ſame time; for the trunk is a continued canal, divided into two cavities by a longitudinal partition; theſe cavities aſcend along the forepart of the upper jaw, where they make a turn inward and deſcend into the palate, and then terminate in two ſeparate orifices; they have likewiſe each a ſeparate orifice at the end of the trunk. At the place where theſe cavities make a turn, and before they enter into the bones of the head, there is a moveable cartilaginous plate ſituate in ſuch a manner as enables the elephant to ſhut the canal, and to prevent the water with which it occaſionally fills the trunk from entering into the paſſage of the noſe where the organs ſerving for the ſenſation of ſmell are placed. The elephant can move the trunk in all directions; he can extend or ſhorten it at pleaſure, without altering the diameters of the two canals within. By this means reſpiration is not interrupted, whatever be the ſituation of the trunk; and the water is allowed to remain till the animal chuſes to throw it out by an expiration. Each canal is lined with a ſmooth ſtrong membrane, and the ſurface of the trunk is covered with another ſtrong membrane or ſkin. The ſubſtance contained between the exterior and interior membranes, is a compoſition of longitudinal and tranſverſe muſcles, which ſerve to extend and contract the length of the trunk. At the extremity of the trunk there is a concave protuberance, in the bottom of which are the two paſſages of the noſtrils. The inferior part of the protuberance is thicker than the ſides, and the ſuperior part is ſtretched out like a finger about five inches long; which, together with the edges of the whole extremity of the trunk, takes on different figures according to the neceſſities of the animal. It is by this organ that the animal lays hold of food, or other ſubſtances, which he manages with as much dexterity as a man does his hand, taking up grains of corn, or the ſmalleſt piles of graſs, and conveying them to his mouth. When he drinks he thruſts his trunk into the water, and fills it by drawing in his breath, and exhauſting the air:

When the trunk is thus filled with water, he can either throw it out to a great diſtance, or drink it by putting the end of the trunk in his mouth.

The two large tuſks, which ſome call the horns of the elephant, are of a yellowiſh colour, and extremely hard. The bony ſubſtance of which they are compoſed is known by the name of ivory, and much uſed in different branches of manufacture.

The ears are very large, and reſemble thoſe of an ape. The ſkin of the elephant has but few hairs on it, and placed at great diſtances from each other. It is full of wrinkles, like thoſe on the palm of a man's hand, beſides many chaped and greaſy ridges. The female has two dugs, one on each ſide of the breaſt. The parts of generation are ſmall in proportion to thoſe of other animals. The penis reſembles that of a horſe. The female organ is ſituate near the middle of the belly, more than two feet diſtant from the uſual ſituation in other quadrupeds: When they copulate, the female lies down on her back.

Elephants, even in a ſavage ſtate, are peaceable and gentle creatures. They never uſe their weapons but in defence of themſelves or companions. Their ſocial diſpoſitions are ſo ſtrong, that they are ſeldom found alone, but march always in large troops; the oldeſt and moſt experienced lead the van; the younger, or lame ones, keep in the middle; and thoſe of a ſecond rate, as to age, walk in the rear. The females carry their young on their tuſks, embracing them at the ſame time with their trunk. They ſeldom march in this regular order but when they reckon the journey dangerous, ſuch as an expedition to cultivated lands, where they expect to meet with reſiſtance. On other occaſions they are leſs cautious, ſome of them falling behind or ſeparating from the reſt, but ſeldom ſo far as to be without the reach of aſſiſtance by alarming and aſſembling their companions. It is only theſe wanderers that the hunters dare attack; for it would require a whole army to aſſail a troop of them; and even an army would be unable to conquer them without loſing a number of lives. It is dangerous to offer them the leaſt injury; for they run ſtraight upon the offender; and, although the weight of their body be great, their ſteps are ſo large, that they eaſily outrun the ſwifteſt man, whom they either pierce with their tuſks or ſeize with their trunk, dart him in the air like a ſtone, and then trample him under their feet. But they never attack any perſon, unleſs when provoked. However, as they are extremely ſenſible and delicate with regard to injuries, it is always prudent to keep out of their way. Travellers who frequent theſe countries kindle large fires, and beat drums during the night, in order to prevent their approach. After being once attacked by men, or falling into any ambuſh, they are ſaid never to forget the injury, but ſearch for every opportunity of getting revenge. As they are endowed perhaps with a more exquiſite ſenſation of ſmell than any other animal, owing to the great extent of their noſe, they can ſcent a man at a very great diſtance, and trace him by his footſteps.

Elephants are peculiarly fond of the banks of rivers, deep valleys, and marſhy grounds, eſpecially when well ſhaded with trees. They delight in drawing up water into their trunks, even when they do not drink it, and amuſe themſelves in daſhing the water around. They cannot endure cold, and are equally averſe to an exceſs of heat: In order to avoid the ſcorching heat of the ſun, they retire to the thickeſt and moſt ſhady parts of the foreſt. The bulk of their bodies is ſo enormous, that they do not chuſe to go into deep waters ſo frequently as ſome other quadrupeds; although the length of their trunk, which they raiſe ſtraight up, and by which they reſpire, is a great advantage in ſwimming.

The ordinary food of elephants is roots, herbs, leaves, the tender branches of trees, fruits, and grains: but they abhor fleſh or fiſh. When any of them diſcovers a fine paſture, he immediately calls and invites his companions to come and eat with him. As they devour a large quantity of food in a ſhort time, they are always ſhifting their paſture; when they meet with cultivated grounds, they make a prodigious deſolation, and deſtroy more plants by their feet than they uſe for nouriſhment, which is very conſiderable, amounting to 150 pounds of herbage every day; by this means, as they conſtantly graze in large troops, they lay waſte whole fields in an hour. The Indians and negroes employ every art to prevent them from viſiting their cultivated lands, making great noiſe, and burning large fires round their fields. However, theſe precautions are not always ſufficient to prevent the elephants from viſiting them. They chaſe away the domeſtic animals, put the men to flight, and ſometimes even throw down their timber huts. Elephants are hardly ſuſceptible of fear; the only things which can ſurpriſe them, or ſtop their courſe, are artificial fires, ſuch as ſquibs, crackers, *&c.* the effects of which are ſo ſudden and ſo quickly repeated, that the elephants frequently turn back; and when one runs, all the reſt inſtantly follow his example.

Although the ſocial diſpoſition in the elephant be exceeding ſtrong; yet whenever the females come in ſeaſon, it immediately gives place to the ſtronger and more intereſting paſſion of love. They obſerve the greateſt delicacy in their amours, abhorring nothing ſo much as to be ſeen by their companions. The troop divide themſelves into couples, ſteal off into the moſt ſecret places of the foreſt, and then give way to all the impulſes of nature, which are lively and laſting in proportion to the long period of abſtinence; for the female goes with young two years, and it is only once in three years that the ſeaſon of love returns. They bring forth but one at a time, which, as ſoon as it comes into the world, is as large as a wild boar, and is furniſhed with teeth; however, the large tuſks do not make their appearance till ſome time after, and at the age of ſix months they are ſeveral inches long. Elephants of this age are as large as an ox, when in a natural ſtate. But it is incredible how they degenerate when inſlaved and under the management of men. Their diſguſt and chagrine for the loſs of liberty ſeems never to depart from their minds. In this ſtate, though they feel, at the proper ſeaſons, the ſtrongeſt deſires for the ſex, no art can allure them to copulate: but the natural paſſion, reſtrained by an exceſs of modeſty, burſts out into ſuch violent fits of fury and reſentment, that the ſtrongeſt chains are hardly ſufficient to command them. This is a ſtriking difference betwixt the elephant and moſt other tamed animals. It is only the individual that we can enſlave; the ſpecies, in ſpite of all our endeavours, ſtill retain their original freedom and independence.

The manner of taking and taming the elephant, therefore, merits our attention. In foreſts and ſuch places as are frequented by elephants, the Indians chuſe a ſpot and incloſe it with ſtrong palliſades; they uſe the largeſt trees as the principal ſtakes, to which are fixed ſmaller ones in a tranſverſe direction. Theſe croſs-trees are fixed ſo as to allow a man to paſs eaſily through. There is likewiſe a large port left for the elephant, over which is ſuſpended a ſtrong barrier, which is let down as ſoon as he enters. In order to decoy him into the incloſure, the hunters take along with them a tame female in ſeaſon, and travel about till they come ſo near as that the cry of the female can reach a male, whom they previouſly obſerve in the foreſt; then the guide of the female makes her give the cry peculiar to the ſeaſon of love: the male inſtantly replies, and ſets out in queſt of her. The guide then makes the female proceed toward the artificial incloſure, repeating her cries from time to time as ſhe goes along. She enters into the incloſure, the male follows her, and the Indians immediately ſhut the port behind him. He no ſooner diſcovers the hunters, and that he is incloſed, than his paſſion for the ſex is converted into rage and fury. The hunters entangle him with ſtrong ropes; they fetter his legs and trunk; they bring two or three tame elephants in order to pacify and reconcile him to his condition. In a word, they reduce them to obedience in a few days, by a proper application of torture, and careſſes. There are many other methods of catching elephants. Inſtead of making large incloſures with palliſades, like the kings of Siam, and other monarchs, the poor Indians content themſelves with a very ſimple apparatus: they dig deep pits in the roads frequented by elephants, covering them over with branches of trees, turf, *&c.* When an elephant falls into one of theſe pits, he is unable to get out again.

The elephant, when tamed, is the moſt friendly and obedient of all animals: he is entirely attached to the perſon who feeds and takes care of him. In a ſhort time he underſtands ſigns, and the ſound of his maſter's voice. He diſtinguiſhes the language of paſſion, of command, of ſatisfaction, and acts accordingly. He receives his orders with attention, and executes them with prudence and alacrity, but without precipitation. He eaſily learns to bow his knees and lower his body, for the convenience of thoſe who mount him. He careſſes his friends with his trunk. He lifts burdens with his trunk, and aſſiſts thoſe who are loading him in laying them on his back. He delights in ſhining harneſs and trappings. When yoked in a cart or waggon, he pulls equally and chearfully, unleſs he be abuſed by injudicious chaſtiſements. His guide is generally mounted on his neck, with a ſmall rod of iron ſharp at the point in his hand; he directs his motion by pricking him on the ears and head; but, for the moſt part, a word is ſufficient.

A tame elephant will do more labour than ſix horſes; but then he requires a proportional quantity of food. They are the principal beaſts of burden in many parts of Africa and the Eaſt Indies. They carry ſacks and bundles of all kinds on their neck, back, and tuſks. They never loſe or damage any thing committed to their care: They will ſtand on the edge of a river, take bundles off their necks and tuſks, lay them carefully in a boat wherever they are deſired, and try with their trunk whether they are properly ſituate; if they be loaded with caſks, they go in queſt of ſtones to prop them and prevent them from rolling.

From the earlieſt accounts in hiſtory, the eaſtern nations have employed elephants in war; Alexander the Great was the firſt European who ever mounted an elephant. He carried a number of them into Greece, which Pyrrhus employed ſome years after againſt the Romans at the battle of Tarentum. Both the Greeks and Romans ſoon learnt to get the better of theſe monſtrous animals, they opened their ranks and allowed them to paſs through; neither did they attempt to hurt them, but threw darts, *&c.* at their guides. Now that fire-arms are the principal inſtruments of war, elephants, who are terrified at the noiſe and flame, inſtead of being uſeful, would only tend to embarraſs and confuſe an army. However, in Cochin and other parts of Malabar, as alſo in Tonquin, Siam, and Pegu, where fire-arms are little underſtood, they are ſtill uſed in battle. The guide ſits aſtride upon the neck, and the combatants ſit or ſtand upon the other parts of the body.

When the elephant is properly managed, he lives very long even in a ſtate of ſlavery and labour. That ſome have lived in this ſtate 130 years, is pretty well authenticated. In a natural ſtate, they often exceed 200 years, and propagate their ſpecies till they be 120: It is 30 years before they come to their full growth. [Plate LXXIV. fig. 3.]

ELEVATION, the ſame with altitude or height. See Altitude.

Elevation *of the hoſt*, in the church of Rome, that part of the maſs where the prieſt raiſes the hoſt above his head for the people to adore. See Mass and Host.

ELEVATOR, in anatomy, the name of ſeveral muſcles, ſo called from their ſerving to raiſe the parts of the body to which they belong. See Anatomy, Part II.

ELEVATORY, in ſurgery, an inſtrument for raiſing depreſſed or fractured parts of the ſcull, to be applied after the integuments and perioſteum are removed. See Surgery.

ELEUSINIA, in Grecian antiquity, a feſtival kept in honour of Ceres, every fourth year by ſome ſtates, but by others every fifth. The Athenians celebrated it at Eleuſis, a town of Attica, whence the name.

It was celebrated with a world of ceremony, and perſons of both ſexes were initiated in it; it being deemed impious to neglect doing ſo. The myſteries were of two ſorts, the leſſer, and the greater; whereof the former were ſacred to Proſerpine, Ceres's daughter, and the latter to Ceres herſelf. According to Lactantius, they conſiſted in a myſtical repreſentation of what mythologiſts teach of Ceres; though ſome of the Chriſtian fathers will have the great myſtery, or ſecret, which they were forbidden by law, upon pain of death, to divulge, to have been the repreſentation or figures of both male and female privities, which were handed about and expoſed to the company.

ELEUTHERIA, another feſtival celebrated at Platæa, by delegates from almoſt all the cities of Greece, in honour of Jupiter Eleutherius, or the aſſertor of liberty.

It was inſtituted in memory of the victory obtained by the Grecians, in the territories of Platæa, over Mardonius, the Perſian general, left by Xerxes with a mighty army to ſubdue Greece.

ELF, a term now almoſt obſolete, formerly uſed to denote a fairy, or hobgoblin, an imaginary being, the creature of ignorance, ſuperſtition, and craft. See Fairy.

Elf-Arrows, in natural hiſtory, a name given to the flints, anciently faſhioned into arrow-heads, and ſtill found foſſile in Scotland, America, and ſeveral other parts of the world; they are believed by the vulgar to be ſhot by fairies, and that cattle are ſometimes killed by them.

ELGIN, the capital of the county of Murray, in Scotland, ſituated on the river Loſey, about ſix miles north of the Spey: W. long. 2° 25′, N. lat. 57° 40′.

ELIQUATION, in metallurgy, a ſeparation of the different parts of mixed bodies, by the different degrees of fire required to melt them. See Chemistry.

ELISION, in grammar, the cutting off, or ſuppreſſing a vowel at the end of a word, for the ſake of ſound, or meaſure, the next word beginning with a vowel.

Eliſions are pretty frequently met with in Engliſh poetry, but more frequently in the Latin, French, *&c.* They chiefly conſiſt in ſuppreſſions of the *a*, *e*, and *i*, though an eliſion ſuppreſſes any of the other vowels.

ELIXATION, in pharmacy, the extracting the virtues of ingredients by boiling or ſtewing.

ELIXIR, in medicine, a compound tincture extracted from many efficacious ingredients. Hence the difference between a tincture and an elixir ſeems to be this; that a tincture is drawn from one ingredient, ſometimes with an addition of another to open it, and to diſpoſe it to yield to the menſtruum; whereas an elixir is a tincture extracted from ſeveral ingredients at the ſame time. See Tincture.

ELK, in zoology. See Cervus.

ELKHOLM, a port-town of Gothland, in Sweden, twenty-four miles weſt of Carelſcroon.

ELL, a meaſure of length, different in different countries; but thoſe moſtly uſed, are the Engliſh and Flemiſh ells; whereof the former is three feet nine inches, or one yard and a quarter; and the latter only twenty-ſeven inches, or three quarters of a yard. In Scotland, the ell contains $37\frac{2}{10}$ Engliſh inches.

ELLERENA, a town of Eſtremadura, in Spain, fifty miles ſouth eaſt of Merida.

ELLIPSIS, in geometry. See Conic Sections.

Ellipsis, in grammar, a figure of ſyntax, wherein one or more words are not expreſſed; and from this deficiency, it has got the name ellipſis.

The ellipſis, properly ſo called, is when the deficient word or words muſt be ſupplied from elſewhere; as *Hectoris Andromache*, where *uxor* is underſtood; that is, Andromache, Hector's wife.

ELLIPTIC, or Elliptical, ſomething belonging to an ellipſis.

ELLIPOMACHROSTYLA, in natural hiſtory, a genus of imperfect cryſtals, with ſingle pyramids; one end of their column being affixed to ſome ſolid body. They are dodecahedral, with thinner hexangular columns and hexangular pyramids.

Of theſe cryſtals, authors enumerate a great many ſpecies; among which are the whitiſh pellucid ſprig cryſtal, a bright brown kind, a dull brown kind, and a bright yellow kind, all which are farther diſtinguiſhed according to the different lengths of their pyramids.

ELLIPOPACHYSTYLA, in natural hiſtory, a genus of imperfect cryſtals, compoſed of twelve planes, in an hexangular column, terminated by an hexangular pyramid at one end, and irregularly affixed to ſome other body at the other, with ſhorter columns.

There are two ſpecies of theſe cryſtals, one ſhort, bright and colourleſs, found in great plenty in New Spain and other parts of America; the other, a ſhort, dull, and duſky brown one, found in Germany, and ſometimes in England.

ELM, in botany. See Ulmus.

ELNA, a town of Catalonia in Spain, but ſubject to France, ſituated ten miles ſouth of Perpignan.

ELOCUTION, in rhetoric, the adapting words and ſentences to the things or ſentiments to be expreſſed. It conſiſts of elegance, compoſition, and dignity. The firſt comprehending the purity and perſpicuity of a language, is the foundation of elocution; the ſecond ranges the words in proper order; and the laſt adds the ornaments of tropes and figures to give ſtrength and dignity to the whole.

ELODES, in botany. See Hypericum.

ELOGY, a praiſe or panegyric beſtowed on any perſon or thing, in conſideration of its merit. The beauty of elogy conſiſts in an expreſſive brevity. Eulogiums ſhould not have ſo much as one epithet, properly ſo called, nor two words ſynonymous; they ſhould ſtrictly adhere to truth; for extravagant and improbable elogies rather leſſen the character of the perſon or thing they would extol.

ELOINED, in law, ſignifies reſtrained or hindered from doing ſomething: thus it is ſaid, that if thoſe within age be eloined, ſo that they cannot ſue perſonally, their next friend ſhall ſue for them.

ELONGATION, in aſtronomy, the digreſſion or receſs of a planet from the ſun, with reſpect to an eye placed on our earth. See Astronomy.

Elongation, in ſurgery, is an imperfect luxation, occaſioned by the ſtretching or lengthening of the ligaments of any joint.

ELOPEMENT, in law, is where a married woman departs

parts from her huſband, and cohabits with an adulterer; in which caſe the huſband is not obliged to allow her any alimony out of his eſtate, nor is he chargeable for neceſſaries for her of any kind.

ELOPS, in ichthyology, a genus of the order of abdominales. The head is ſmooth, and the teeth are in the margin of the jaws and the palate; there are thirty rays in the branchioſtege membrane. There is but one ſpecies, *viz.* the ſavrus, with a tail armed both above and below. It is a native of Carolina.

ELOQUENCE, the art of ſpeaking well, ſo as to affect and perſuade.

Cicero defines it, the art of ſpeaking with copiouſneſs and embelliſhment.

Eloquence and rhetoric differ from each other, as the theory from the practice; rhetoric being the art which deſcribes the rules of eloquence, and eloquence that art which uſes them to advantage

ELSINORE, a port-town of Denmark, about twenty-two miles north of Copenhagen, and ſituated on the Sound or the entrance into the Baltic ſea.

ELVAS, a city and biſhop's ſee of Alentejo, in Portugal, ſituated near the frontiers of Spaniſh Eſtremadura: W. long. 7° 35′, and N. lat. 38° 45′.

It is one of the ſtrongeſt fortreſſes in Portugal.

ELUL, in ancient chronology, the twelfth month of the Jewiſh civil year, and the ſixth of the eccleſiaſtical: it conſiſted of only twenty-nine days, and anſwered pretty nearly to our Auguſt.

ELUTRIATION, the ſeparating the lighter matters from the mixt ores of metals, by means of great quantities of fair water. See CHEMISTRY.

ELY, a city and biſhop's ſee of Cambridgeſhire, ſituated about twelve miles north of Cambridge: E. long. 15′, and N. lat. 52° 24′.

It is a county of itſelf, including the territory around, and has a judge who determines all cauſes civil and criminal within its limits.

ELYMUS, in botany, a genus of the tetrandria digynia claſs. The involucrum conſiſts of two leaves; and the ſpiculæ are double. There are eight ſpecies, only one of which, *viz.* the arenarius, or ſea lyme graſs, is a native of Britain.

ELYSIUM, or ELYSIAN FIELDS, in heathen mythology, certain plains abounding with woods, fountains, verdure, and every delightful object; ſuppoſed to be the habitation of heroes and good men after death.

According to ſome, the fable of Elyſium is of Phœnician extraction, or rather founded upon the account of paradiſe delivered in the Scriptures.

ELYTROIDES, or VAGINALES, in anatomy. See Vol I. p. 270.

EMANATION, the act of flowing or proceeding from ſome ſource or origin; or, the thing that proceeds from that action.

EMANCIPATION, in the Roman law, the ſetting free a ſon from the ſubjection of his father; ſo that whatever moveables he acquires belong in property to him, and not to his father as before emancipation.

Emancipation puts the ſon in capacity of managing his own affairs, and of marrying without his father's conſent, though a minor. Emancipation differs from manumiſſion, as the latter was the act of a maſter in favour of a ſlave, whereas the former was that of a father in favour of his ſon.

There were two kinds of emancipation; the one tacit, which was by the ſons being promoted to ſome dignity, by his coming of age, or by his marrying, in all which caſes he became his own maſter of courſe.

The other, expreſs; where the father declared before a judge, that he emancipated his ſon. In performing this, the father was firſt to ſell his ſon imaginarily to another, whom they called *pater fiduciarius*, father in truſt, of whom being bought back again by the natural father, he manumitted him before the judge by a verbal declaration.

Emancipation ſtill obtains in France with regard to minors or pupils, who are hereby ſet at liberty to manage their own effects, without the advice or direction of their parents or tutors.

EMARGINATED, amongſt botaniſts. See Vol. I. p. 640.

EMASCULATION, the act of caſtrating or depriving a male of thoſe parts which characteriſe his ſex. See CASTRATION.

EMBALMING, is the opening a dead body, taking out the inteſtines, and filling the place with odoriferous and deſiccative drugs and ſpices, to prevent its putrifying. The Egyptians excelled all other nations in the art of preſerving bodies from corruption; for ſome that they have embalmed upwards of two thouſand years ago, remain whole to this day, and are often brought into other countries as great curioſities. Their manner of embalming was thus: they ſcooped out the brains with an iron ſcoop, out at the noſtrils, and threw in medicaments to fill up the vacuum: they alſo took out the entrails, and, having filled the body with myrrh, caſſia, and other ſpices, except frankincenſe, proper to dry up the humours, they pickled it in nitre, where it lay ſoaking for ſeventy days. The body was then wrapped up in bandages of fine linen and gums, to make it ſtick like glue, and ſo was delivered to the kindred of the deceaſed, entire in all its features, the very hairs of the eye-lids being preſerved. They uſed to keep the bodies of their anceſtors, thus embalmed, in little houſes magnificently adorned, and took great pleaſure in beholding them, alive as it were, without any change in their ſize, features, or complexion. The Egyptians alſo embalmed birds, *&c.* The prices for embalming were different; the higheſt was a talent, the next twenty minæ, and ſo decreaſing to a very ſmall matter: but they who had not wherewithal to anſwer this expence, contented themſelves with infuſing, by means of a ſyringe, thro' the fundament, a certain liquor extracted from the cedar, and leaving it there wrapped up the body in ſalt of nitre: the oil thus preyed upon the inteſtines, ſo that when they took it out, the inteſtines came away with it, dried, and not in the leaſt putrified: the body being incloſed in nitre, grew dry, and nothing remained beſides the ſkin glued upon the bones.

EMBARGO, in commerce, in arreſt on ſhips, or merchandiſe,

chandiſe, by public authority; or a prohibition of ſtate, commonly on foreign ſhips, in time of war, to prevent their going out of port, ſometimes to prevent their coming in, and ſometimes both, for a limited time.

The king may lay embargoes on ſhips, or employ thoſe of his ſubjects, in time of danger, for ſervice and defence of the nation; but they muſt not be for the private advantage of a particular trader, or company; and therefore a warrant to ſtay a ſingle ſhip is no legal embargo. No inference can be made from embargoes which are only in war time; and are a prohibition by advice of council, and not at proſecution of parties. If goods be laden on board, and after an embargo or reſtraint from the prince or ſtate comes forth, and then the maſter of the ſhip breaks ground, or endeavours to ſail, if any damage accrues, he muſt be reſponſible for the ſame; the reaſon is, becauſe his freight is due, and muſt be paid, nay though the goods be ſeized as contraband.

Embargo differs from quarantine, inſomuch as this laſt is always for the term of forty days, in which perſons from foreign parts, infected with the plague, are not permitted to come on ſhore. See Quarantine.

EMBASSADOR, or Ambassador, a public miniſter ſent from one ſovereign prince, as a repreſentative of his perſon, to another.

Embaſſadors are either ordinary or extraordinary. Embaſſador in ordinary, is he who conſtantly reſides in the court of another prince, to maintain a good underſtanding, and look to the intereſt of his maſter. Till about two hundred years ago, embaſſadors in ordinary were not heard of; all, till then, were embaſſadors extraordinary, that is, ſuch as are ſent on ſome particular occaſion, and who retire as ſoon as the affair is diſpatched.

By the law of nations, none under the quality of a ſovereign prince can ſend or receive an embaſſador. At Athens, embaſſadors mounted the pulpit of the public orators, and there opened their commiſſion, acquainting the people with their errand. At Rome, they were introduced to the ſenate, and delivered their commiſſions to them.

Embaſſadors ſhould never attend any public ſolemnities, as marriages, funerals, *&c.* unleſs their maſters have ſome intereſt therein: nor muſt they go into mourning on any occaſions of their own, becauſe they repreſent the perſons of their prince. By the civil law, the moveable goods of an embaſſador, which are accounted an acceſſion to his perſon, cannot be ſeized on, neither as a pledge, nor for payment of a debt, nor by order or execution of judgment, nor by the king's or ſtate's leave where he reſides, as ſome conceive; for all actions ought to be far from an ambaſſador, as well that which toucheth his neceſſaries, as his perſon: if, therefore, he hath contracted any debt, he is to be called upon kindly, and if he refuſes, then letters of requeſt are to go to his maſter. Nor can any of the embaſſador's domeſtic ſervants that are regiſtered in the ſecretaries of ſtate's office be arreſted in perſon or goods: if they are, the proceſs ſhall be void, and the parties ſuing out and executing it ſhall ſuffer and be liable to ſuch penalties and corporal puniſhment as the lord chancellor or either of the chief juſtices ſhall think fit to inflict. Yet embaſſadors cannot be defended when they commit any thing againſt that ſtate, or the perſon of the prince, with whom they reſide; and if they are guilty of treaſon, felony, *&c.* or any other crime againſt the law of nations, they loſe the privilege of an embaſſador, and may be ſubject to puniſhment as private aliens.

EMBASSY, the office or function of an embaſſador. See the preceding article.

EMBDEN, a port-town and city of Germany, capital of a county of the ſame name, now in poſſeſſion of the king of Pruſſia; it is ſituated at the mouth of the river Ems: E. long. 6° 45′, and N. lat. 53° 50′.

EMBER-WEEKS, or Days, in the epiſcopal church, are certain ſeaſons of the year, ſet apart for the imploring God's bleſſing, by prayer and faſting, upon the ordinations performed in the church at ſuch times.

Theſe ordination-faſts are obſerved four times in the year, *viz.* the Wedneſday, Friday, and Saturday after the firſt Sunday in lent, after Whitſunday, after the fourteenth of September and the thirteenth of December; it being enjoined, by a canon of the church, that deacons and miniſters be ordained, or made, only upon the Sundays immediately following theſe ember-faſts.

EMBERIZA, in ornithology, a genus of birds, belonging to the order of paſſeres. The bill is conical, and the mandibles recede from each other towards the baſe; the inferior mandible has the ſides narrowed inwards, but the upper one is ſtill narrower. There are twenty-four ſpecies, *viz.* The nivalis, or great pyed mountain-finch of Ray, and the ſnow-bird of Edwards, has white-wings; but the outer edge of the prime-feathers are black; the tail is black, with three white feathers on each ſide. They inhabit Lapland and Hudſon's bay, and in hard winters they come into Sweden, when they are totally white. 2 The hyemalis, or ſnow-ſparrow of Cateſby, is black above, and the belly is white. It is a native of North America. 3. The miliaris, or grey emberiza, is of a greyiſh colour, ſpotted with black in the belly, and the orbits are rediſh. It is the bunting of Engliſh authors, and a bird of Europe. 4 The hortulana, or ortolan, has black wings: the firſt three feathers on the tail are white on the edges, only the two lateral are black outwardly. The orbits of the eyes are naked and yellow; the head is greeniſh, and yellow towards the inferior mandible. It feeds principally upon the panick-graſs; grows very fat, and is reckoned a delicate morſel by certain epicures. It is a bird of Europe. 5. The citrinella, or yellow hammer, has a blackiſh tail, only the two outward ſide-feathers are marked on the inner edge with a ſharp white ſpot. It is a bird of Europe, and comes about houſes in winter: it builds its neſt on the ground in meadows. 6. The olivacea, or olive emberiza, is of an olive colour above, whiter below; the nape of the neck is orange-coloured, and it has a black belt acroſs the breaſt. It is a native of Dominica. 7. The orix, or grenadier of Edwards, is greyiſh, with the front and belly black, a tawny neck and rump, and a black bill. It is a native of Africa. 8. The quelca, has a grey back, a black front, and a red bill. It is a native of Africa. 9. The capenſis, or ortolon of the cape of Good Hope, is greyiſh, with a white-nape of the neck, and a black belt round the orbits and mandibles. It inhabits the Cape of Good Hope. 10. The ludovicia is greyiſh above, and pale below; the breaſt is reddiſh, and there is a black circle on the head. 11. The cia, is reddiſh, with white eye-brows, and black lines on the head. It is a bird of Europe. 12. The cirlus, is a bird of Europe; it has a greyiſh back, a ſpotted breaſt, and yellowiſh eye-brows. 13. The familiaris is greyiſh and ſpotted; the tips of the tail-feathers are white, and hind part of the back yellow. It is a native of Aſia. 14. The flaveola, is greyiſh, with a yellow face; it is about the ſize of a ſiſkin, and is a native of warm countries. 15. The amazona is of a tanny colour, with the crown of the head yellow, and the baſe of the wings white underneath. It is a native of Surinam. 16. The orizivora, or ortolan of Carolina, is browniſh, with a tawny head, and a black belly. It is properly a native of Cuba, but migrates to Carolina about the autumn after the rice is reaped. 17. The ſchoeniclas, or reed-ſparrow, has a black head, a blackiſh-grey body, and a white ſpot on the quill-feathers. It is a bird of Europe. 18. The pſittacus, is of a tawny aſh-colour, with yellow wings, and two of the tail-feathers remarkably long. 19. The paradiſæa is browniſh, with a red breaſt, and two long ſharp-pointed feathers in the tail, and a black bill. It is a native of Africa, and ſheds the long feathers of the tail every year, like the peacock. 20. The ſerena, has a red bill, a black fillet, a red vertex, and a wedge-ſhaped tail. 21. The vidua, or Indian ſparrow of Aldrovandus, is blackiſh above, and white below, with four very long feathers in the tail, and a red bill. It is a native of India. 22. The principalis, is ſpotted, with the breaſt, bill, and legs red. It is a bird of Argola. 23. The regia, has a red bill, four long equal feathers in the tail, and red legs. It is a native of Africa. 24. The ciris, has a blueiſh head, a yellow belly, and a green back. It is a native of North America.

EMBLEM, a kind of painted enigma, or certain figures painted or cut, metaphorically expreſſing ſome action, with reflections underneath, which in ſome meaſure explain the ſenſe of the device, and at the ſame time inſtruct us in ſome moral truth, or other matter of knowledge.

EMBLEMENTS, among lawyers, denote the profits of ſown lands; but are ſometimes uſed, more largely, for any products that naturally ariſe from the ground.

EMBOLISMIC, or INTERCALARY. See INTERCALARY.

EMBOLUS, the moveable part of a pump, or ſyringe, called alſo the piſton, or ſucker.

EMBOSSING, or IMBOSSING, in architecture and ſculpture, the forming or faſhioning works in relievo, whether cut with a chiſſel or otherwiſe.

EMBRASURE, in architecture, the enlargement made of the aperture of a door or window, on the inſide of the wall; its uſe being to give the greater play for the opening of the door or caſement, or to admit the more light.

EMBROCATION, in ſurgery and pharmacy, an external kind of remedy, which conſiſts in an irrigation of the part affected, with ſome proper liquor, as oils, ſpirits, *&c.* by means of a woollen or linen cloth, or a ſpunge, dipped in the ſame.

EMBROIDERY, a work in gold, or ſilver, or ſilk thread, wrought by the needle upon cloth, ſtuffs, or muſlin, into various figures. In embroidering ſtuffs, the work is performed in a kind of loom, becauſe the more the piece is ſtretched, the eaſier it is worked. As to muſlin, they ſpread it upon a pattern ready deſigned; and ſometimes, before it is ſtretched upon the pattern, it is ſtarched, to make it more eaſy to handle. Embroidery on the loom is leſs tedious than the other, in which, while they work flowers, all the threads of the muſlin, both lengthwiſe and breadthwiſe, muſt be continually counted; but, on the other hand, this laſt is much richer in points, and ſuſceptible of greater variety. Cloths too much milled are ſcarce ſuſceptible of this ornament, and in effect we ſeldom ſee them embroidered. The thinneſt muſlins are left for this purpoſe; and they are embroidered to the greateſt perfection in Saxony: in other parts of Europe, however, they embroider very prettily, and eſpecially in France.

There are ſeveral kinds of embroidery; as, 1. Embroidery on the ſtamp, where the figures are raiſed and rounded, having cotton or parchment put under them to ſupport them. 2. Low embroidery, where the gold and ſilver lie low upon the ſketch, and are ſtitched with ſilk of the ſame colour. 3. Guimped embroidery: this is performed either in gold or ſilver; they firſt make a ſketch upon the cloth, then put on cut vellum, and afterwards ſow on the gold and ſilver with ſilk thread: in this kind of embroidery they often put gold and ſilver cord, tinſel, and ſpangles. 4. Embroidery on both ſides, that which appears on both ſides of the ſtuff. 5. Plain embroidery, where the figures are flat and even, without cords, ſpangles, or other ornaments.

EMBRUN, or AMBRUN, a city of Dauphiny, in France, near the confines of Piedmont: E. long. 6° 6′, and N. lat. 44° 35.

EMBRIO, in phyſiology, the firſt rudiments of an animal in the womb, before the ſeveral members are diſtinctly formed; after which period it is denominated a fœtus.

EMBRYOTHLASTES, in midwifery, an inſtrument contrived for breaking the bones, for the more eaſy extraction of the fœtus in difficult labours.

EMBRYOTOMY, the cutting a fœtus to pieces whilſt in the womb, practiſed in caſes of neceſſity, when there is no other way of ſaving the mother.

EMBRYULCUS, a hook for extracting the child in difficult labours. See MIDWIFERY.

EMERALD, in natural hiſtory, a genus of precious ſtones, of a green colour, and next in hardneſs to the ruby.

Our jewelers diſtinguiſh emeralds into two kinds, the oriental and occidental: the emeralds of the Eaſt-Indies are evidently finer than thoſe of any other part of the world; but our jewellers, ſeldom meeting with theſe, call the American emeralds the oriental, and uſually ſell cryſtal accidentally tinged with green, under the name of the occidental emerald: theſe being alſo the moſt common, there has grown an opinion among the lapidaries, that the emerald is no harder than the cryſtal; becauſe what they take to be emeralds, are in general only cryſtals.

The genuine emerald, in its moſt perfect ſtate, is perhaps the moſt beautiful of all the gems; it is found of various ſizes, but uſually ſmall; a great number of them are met with of about the ſixteenth part of an inch in diameter, and they are found from this to the ſize of a walnut.

The emerald is of different figures like the diamond and many of the other gems, being ſometimes found in a roundiſh or pebble-like form, but much more frequently in a columnar one, reſembling common cryſtal: the pebble-emeralds are always the hardeſt and brighteſt, but are ſeldom found exceeding the ſize of a pea: the cryſtalliform ones grow ſeveral together, and are often larger: the pebble-kind are found looſe in the earths of mountains, and ſands of rivers; the columnar are found uſually bedded in, or adhering to, a white, opake, and coarſe cryſtalline maſs, and ſometimes to the jaſper, or the praſius.

The oriental emerald is of the hardneſs of the ſapphire and ruby, and is ſecond only to the diamond in luſtre and brightneſs: the American is of the hardneſs of the garnet, and the European ſomewhat ſofter than that, yet conſiderably harder than cryſtal: It loſes it colour in the fire, and becomes undiſtinguiſhable from the white ſapphire.

The oriental emeralds are very ſcarce, and at preſent found only in the kingdom of Cambay; very few of them have of late been imported into Europe, inſomuch that it has been ſuppoſed there were no oriental emeralds; but within theſe ten years, ſome few have been brought from Cambay into Italy, that greatly excel the American ones. The American, being what our jewelers call oriental emeralds, are found principally about Peru; and the European are principally from Sileſia.

To counterfeit EMERALDS: Take of natural cryſtal, four ounces; of red-lead, four ounces; verdegreaſe, forty-eight grains; crocus martis, prepared with vinegar, eight grains; let the whole be finely pulverized and ſifted; put this into a crucible, leaving one inch empty: lute it well, and put it into a potter's furnace, and let it ſtand there as long as they do their pots. When cold, break the crucible, and you will find a matter of a fine emerald colour, which, after it is cut and ſet in gold, will ſurpaſs in beauty an oriental emerald.

EMERY, in natural hiſtory, a rich iron ore found in large maſſes of no determinate ſhape or ſize, extremely hard, and very heavy. It is uſually of a duſky browniſh red on the ſurface; but when broken, is of a fine bright iron-grey, but not without ſome tinge of redneſs; and is ſpangled all over with ſhining ſpecks, which are ſmall flakes of a foliaceous talc, highly impregnated with iron. It is alſo ſometimes very red, and then uſually contains veins of gold. It makes no effervеſcence with any of the acid menſtruums, and is found in the iſland of Guernſey, in Tuſcany, and many parts of Germany.

EMETIC, a medicine which induces vomiting.

EMINENCE, a title of honour peculiar to cardinals. See CARDINAL.

EMIR, a title of dignity among the Turks, ſignifying a prince.

This title was firſt given to the caliphs; but when they aſſumed the title of ſultans, that of emir remained to their children; as that of Cæſar among the Romans. At length the title became attributed to all who were judged to deſcend from Mahomet by his daughter Fatimah, and who wear the green turban inſtead of the white. The Turks make an obſervation, that the emirs, before their fortieth year, are men of the greateſt gravity, learning and wiſdom; but after this, if they are not great fools, they diſcover ſome ſigns of levity and ſtupidity. This is interpreted by the Turks as a ſort of divine impulſe in token of their birth and ſanctity. The Turks alſo call the vizirs, baſhaws, or governors of provinces, by this name.

EMISSARY, in a political ſenſe, a perſon employed by another to ſound the opinions of people, ſpread certain reports, or act as a ſpy over other peoples actions.

EMMENAGOGUES, in pharmacy, medicines which promote the menſes, either by giving a greater force to the blood in its circulation, whereby its momentum againſt the veſſels is increaſed; or by making it thinner, whereby it will more eaſily paſs through any outlet.

EMMERIC, a city of Weſtphalia, in Germany, ſubject to Pruſſia: E. long. 5° 45′, N. lat. 51° 48′.

EMOLLIENTS, in medicine and pharmacy, are ſuch remedies as ſheath and ſoften the aſperity of the humours, and relax and ſupple the ſolids at the ſame time.

EMPALEMENT, an ancient kind of puniſhment, which conſiſted in thruſting a ſtake up the fundament.

EMPALEMENT *of a flower*, the ſame with calix. See CALIX.

EMPEROR, a title of honour among the ancient Romans, conferred on a general who had been victorious, and now made to ſignify a ſovereign prince, or ſupreme ruler of an empire.

The title of emperor adds nothing to the rights of ſovereignty; it only gives preheminence above other ſovereigns. The emperors, however, pretend, that the imperial dignity is more eminent than the regal. It is diſputed whether emperors have the power of diſpoſing of the regal title; however this may be, they have ſometimes taken upon them to erect kingdoms: thus it is that Bohemia, Pruſſia, and Poland, are ſaid to have been raiſed to that dignity. In the eaſt, the title of emperor is more frequent than with us; thus the ſovereign princes of China, Mogul, &c. are called emperors.

perors. In the weſt, the title has been a long time reſtrained to the emperors of Germany. The firſt who bore it was Charlemagne, who was crowned by Pope Leo III. in 800. And it is to be obſerved, that there was not a foot of land or territory annexed to the emperor's title.

In the year 1723, the Czar of Muſcovy aſſumed the title of emperor of all the Ruſſias. The kings of France were alſo called emperors, when they reigned with their ſons, whom they aſſociated in the crown: thus Hugh Caput was called emperor, and his ſon Robert king. The kings of England were anciently ſtyled emperors, as appears from a charter of king Edgar.

The emperor of Germany is a limited monarch in regard to the empire, though he is an abſolute ſovereign in moſt of his hereditary dominions; the late emperors of the Auſtrian family, having hereditary dominions, enumerated all of them in their title. Charles VI. was ſtyled emperor of the Romans, always auguſt, king Bohemiah and Hungary, archduke of Auſtria, *&c.*; but the preſent empreſs inheriting thoſe countries, her conſort enjoys only the title of emperor of the Romans, duke of Lorrain and Tuſcany. The emperor creates dukes, marquiſſes, and other noblemen; and he appoints moſt of the officers, civil and military, in the empire: he is elected by the nine electors; and he ſummons the general diet of the empire.

EMPETRUM, BERRY BEARING HEATH, in botany, a genus of the diœcia triandria claſs. The calix of both male and female conſiſts of three ſegments, and the corolla of three petals. The female has nine ſtyli; and the berry contains nine ſeeds. There are two ſpecies, one of which, *viz.* the nigrum, black-berried heath, crow or crake berries, is a native of Britain.

EMPHASIS, in rhetoric, a particular ſtreſs of the voice and action, laid on ſuch parts or words of the oration as the orator wants to enforce upon his audience.

EMPHYSEMA, in ſurgery, a tumour generally occaſioned in a fracture of the ribs. See SURGERY, and MEDICINE.

EMPIRE, a large extent of land, under the juriſdiction or government of an emperor. See EMPEROR.

EMPIRIC, an appellation given to thoſe phyſicians who conduct themſelves wholly by their own experience, without ſtudying phyſic in a regular way. Some even uſe the term, in a ſtill worſe ſenſe, for a quack who preſcribes at random, without being at all acquainted with the principles of the art.

EMPIS, in zoology, a genus of inſects belonging to the order of diptera. The beak is horny, inflected, conſiſts of two valves, and is longer than the thorax. There are five ſpecies, principally diſtinguiſhed by their colour.

EMPRESS, the ſpouſe of an emperor, or a woman who governs an empire. See EMPEROR.

EMPROSTHOTONOS, a ſpecies of convulſion, wherein the head bends forward. See MEDICINE.

EMPYREMA, in medicine, a diſorder wherein purulent matter is contained in the thorax or breaſt, after an inflammation and ſuppuration of the lungs and pleura. See MEDICINE, and SURGERY.

EMPYREUM, a term uſed by divines for the higheſt heaven, where the bleſſed enjoy the beatific viſion.

EMPYREUMA, among chemiſts and phyſicians, the fiery taſte or offenſive ſmell which brandies, and other bodies prepared by fire, are impregnated with. See CHEMISTRY.

EMRODS. See HÆMORRHOIDS.

EMULGENT, or RENAL ARTERIES. See ANATOMY, Part III.

EMULSION, a ſoft liquid remedy, of a colour and conſiſtence reſembling milk. See CHEMISTRY.

EMUNCTORY, in anatomy, a general term for all thoſe parts which ſerve to carry off the excrementitious parts of the blood and other humours of the body. Such more eſpecially are the kidneys, bladder, and moſt of the glands. See ANATOMY.

ENÆMON, in medicine, an epithet often applied by Hippocrates and Galen, to ſuch topical medicines as are appropriated to a wound newly inflicted, before the blood be ſtopped.

ENÆOREMA, in medicine, that pendulous ſubſtance which floats in the urine. It is alſo called ſublimamentum and nubeculæ, from its reſemblance to little clouds.

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In making theſe enamels, the following general cautions are neceſſary to be obſerved. 1. That the pots muſt be glazed with white glaſs, and muſt be ſuch as will bear the fire. 2. That the matter of enamels muſt be very nicely mixed with the colours. 3. When the enamel is good, and the colour well incorporated, it muſt be taken from the fire with a pair of tongs. 4. The general way of making the coloured enamel is this: powder, ſift, and grind all the colours very nicely, and firſt mix them with one another, and then with the common matter of enamels: then ſet them in pots in a furnace, and when they are well mixed and incorporated, caſt them into water; and when dry, ſet them in a furnace again to melt; and when melted, take a proof of it. If too deep-coloured, add more of the common matter of enamels; and if too pale, add more of the colours.

Enamels are uſed either in counterfeiting or imitating precious ſtones, in painting in enamel; or by enamellers, jewellers, and goldſmiths, in gold, ſilver, and other metals. The two firſt kinds are uſually prepared by the workmen themſelves, who are employed in theſe arts. That uſed by jewellers, *&c.* is brought to us chiefly from Venice or Holland, in little cakes of different ſizes, commonly about four inches diameter, having the mark of the maker ſtruck upon it with a puncheon. It pays the pound 1 s. 7 $\frac{41}{100}$ d. on importation, and draws back 1 s. 5 $\frac{70}{100}$ d. at the rate of 4 s. per pound.

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Great care muſt likewiſe be taken, that the leaſt duſt imaginable come not to your colours while you are either painting or grinding them; for the leaſt ſpeck, when it is worked up with it, and when the work comes to be put into the reverberatory to be red-hot, will leave a hole, and ſo deface the work.

When the colours are all laid, the painting muſt be gently dried over a ſlow fire to evaporate the oil, and the colours afterwards melted to incorporate them with the enamel, making the plate red-hot in a fire like what the enamellers uſe. Afterwards that part of the painting muſt be paſſed over again which the fire hath any thing effaced, ſtrengthening the ſhades and colours, and committing it again to the fire, obſerving the ſame method as before, which is to be repeated till the work be finiſhed.

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cold,

perors. In the weſt, the title has been a long time reſtrained to the emperors of Germany. The firſt who bore it was Charlemagne, who was crowned by Pope Leo III. in 800. And it is to be obſerved, that there was not a foot of land or territory annexed to the emperor's title.

In the year 1723, the Czar of Muſcovy aſſumed the title of emperor of all the Ruſſias. The kings of France were alſo called emperors, when they reigned with their ſons, whom they aſſociated in the crown: thus Hugh Caput was called emperor, and his ſon Robert king. The kings of England were anciently ſtyled emperors, as appears from a charter of king Edgar.

The emperor of Germany is a limited monarch in regard to the empire, though he is an abſolute ſovereign in moſt of his hereditary dominions; the late emperors of the Auſtrian family, having hereditary dominions, enumerated all of them in their title. Charles VI. was ſtyled emperor of the Romans, always auguſt, king Bohemiah and Hungary, archduke of Auſtria, *&c.*; but the preſent empreſs inheriting thoſe countries, her conſort enjoys only the title of emperor of the Romans, duke of Lorrain and Tuſcany. The emperor creates dukes, marquiſſes, and other noblemen; and he appoints moſt of the officers, civil and military, in the empire: he is elected by the nine electors; and he ſummons the general diet of the empire.

EMPETRUM, BERRY BEARING HEATH, in botany, a genus of the diœcia triandria claſs. The calix of both male and female conſiſts of three ſegments, and the corolla of three petals. The female has nine ſtyli; and the berry contains nine ſeeds. There are two ſpecies, one of which, *viz.* the nigrum, black-berried heath, crow or crake berries, is a native of Britain.

EMPHASIS, in rhetoric, a particular ſtreſs of the voice and action, laid on ſuch parts or words of the oration as the orator wants to enforce upon his audience.

EMPHYSEMA, in ſurgery, a tumour generally occaſioned in a fracture of the ribs. See SURGERY, and MEDICINE.

EMPIRE, a large extent of land, under the juriſdiction or government of an emperor, See EMPEROR.

EMPIRIC, an appellation given to thoſe phyſicians who conduct themſelves wholly by their own experience, without ſtudying phyſic in a regular way. Some even uſe the term, in a ſtill worſe ſenſe, for a quack who preſcribes at random, without being at all acquainted with the principles of the art.

EMPIS, in zoology, a genus of inſects belonging to the order of diptera. The beak is horny, inflected, conſiſts of two valves, and is longer than the thorax. There are five ſpecies, principally diſtinguiſhed by their colour.

EMPRESS, the ſpouſe of an emperor, or a woman who governs an empire. See EMPEROR.

EMPROSTHOTONOS, a ſpecies of convulſion, wherein the head bends forward. See MEDICINE.

EMPYREMA, in medicine, a diſorder wherein purulent matter is contained in the thorax or breaſt, after an inflammation and ſuppuration of the lungs and pleura. See MEDICINE, and SURGERY.

EMPYREUM, a term uſed by divines for the higheſt heaven, where the bleſſed enjoy the beatific viſion.

EMPYREUMA, among chemiſts and phyſicians, the fiery taſte or offenſive ſmell which brandies, and other bodies prepared by fire, are impregnated with. See CHEMISTRY.

EMRODS. See HÆMORRHOIDS.

EMULGENT, or RENAL ARTERIES. See ANATOMY, Part III.

EMULSION, a ſoft liquid remedy, of a colour and conſiſtence reſembling milk. See CHEMISTRY.

EMUNCTORY, in anatomy, a general term for all thoſe parts which ſerve to carry off the excrementitious parts of the blood and other humours of the body. Such more eſpecially are the kidneys, bladder, and moſt of the glands. See ANATOMY.

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ENARTHROSIS, in anatomy, a ſpecies of diarthroſis. See ANATOMY, Part I.

ENCÆNIA, the name of three ſeveral feaſts celebrated by the Jews in memory of the dedication, or rather purification, of the temple, by Judas Maccabæus, Solomon, and Zorobabel.

This term is likewiſe uſed in church-hiſtory for the dedication of Chriſtian churches.

ENCAMPMENT, the pitching of a camp. See CAMP.

ENCANTHIS, in ſurgery, a tubercle ariſing either from the caruncula lacrymalis, or from the adjacent red ſkin; ſometimes ſo large, as to obſtruct not only the puncta lacrymalia, but alſo part of the ſight, or pupil itſelf. See SURGERY.

ENCAUSTIC and ENCAUSTUM, the ſame with enamelling and enamel. See ENAMELLING, and ENAMEL.

ENCEINTE, in fortification, is the wall or rampart which ſurrounds a place, ſometimes compoſed of baſtions or curtains, either faced or lined with brick or ſtone, or only made of earth. The enceinte is ſometimes only flanked by round or ſquare towers, which is called a Roman wall.

ENCEPHALI, in medicine, worms generated in the head, where they cauſe ſo great a pain, as ſometimes to occaſion diſtraction.

ENCEPPE', in heraldry, denotes fettered, chained, or girt about the middle, as is uſual with monkeys.

ENCHANTER, a perſon ſuppoſed to practiſe enchantment or faſcination. See FASCINATION, WITCHCRAFT, &c.

ENCHANTER'S NIGHTSHADE, in botany. See CIRCÆA.

ENCHASING, INCHASING, or CHASING, the art of enriching and beautifying gold, ſilver, and other metal-work, by ſome deſign or figures repreſented thereon in low relievo.

Enchaſing is practiſed only on hollow thin works, as watch-caſes, cane-heads, tweezer caſes, or the like It is performed by punching or driving out the metal, to form a figure, from with-inſide, ſo as to ſtand out prominent from the plane or ſurface of the metal. In order to this, they provide a number of fine ſteel blocks, or puncheons, of divers ſizes; and the deſign being drawn on the ſurface of the metal, they apply the inſide upon the heads or tops of theſe blocks, directly under the lines or parts of the figures; then, with a fine hammer, ſtriking on the metal, ſuſtained by the block, the metal yields, and the block makes an indenture or cavity on the inſide, correſponding to which there is a prominence on the outſide. which is to ſtand for that part of the figure.

Thus the workmen proceeds to chaſe and finiſh all the parts by ſucceſſive application of the block and hammer to the ſeveral parts of the deſign. And it is wonderful to conſider with what beauty and juſtneſs, by this ſimple piece of mechaniſm, the artiſts in this kind will repreſent foliages, groteſques, animals, hiſtories, *&c.*

ENCHYSMA, in medicine, the ſame with enema. See ENEMA.

ENCLITICA, in grammar, particles which are ſo cloſely united with other words, as to ſeem part of them, as in *virumque*, *&c.*

There are three enclitic particles in Latin, viz. *que*, *ne*, *ve*.

ENCRATITES, in church-hiſtory, heretics who appeared towards the end of the ſecond century: they were called Encratites, or Continentes, becauſe they gloried in abſtaining from marriage and the uſe of wine and animal-food.

ENCYCLOPÆDIA. See CYCLOPÆDIA, and DICTIONARY.

ENDECERIS, in antiquity, denotes a veſſel or galley with eleven tires of oars.

ENDEMIC, or ENDEMICAL DISEASES, thoſe to which the inhabitants of particular countries are ſubject more than others, on account of the air, water, ſituation, and manner of living.

ENDIVE, in botany. See CICHORIUM.

ENDLESS, ſomething without an end: thus authors mention endleſs rolls, the endleſs ſcrew, *&c.*

ENDORSE, in heraldry, an ordinary, containing the eighth part of a pale, which Leigh ſays is only uſed when a pale is between two of them.

ENDORSED, in heraldry, is ſaid of things borne back to back, more uſually called adoſsé. See ADOSSE'.

ENDOWMENT, in law, denotes the ſettling a dower on a woman; though ſometimes it is uſed figuratively, for ſettling a proviſion upon a parſon, on the building of a church; or the ſevering a ſufficient portion of tithes for a vicar, when the benefice is appropriated.

ENEMA, in medicine. See CLYSTER.

ENEMY, in law, an alien or foreigner, who publicly invades the kingdom.

ENERGUMENS, in church-hiſtory, perſons ſuppoſed to be poſſeſſed by the devil, concerning whom there were many regulations among the primitive Chriſtians. They were denied baptiſm, and the euchariſt; at leaſt, this was the practice of ſome churches: and though they were under the care of exorciſts, yet it was thought a becoming act of charity to let them have the public prayers of the church, at which they were permitted to be preſent. See EXORCISM.

ENERGY, a term of Greek origin, ſignifying the power, virtue, or efficacy of a thing. It is alſo uſed, figuratively, to denote emphaſis of ſpeech.

ENFILADE, in the art of war, is uſed in ſpeaking of trenches, or other places, which may be ſcoured by the enemy's ſhot along their whole length. In conducting the approaches at a ſiege, care muſt be taken that the trenches be not enfiladed from any work of the place. See TRENCHES.

ENFRANCHISEMENT, in law, the incorporating a perſon into any ſociety or body politic.

ENGASTRIMYTHI, in Pagan theology, the Pythians, or prieſteſſes of Apollo, who delivered oracles from within, without any action of the mouth or lips.

The ancient philoſophers, *&c.* are divided upon the ſubject of the engaſtrimythi. Hippocrates mentions it as a diſeaſe. Others will have it a kind of divination. Others attribute it to the operation or poſſeſſion of an evil ſpirit. And others to art and mechaniſm. M. Scottus maintains that the engaſtrimythi of the ancients were poets, who, when the prieſts could not ſpeak, ſupplied the defect by explaining in verſe what Apollo dictated in the cavity of the baſon on the ſacred tripod.

ENGENDERING, a term ſometimes uſed for the act of producing or forming any thing: thus meteors are ſaid to be engendered in the middle region of the atmoſphere, and worms in the belly. See GENERATION.

ENGERS, the capital of a county of the ſame name, in Germany, ſituated on the river Rhine, about ſeven miles north of Coblentz.

ENGHIEN, a city of Hainalt, about fourteen miles ſouth-weſt of Bruſſels.

ENGINA, an iſland on the north-eaſt of the Morea, about fifty miles eaſt of Corinth.

ENGINE, in mechanics, is a compound machine, made of one or more mechanical powers, as levers, pullies, ſcrews, *&c.* in order to raiſe, caſt, or ſuſtain any weight, or produce any effect which could not be eaſily effected otherwiſe. See MECHANICS.

ENGINE *for extinguiſhing fires.* See HYDROSTATICS, and HYDRAULICS.

Pile-ENGINE, one contrived for driving piles. See MECHANICS.

Steam-ENGINE, a machine to raiſe water by fire, or rather by the force of water turned into ſteam. See HYDROSTATICS, and HYDRAULICS.

ENGINEER, in the military art, an able expert man, who, by a perfect knowledge in mathematics, delineates upon paper, or marks upon the ground, all ſorts of forts, and other works proper for offence and defence. He ſhould underſtand the art of fortification, ſo as to be able, not only to diſcover the defects of a place, but to find a remedy proper for them; as alſo how to make an attack upon, as well as to defend, the place. Engineers are extremely neceſſary for theſe purpoſes: wherefore it is requiſite that, beſides being ingenious, they ſhould be brave in proportion. When at a ſiege the engineers have narrowly ſurveyed the place, they are to make their report to the general, by acquainting him which part they judge the weakeſt, and where approaches may be made with moſt ſucceſs. Their buſineſs is alſo to delineate the lines of circumvallation and contravallation, taking all the advantages of the ground; to mark out the trenches, places of arms, batteries, and lodgments, taking care that none of their works be flanked or diſcovered from the place. After making a faithful report to the general of what is a-doing, the engineers are to demand a ſufficient number of workmen and utenſils, and whatever elſe is neceſſary.

ENGLAND, the ſouthern diviſion of Great Britain, ſituated in the Atlantic ocean, between 2° E. and 6° W. longitude, and between 49° 55′ and 55° 55′ N. latitude.

There are in England, including Wales, fifty-two counties, two archbiſhoprics, twenty-four biſhoprics, two univerſities, twenty-nine cities, upwards of eight hundred towns, and near ten thouſand pariſhes; ſuppoſed to contain about 7,000,000 of people.

New ENGLAND, comprehending the colonies of Maſſachuſets, New Hampſhire, Connecticut, Rhode-iſland, and Providence-Plantation, is ſituated between 67° and 73° W. longitude, and between 41° and 45° N. latitude.

ENGLISH, or the ENGLISH TONGUE, the language ſpoken by the people of England, and, with ſome variation, by thoſe of Scotland, as well as part of Ireland, and the reſt of the Britiſh dominions.

The ancient language of Britain is generally allowed to have been the ſame with the Gaulic, or French; this iſland, in all probability, having been firſt peopled from Gallia, as both Cæſar and Tacitus affirm, and prove by many ſtrong and concluſive arguments, as by their religion, manners, cuſtoms, and the nearneſs of their ſituation. But now we have very ſmall remains of the ancient Britiſh tongue, except in Wales, Cornwall, the iſlands and highlands of Scotland, part of Ireland, and ſome provinces of France; which will not appear ſtrange, when what follows is conſidered.

Julius Cæſar, ſome time before the birth of our Saviour, made a deſcent upon Britain, though he may be ſaid rather to have diſcovered than conquered it; but, about the year of Chriſt 45, in the time of Claudius, Aulus Plautius was ſent over with ſome Roman forces, by whom two kings of the Britons, Codigunus and Caractacus, were both overcome in battle: whereupon a Roman colony was planted at Malden in Eſſex, and the ſouthern parts of the iſland were reduced to the form of a Roman province: after that, the iſland was conquered as far north as the friths of Dumbarton and Edinburgh, by Agricola, in the time of Domitian; whereupon, a great number of the Britons, in the conquered part of the iſland, retired to the weſt part called Wales, carrying their language with them.

The greateſt part of Britain being thus become a Roman province, the Roman legions, who reſided in Britain for above two hundred years, undoubtedly diſſeminated the Latin tongue; and the people being afterwards governed by laws written in Latin, muſt neceſſarily make a mixture of languages. This ſeems to have been the firſt mutation the language of Britain ſuffered.

Thus the Britiſh tongue continued, for ſome time, mixed with the provincial Latin, till, the Roman legions being called home, the Scots and Picts took the opportunity to attack and harraſs England: upon which, K. Vortigen, about the year 440, called the Saxons to his aſſiſtance, who came over with ſeveral of their neighbours, and having repulſed the Scots and Picts, were rewarded for their ſervices with the iſle of Thanet, and the whole county of Kent; but growing too powerful, and not being contented with their allotment, diſpoſſeſſed the inhabitants of all the country on this ſide of the Severn: thus the Britiſh tongue was in a great meaſure deſtroyed, and the Saxon introduced in its ſtead.

What the Saxon tongue was long before the conqueſt, about the year 700, we may obſerve in the moſt ancient manuſcripts of that language, which is a gloſs on the Evangeliſts, by biſhop Edfrid, in which the three firſt articles of the Lord's prayer runs thus.

“ Uren fader thic arth in heofnas, ſic gehalgud thin noma, ſo cymeth thin ric. Sic thin willa ſue is heofnas, and in eortho, *&c.*”

In the beginning of the ninth century the Danes invaded England; and getting a footing in the northern and eaſtern part of the country, their power gradually increaſed, and they became ſole maſters of it in about two hundred years. By this means the ancient Britiſh obtained a tincture of the Daniſh language: but their government being of no long continuance, did not make ſo great an alteration in the Anglo-Saxon, as the next revolution, when the whole land, *A. D.* 1067, was ſubdued by William the Conqueror, duke of Normandy in France: for the Normans, as a monument of their conqueſt, endeavoured to make their language as generally received as their commands, and thereby rendered the Britiſh language an entire medley.

About the year 900, the Lord's prayer, in the ancient Anglo-Saxon, ran thus:

“ Thue ur fader the eart on heofenum, ſi thin nama gehalgod; cume thin rice ſi thin willá on eorthan ſwa, ſwa on heofenum, *&c.*”

About the year 1160, under Henry II. it was rendered thus by pope Adrian, an Engliſhman, in rhyme:

“ Ure fader in heaven riche,
“ Thy name be halyed ever lich,
“ Thou bring us thy michell bliſſe:
“ Als hit in heaven y-doe,
“ Evar in yearth beene it alſo, *&c.*”

Dr Hicks gives us an extraordinary ſpecimen of the Engliſh, as ſpoken in the year 1385, upon the very ſubject of the Engliſh tongue.

“ As it is knowe how meny maner peple beeth in this lond; ther beeth alſo ſo many dyvers longages and tonges. Notheleſs Walſchemen and Scots that beeth nought medled with other nation, holdeth wel nyh hir firſte longage and ſpeche; but yif the Scottes, that were ſometime confederate and woned with the Pictes, drawe ſomewhat after hir ſpeche; but the Flemynges, that woneth on the weſte ſide of Wales, haveth loſt her ſtrange ſpech, and ſpeketh Sexonliche now. Alſo Engliſhemen, they had from the bygynnynge thre maner ſpeche: northerne, ſoutherne, and middel ſpeche in the middel of the lond, as they come of thre maner of peple of Germania: notheleſs by commyxtion and mellynge firſt with Danes, and afterwards with Normans, in meny the contrary longage is apayred (*corrupted.*)

“ This apayrynge of the burth of the tunge is bycauſe of tweie thinges; oon is for children in ſcole agenſt the uſuage and maner of all other nations, beeth compelled for to leve hire own longage, and for to conſtrue hir leſſons and here thynges in French, and ſo they haveth ſethe Normans come firſt into Engelond. Alſo gentlemen children beeth taught to ſpeke Frenſche from the tyme that they beeth rokked in here cradel, and kunneth ſpeke and play with a childes broche; and uplondiſſche men will lykne hymſelf to gentilmen, and fondeth with great beſyneſſe for to ſpeak Frenſche to be told of.—Hit ſeemeth a greet wonder how Engliſchemen and her own longage and tonge is ſo dyverſe of ſown in this oon ilond: and the longage of Normandie is comlynge of another lond, and hath oon maner ſoun amonge alle men that ſpeketh hit arigt in Engelond. Alſo of the foreſaid Saxon tonge that is deled (*divided*) a three, and is abide ſcarceliche with fewe uplondiſſche men is greet wonder. For men of the eſt, with men of the weſt, is, as it were, undir the ſame partie of hevene acordeth more in ſownynge of ſpeche, than men of the north, with men of the ſouth. Therefore it is that Mercii, that beeth men of myddel Engelond, as it were, parteners of the endes, underſtondeth bettre the ſide longages northerne and ſoutherne, than northerne or ſoutherne underſtondeth either other.—All the longage of the Northumbers and ſpechialliche at York, is ſo ſcharp, ſlitting and frotynge, and unſchape, that we ſoutherne men may that longage unnethe underſtonde, *&c.*” *Hicks's Theſaur. liter. ſept.*

In the year 1537, the Lord's prayer was printed as follows: “ O oure Father which arte in heven, halowed be thy name: let thy kingdome come, thy will be fulfiled as well in erth as it is in heven; geve us this daye in dayly bred, *&c.*” Where it may be obſerved that the diction is brought almoſt to the preſent ſtandard, the chief variations being only in the orthography. By theſe inſtances, and many others that might be given, it appears, that the Engliſh Saxon language, of which the Normans deſpoiled us in a great meaſure, had its beauties, was ſignificant and emphatical, and preferable to what they impoſed on us. “ Great, verily,” ſays Camden, “ was the glory of our tongue before the Norman conqueſt, in this, that the old Engliſh could expreſs, moſt aptly, all the conceptions of the mind in their own tongue, without borrowing from any.” Of this he gives ſeveral examples.

Having thus ſhewn how the ancient Britiſh language was in a manner extirpated by the Romans, Danes, and Saxons, and ſucceeded by the Saxon, and after that the Saxon blended with the Norman French, we ſhall now mention two other cauſes of change in the language: the firſt of theſe is owing to the Britons having been a long time a trading nation, whereby offices, dignities, names of wares, and terms of traffic are introduced, which we take with the wares from the perſons of whom we have them, and form them anew, according to the genius of our own tongue; and beſides this change in the language, ariſing from commerce, Britain's having been a conſiderable time ſubject to the ſee of Rome, in eccleſiaſtical affairs, muſt unavoidably introduce ſome Italian words among us. Secondly, as to the particular properties of a language, our tongue has undergone no ſmall mutation, or rather has received no ſmall improvement upon that account: for, as to the Greek and Latin, the learned have, together with the arts and ſciences now rendered familiar among us, introduced abundance; nay, almoſt all the terms of art in the mathematics, philoſophy, phyſic, and anatomy; and we have entertained many more from the Latin, French, &c. for the ſake of neatneſs and elegancy: ſo that, at this day, our language, which about 1800 years ago, was the ancient Britiſh, or Welch, &c. is now a mixture of Saxon, Teutonic, Dutch, Daniſh, Norman, and modern French, embelliſhed with the Greek and Latin. Yet this, in our opinion, is ſo far from being a diſadvantage to the Engliſh tongue, as now ſpoke (for all languages have undergone changes, and do continually participate with each other) that it has ſo enriched it, as now to become the moſt copious, ſignificant, fluent, courteous, and maſculine language in Europe, if not in the world.

ENGRAFTING, or GRAFTING, in gardening. See GARDENING.

ENGRAILED, or INGRAILED, in heraldry, a term derived from the French *greſly*, hail; and ſignifying a thing the hail has fallen upon and broke off the edges, leaving them ragged, or with half-rounds, or ſemicircles, ſtruck out of their edges.

ENGRAVING, the art of cutting metals and precious ſtones, and repreſenting thereon figures, letters, or whatever device, or deſign, the artiſt fancies.

Engraving, properly a branch of ſculpture, is divided into ſeveral other branches, according to the matter whereon it is employed, and the manner of performing it.

The original way of engraving on wood is denominated at preſent, with us, by cutting in wood; that on metals with aquafortis, is named etching; that by the knife, burniſher, punch, and ſcraper, is called mezzotinto; that on ſtones for tombs, &c. ſtone-cutting; and that performed with the graver on metals or precious ſtones, keeps alone the primitive name of engraving, being that which we ſhall at preſent attend to.

ENGRAVING *on copper*, is employed in repreſenting portraits, hiſtories, landſkips, foliages, figures, buildings, &c. either after paintings, or deſigns for that purpoſe.

It is performed with the graver on a plate of copper, which, being well poliſhed, is covered over thinly with virgin-wax, and then ſmoothed, while warm, with a feather, ſo that the wax be of an equal thickneſs on the plate; and on this the draught or deſign, done in black lead, red chalk, or ungummed ink, is laid with the face of the drawing on the wax: then they rub the backſide, which will cauſe the whole deſign of the drawing to appear on the wax. The deſign, thus tranſferred, is traced through on the copper, with a point, or needle; then heating the plate, and taking off the wax, the ſtrokes remain to be followed, heightened, &c. according to the tenor of the deſign, with the graver, which muſt be very ſharp and well pointed.

In the conduct of the graver conſiſts almoſt all the art, which depends not ſo much upon rules as upon practice, the habitude, diſpoſition, and genius of the artiſt, the principles of engraving being the ſame with thoſe of painting; for if an engraver be not a perfect maſter of deſign, he can never hope to arrive at a degree of perfection in this art. In conducting the ſtrokes, or cuts, of the graver, he muſt obſerve the action of the fingers, and of all their parts, with their outlines; and remark how they advance towards, or fall back from his ſight, and then conduct his graver according to the riſings or cavities of the muſcles, or folds, widening the ſtrokes in the light, and contracting them in the ſhades; as alſo at the extremity of the outlines, to which he ought to conduct the cuts of the graver, that the figures or objects repreſented may not appear as if they gnawn; and lightening his hand, that the outlines may be perfectly ſound, without appearing cut or ſlit; and, although his ſtrokes neceſſarily break off where a muſcle begins, yet they ought always to have a certain connection with each other, ſo that the firſt ſtroke ſhould often ſerve to make the ſecond, becauſe this will ſhew the freedom of the graver.

If hair be the ſubject, let the engraver begin his work by making the outlines of the principal locks, and ſketch them out in a careleſs manner, which may be finiſhed, at leiſure, with finer and thinner ſtrokes to the very extremities.

The engraver muſt avoid making very acute angles, eſpecially in repreſenting fleſh, when he croſſes the firſt ſtrokes with the ſecond, becauſe it will form a very diſagreeable piece of tabby like lattice-work except in the repreſentation of ſome clouds, in tempeſts, the waves of the ſea, and in repreſentations of ſkins of hairy animals, and leaves of trees. So that the medium between ſquare and acute ſeems to be the beſt and moſt agreeable to the eye. He that would repreſent ſculpture, muſt remember, that as ſtatues, &c. are moſt commonly made of white marble, or ſtone, whoſe colour does not produce ſuch dark ſhades as other matters do, they have no black to their eyes, nor hair of the head and beard flying in the air. If the engraver would preſerve one quality and harmony in his works, he ſhould always ſketch out the principal objects of his piece before any part of them are finiſhed.

The inſtruments neceſſary for this ſort of engraving are, beſides a graver, a cuſhion, or ſand-bag, made of leather, to lay the plate on, in order to give it the neceſſary turns and motions; a burniſher made of iron, or ſteel, round at one end, and uſually flattiſh at the other, to rub out ſlips and failures, ſoften the ſtrokes, *&c.*; a ſcraper, to pare off the ſurface, on occaſion; and a rubber, of a black hat, or cloth rolled up, to fill up the ſtrokes that they may appear the more viſible.

In ENGRAVING *precious ſtones*, they uſe either the diamond, or the emery. The diamond, which is the hardeſt of all ſtones, is only cut by itſelf, or with its own matter. The firſt thing to be done in this branch of engraving, is to cement two rough diamonds to the ends of two ſticks big enough to hold them ſteady in the hand, and to rub or grind them againſt each other till they be brought to the form deſired. The duſt or powder that is rubbed off ſerves afterwards to poliſh them, which is performed with a kind of mill that turns a wheel of ſoft iron. The diamond is fixed in a braſs diſh, and, thus applied to the wheel, is covered with diamond-duſt, mixt up with oil of olives; and when the diamond is to be cut facet-wiſe, they apply firſt one face, then another, to the wheel. Rubies, ſapphires, and topazes, are cut and formed the ſame way on a copper wheel, and poliſhed with tripoli diluted in water. As to agates, amethyſts, emeralds, hyacinths, granates, rubies, and others of the ſofter ſtones, they are cut on a leaden wheel, moiſtened with emery and water, and poliſhed with tripoli, on a pewter wheel. Lapis-lazuli, opal, *&c.* are poliſhed on a wooden wheel. To faſhion and engrave vaſes of agate, cryſtal, lapis-lazuli, or the like, they make uſe of a kind of lathe, like that uſed by pewterers to hold the veſſels, which are to be wrought with proper tools; that of the engraver generally holds the tools, which are turned by a wheel; and the veſſel is held to them to be cut and engraved, either in relievo or otherwiſe; the tools being moiſtened, from time to time, with diamond-duſt and oil, or at leaſt emery and water. To engrave figures or devices on any of theſe ſtones, when poliſhed, ſuch as medals, ſeals, *&c.* they uſe a little iron wheel, the ends of whoſe axis are received within two pieces of iron, placed upright, as in the turner's lathe; and to be brought cloſer, or ſet further apart, at pleaſure: at one end of the axis are fitted the proper tools, being kept tight by a ſcrew. Laſtly, The wheel is turned by the foot, and the ſtone applied by the hand to the tool, and is ſhifted and conducted as occaſion requires.

The tools are generally of iron, and ſometimes of braſs; their form is various, but it generally bears ſome reſemblance to chiſſels, gouges, *&c.* Some have ſmall round heads, like buttons, others like ferrels, to take the pieces out, and others flat, *&c.* when the ſtone has been engraven, it is poliſhed on wheels of hair-bruſhes and tripoli.

ENGRAVING *on ſteel* is chiefly employed in cutting ſeals, punches, matrices, and dyes proper for ſtriking coins, medals, and counters. The method of engraving with the inſtruments, *&c.* is the ſame for coins as for medals and counters: All the difference conſiſts in their greater or leſs relievo, the relievo of coins being much leſs conſiderable than that of medals, and that of counters ſtill leſs than that of coins.

Engravers in ſteel commonly begin with punches, which are in relievo, and ſerve for making the creux, or cavities, of the matrices and dyes: though ſometimes they begin with the creux, or hollowneſs, but then it is only when the intended work is to be cut very ſhallow. The firſt thing done, is that of deſigning the figures; the next is the moulding them in wax, of the ſize and depth they are to lie, and from this wax the punch is engraven. When the punch is finiſhed, they give it a very high temper, that it may the better bear the blows of the hammer with which it is ſtruck to give the impreſſion to the matrix.

The ſteel is made hot to ſoften it, that it may the more readily take the impreſſion of the punch; and after ſtriking the punch on it, in this ſtate, they proceed to touch up or finiſh the ſtrokes and lines, where by reaſon of their fineneſs or the too great relievo they are any thing defective, with ſteel gravers of different kinds, chiſſels, flatters, *&c.* being the principal inſtruments uſed in graving on ſteel.

The figure being thus finiſhed, they proceed to engrave the reſt of the medal, as the mouldings of the border, the engrailed ring, letters, *&c.* with little ſteel punches, well tempered, and very ſharp.

ENGUICHE', in heraldry, is ſaid of the great mouth of a hunting horn, when its rim is of a different colour from that of the horn itſelf.

ENGYSCOPE, the ſame with microſcope. See MICROSCOPE.

ENHARMONIC, in the ancient muſic, one of their genera or kinds of muſic, ſo called from its ſuperior excellence; though wherein it conſiſted, ſays Mr Malcom, is hard to ſay: it was allowed by all to be ſo very difficult, that few could ever practiſe it.

ENHYDRUS, in natural hiſtory, a genus of ſiderochita or cruſtated ferrugineous bodies, formed in large and in great part empty caſes, incloſing a ſmall quantity of an aqueous fluid.

Of this genus there are only two ſpecies: 1. The thick-ſhelled enhydrus, with black, reddiſh-brown, and yellow cruſts. 2. The thinner-ſhelled kind, with yellowiſh-brown and purple cruſts; neither of which ferments with aqua fortis, or gives fire with ſteel.

ENIXUM, among chemiſts, a kind of neutral ſalt, generated of an acid and an alkali.

The ſal enixum of Paracelſus, is the caput mortuum of ſpirits of nitre with oil of vitriol, or what remains in the retort after the diſtillation of this ſpirit; being of a white colour, and pleaſing acid taſte.

ENMANCHE', in heraldry, is when lines are drawn from the centre of the upper edge of the chief to the ſides, to about half the breadth of the chief; ſignifying ſleeved, or reſembling a ſleeve, from the French *manche*.

ENNEAGON, in geometry, a polygon with nine ſides. See Polygon.

ENNEAHEDRIA, in natural hiſtory, a genus of columnar, cryſtalliform, and double-pointed ſpars, compoſed of a trigonal column, terminated at each end by a trigonal pyramid.

Of this genus there are ſeveral ſpecies, diſtinguiſhed by the length or ſhortneſs of the column and pyramids, none of which will give fire with ſteel, but all of them ferment with aqua fortis. See Spar.

ENNEANDRIA, in botany. See Botany, p. 635. and Plate LIII. fig. 9.

ENS, among metaphyſicians, denotes entity, being, or exiſtence: this the ſchools call *ens reale*, and *ens poſitivum*, to diſtinguiſh it from their *ens rationis*, which is only an imaginary thing, or exiſts only in the imagination.

Ens, among chemiſts, imports the power, virtue, and efficacy which certain ſubſtances exert upon our bodies.

Ens, in geography, a city of Germany, ſituated at the confluence of the Danube and the river Ens, about eighty miles ſouth of Vienna: E. long. 14° 20′, N. lat. 48° 16′.

ENSEELED, in falconry, is ſaid of a hawk that has a thread drawn through her upper eye-lid, and made faſt under her beak, to take away the ſight.

ENSIGN, in the military art, a banner under which the ſoldiers are ranged according to the different companies or parties they belong to.

Ensign is alſo the officer that carries the colours, being the loweſt commiſſioned officer in a company of foot, ſubordinate to the captain and lieutenant.

ENSISHEIM, a town of Germany, in the landgraviate of Alſace, about fifty miles ſouth of Straſburg: E. long. 7° 30′, N. lat. 47° 50′.

ENSKIRKEN, a town of Germany, fifteen miles ſouth-weſt of Cologn.

ENTABLATURE, or **Entablement**, in architecture, is that part of an order of a column which is over the capital, and comprehends the architrave, frieze, and corniche. See Architecture.

ENTABLER, in the menage, the fault of a horſe whoſe croupe goes before his ſhoulders in working upon volts; which may be prevented by taking hold of the right rein, keeping your right leg near, and removing your left leg as far from the horſe's ſhoulder as poſſible.

This is always accompanied with another fault called aculer. See Aculer.

ENTAIL. See Tailzie.

ENTE′, in heraldry, a method of marſhalling more frequent abroad than with us, and ſignifying grafted or ingrafted.

We have, indeed, one inſtance of enté in the fourth grand quarter of his majeſty's royal enſign, whoſe blazon is Brunſwick and Lunenburg impaled with ancient Saxony, *enté en pointé*, grafted in point.

ENTELECHIA, a word uſed by Ariſtotle to expreſs the ſoul, and which, not occurring in any other author, has given the commentators upon that philoſopher great trouble to diſcover its true meaning.

ENTEROCELE, in ſurgery, a tumor formed by a prolapſion of the inteſtines through the rings of the abdomen, and proceſſes of the peritonæum, into the ſcrotum. See Surgery.

ENTEROLOGY, a term uſed by phyſicians, for a diſcourſe or treatiſe on the contents of the head, breaſt, and abdomen.

ENTEROMPHALUS, the ſame with a hernia umbilicalis, or rupture at the navel.

ENTERSOLE, in architecture, a kind of little ſtory, ſometimes called a mezanzine, contrived occaſionally at the top of the firſt ſtory, for the conveniency of a wardrobe, &c.

ENTHUSIASM, a tranſport of the mind, whereby it is led to think and imagine things in a ſublime, ſurpriſing, yet probable manner. This is the enthuſiaſm felt in poetry, oratory, muſic, painting, ſculpture, &c.

Enthusiasm, in a religious ſenſe, implies a tranſport of the mind, whereby it fancies itſelf inſpired with ſome revelation, impulſe, &c. from heaven.

ENTHUSIAST, a perſon poſſeſſed with enthuſiaſm. See the preceding article.

ENTHYMEME, among logicians, denotes a ſyllogiſm, perfect in the mind, but imperfect in the expreſſion, by reaſon one of the propoſitions is ſuppreſſed, as being eaſily ſupplied by the underſtanding of thoſe with whom we diſcourſe.

ENTOMON, in zoology. See Oniscus.

ENTREPAS, in the manege, a broken pace or going, that is neither walk nor trot, but has ſomewhat of an amble.

This is a pace or gait of ſuch horſes as have no reins or back, and go upon their ſhoulders; or, of ſuch as are ſpoiled in their limbs.

Entring-ladders, in a ſhip, are of two ſorts; one uſed by the veſſel's ſides, in a harbour, or in fair weather, for perſons to go in and out of the ſhip: the other is made of ropes, with ſmall ſtaves for ſteps; and is hung out of the gallery to enter into the boat, or to come aboard the ſhip, when the ſea runs ſo high that they dare not bring the boat to the ſhip's ſide for fear of ſtaving it.

ENTROCHUS, in natural hiſtory. See Isis.

ENTRY *of an heir*, in Scots law, that form of law by which an heir veſts in himſelf a proper title to his predeceſſor's eſtate. See *Precept of* Clare Constat.

Bill of **ENTRY**, in commerce. See Bill.

In making entries inwards, it is uſual for merchants to include all the goods they have on board the ſame ſhip in one bill, though ſometimes they may happen to be upwards of twenty ſeveral kinds; and in caſe the goods are ſhort entered, additional or poſt entries are now allowed; though formerly the goods, ſo entered, were forfeited. As to bills of entry outwards, or including goods to be exported, upon delivering them, and paying the cuſtoms, you will receive a ſmall piece of parchment called a cocket, which teſtifies your payment thereof, and all duties for ſuch goods.

If ſeveral ſorts of goods are exported at once, of which ſome are free, and others pay cuſtoms; the exporter muſt have two cockets, and therefore muſt make two entries; one for the goods that pay, and the other for the goods that do not pay cuſtom.

Entries of goods, on which a drawback is allowed, muſt likewiſe contain the name of the ſhip in which the goods were imported, the importer's name, and time of entry inwards. The entry being thus made, and an oath taken that the cuſtoms for thoſe goods were paid as the law directs, you muſt carry it to the collector and comptroller, or their deputies; who, after examining their books, will grant warrant, which muſt be given to the ſurveyor, ſearcher, or land-waiter, for them to certify the quantity of goods; after which the certificate muſt be brought back to the collector and comptroller, or their deputies, and oath made that the ſaid goods are really ſhipped, and not landed again in any part of Great Britain.

ENVELOPE, in fortification, a work of earth, ſometimes in form of a ſimple parapet, and at others like a ſmall rampart with a parapet: it is raiſed ſometimes on the ditch, and ſometimes beyond it.

ENVIRONNE', in heraldry, ſignifies ſurrounded with other things: thus, they ſay, a lion environné with ſo many bezants. See Bezant.

ENUMERATION, an account of ſeveral things, in which mention is made of every particular article.

ENVOY, a perſon deputed to negociate ſome affair with any foreign prince or ſtate. Thoſe ſent from the courts of France, Britain, Spain, *&c* to any petty prince or ſtate, ſuch as the princes of Germany, the republics of Venice, Genoa, *&c.* go in quality of envoys, not embaſſadors; and ſuch a character only do thoſe perſons bear, who go from any of the principal courts of Europe to another, when the affair they go upon is not very ſolemn or important. There are envoys ordinary and extraordinary, as well as embaſſadors; they are equally the ſame under the protection of the law of nations, and enjoy all the privileges of embaſſadors, only differing from them in this, that the ſame ceremonies are not performed to them.

ENVY, in ethics, an uneaſineſs of the mind, cauſed by the conſideration of a good we deſire, obtained by one we think leſs worthy of it than ourſelves. See Passion, and Morals.

EPACT. See Astronomy, *Of the Diviſion of Time.*

EPANORTHOSIS, in rhetoric, a figure by which a perſon corrects, or ingeniouſly revokes, what he juſt before alledged, as being too weakly expreſſed, in order to add ſomething ſtronger, and more conformable to the paſſion with which he is agitated.

The epanorthoſis is diſtinguiſhed into two kinds. The one is when we correct or revoke the word, as in the following example of the apoſtle, *But I laboured more abundantly than they all: yet not I, but the grace of God, which was with me*, 1 Cor. xv. 10. where, what he firſt attributed to his own merit, he chuſes afterwards to call the work of grace, as being the principal cauſe. The ſecond kind of epanorthoſis, is when we correct or revoke the ſentiment, as in the following of Cicero: *Italiam ornare, quam domum ſuam, maluit: quamquam, Italia ornata, domus ipſa mihi videtur ornatior.*

EPARER, in the menage, ſignifies the flinging of a horſe, or his yerking and ſtriking with his hind-legs.

EPAULEMENT, in fortification, a work raiſed to cover ſidewiſe, is either of earth, gabions, or faſcines loaded with earth. The epaulements of the places of arms for the cavalry, at the entrance of the trenches, are generally of faſcines mixed with earth.

EPENTHESIS, in grammar, the interpoſition or inſertion of a letter or ſyllable in the middle of a word; as *alituum*, for *alitum*; *relligio*, for *religio*; *induperator*, for *imperator*, &c.

EPERLANUS, in ichthyology. See Salmo.

EPHA, or Ephah, in Jewiſh antiquity, a meaſure for things dry, containg 1.0961 of a buſhel.

EPHÆTUM, in botany. See Ranunculus.

EPHEDRA, the sea-grape, or shrub horse-tail, in botany, a genus of the dioecia monadelphia claſs. The calix of the amentum of the male and female is divided into ſegments; the corolla is wanting in both; the ſtamina are ſeven; there are two piſtils, and two ſeeds covered with a kind of cup-berry. There are two ſpecies, none of them natives of Britain.

EPHEMERY, in medicine, the name of a ſpecies of fever continuing the ſpace of one day, or ſometimes more; for the medical writers expreſs themſelves by *ephemera ſimplex, vel plurium dierum.* See Medicine.

EPHEMERA, the day-fly, in zoology, a genus belonging to the order of neuroptera. It has no teeth or palpæ; there are two large protuberances above the eyes; the wings are erect, the two hind ones being largeſt; and the tail is briſtly. There are eleven ſpecies, diſtinguiſhed by their colour and the number of briſtles in their tail. This fly derives its name from the circumſtance of its living but one day.

EPHEMERIDES, in literary hiſtory, an appellation given to thoſe books or journals, which ſhew the motions and places of the planets for every day of the year.

It is from the tables contained in theſe ephemerides that eclipſes, and all the variety of aſpects of the planets, are found.

EPHEMERUM, in botany. See Tradescantia.

EPHIALTES, in medicine, the ſame with the incubus, or night-mare. See Incubus.

EPHIPPUIM, in anatomy. See Anatomy, Part I.

EPHOD, in Jewiſh antiquity, one part of the prieſtly habit; being a kind of girdle, which, brought from behind the neck over the two ſhoulders, and hanging down before, was put croſs the ſtomach, then carried round the waiſt, and made uſe of as a girdle to the tunic

There were two ſorts of ephods, one of plain linen for the prieſts, and the other embroidered for the high prieſt.

EPHORI, in Grecian antiquity, magiſtrates eſtabliſhed in ancient Sparta to balance the regal power. The authority of the ephori was very great. They ſometimes expelled and even put to death the kings, and aboliſhed or ſuſpended the power of the other magiſtrates, calling them to account at pleaſure. There were five of them, others ſay nine. They preſided in the public ſhews and feſtivals. They were entruſted with the public treaſure, made war and peace, and were ſo abſolute, that Ariſtotle makes their government equal to the prerogative of a monarchy. They were eſtabliſhed by Lycurgus.

EPHYDRUM, in botany. See Equisetum.

EPIC, or Heroic poem. See Composition.

EPICEDIUM, in ancient poetry, a poem rehearſed during the funeral ſolemnity of perſons of diſtinction.

EPICOENE, in grammar, a term applied to nouns, which, under the ſame gender and termination, mark indifferently the male and female ſpecies.

EPICUREAN philosophy, the doctrine or ſyſtem of philoſophy maintained by Epicurus and his followers.

His philoſophy conſiſted of three parts, canonical, phyſical, and etherial. The firſt was about the canons, or rules of judging. The cenſure which Tully paſſes upon him for his deſpiſing logic, will hold true only with regard to the logic of the ſtoics, which he could not approve of, as being too full of nicety and quirk. Epicurus was not acquainted with the analytical method of diviſion and argumentation, nor was he ſo curious in modes and formation as the ſtoics. Soundneſs and ſimplicity of ſenſe, aſſiſted with ſome natural reflections, was all his art. His ſearch after truth proceeded only by the ſenſes, to the evidence of which he gave ſo great a certainty, that he conſidered them as an infallible rule of truth, and termed them the firſt natural light of mankind.

In the ſecond part of this philoſophy he laid down atoms, ſpace, and gravity, as the firſt principles of all things: he did not deny the exiſtence of God, but thought it beneath his majeſty to concern himſelf with human affairs: he held him a bleſſed immortal being, having no affairs of his own to take care of, and above meddling with thoſe of others.

As to his ethics, he made the ſupreme good of man to conſiſt in pleaſure, and conſequently ſupreme evil in pain. Nature itſelf, ſays he, teaches us this truth, and prompts us from our birth to procure whatever gives us pleaſure, and avoid what gives us pain. To this end he propoſes a remedy againſt the ſharpneſs of pain: this was to divert the mind from it, by turning our whole attention upon the pleaſures we have formerly enjoyed: he held that the wiſe man muſt be happy, as long as he is wiſe; that pain, not depriving him of his wiſdom, cannot deprive him of his happineſs.

There is nothing that has a fairer ſhew of honeſty than the moral doctrine of Epicurus. Gaſſendus pretends, that the pleaſure in which this philoſopher has fixed the ſovereign good, was nothing elſe but the higheſt tranquillity of mind in conjunction with the moſt perfect health of body: but Tully, Horace, and Plutarch, as well as almoſt all the fathers of the church, give us a very different repreſentation: indeed the nature of this pleaſure, in which the chief happineſs is ſuppoſed to be ſeated, is a grand problem in the morals of Epicurus. Hence there were two kinds of Epicureans, the rigid and the remiſs: the firſt were thoſe who underſtood Epicurus's notion of pleaſure in the beſt ſenſe, and placed all their happineſs in the pure pleaſures of the mind, reſulting from the practice of virtue: the looſe or remiſs Epicureans, taking the words of that philoſopher in a groſs ſenſe, placed all their happineſs in bodily pleaſures or debauchery.

EPICYCLE, in the ancient aſtronomy, a little circle whoſe centre is in the circumference of a greater circle; or it is a ſmall orb, or ſphere, which being fixed in the deferent of a planet, is carried along with it; and yet, by its own peculiar motion, carries the planet faſtened to it round its proper centre.

It was by means of epicycles, that Ptolemy and his followers ſolved the various phænomena of the planets, but more eſpecially their ſtations and retrogradations.

EPICYCLOID, in geometry, a curve generated by the revolution of the periphery of a circle, along the convex or concave ſide of the periphery of another circle.

EPICYEMA, among phyſicians, denotes a ſuperfœtation; being a falſe conception or mole happening after the birth of a regular fœtus.

EPIDEMIA, in Grecian antiquity, feſtivals kept in honour of Apollo and Diana, at the ſtated ſeaſons when theſe deities, who could not be preſent every where, were ſuppoſed to viſit different places, in order to receive the vows of their adorers.

EPIDEMIC, among phyſicians, an epithet of diſeaſes which at certain times are popular; attacking great numbers at or near the ſame time. See Medicine.

EPIDENDRUM, in botany, a genus of the gynandria diandria claſs. The nectarium is oblique, reflected, and ſhaped like a turban. There are thirty ſpecies, none of them natives of Britain.

EPIDERMIS, in anatomy. See Anatomy, p. 255.

EPIDIDYMIS, in anatomy. See Anatomy, p. 171.

EPIGASTRIC region, a part or ſubdiviſion of the abdomen. See Anatomy, p. 256.

EPIGLOTTIS, in anatomy, one of the cartilages of the larynx, or wind-pipe. See Anatomy, p. 281.

EPIGRAM, in poetry, a ſhort poem in verſe, treating only of one thing, and ending with ſome lively, ingenious, and natural thought or point.

EPIGRAPHE, among antiquarians, denotes the inſcription of a building, pointing out the time when, the perſons by whom, the uſes, and the like, for which it was erected.

EPILEPSY, in medicine, the ſame with what is otherwiſe called the falling-ſickneſs, from the patient's falling ſuddenly to the ground. See Medicine.

EPILOBIUM, in botany, the willow-herb, a genus of the octandria monogynia claſs. The calix is divided into four ſegments, and the corolla conſiſts of four petals; the capſule is oblong and below the flower; and the ſeeds are pappous. There are ſeven ſpecies, all of them natives of Britain, *viz.* the anguſtifolium, or roſebay willow-herb; the hirſutum, or ſmall-flowered hairy willow herb; the ramoſum, great-flowered willow-herb, or codlings and cream; the montanum, or ſmooth-leaved willow herb; the tetragonum, or narrow-leaved willow-herb; the paluſtre, or marſh willow herb; and the alpinum, or mountain willow-herb.

EPILOGUE, in oratory, the end or concluſion of a diſcourſe, ordinarily containing a recapitulation of the principal matters delivered.

EPILOGUE, in dramatic poetry, a ſpeech addreſſed to the audience after the play is over, by one of the principal actors therein, uſually containing ſome reflections on certain incidents in the play, eſpecially thoſe in the part of the perſon that ſpeaks it.

EPIMEDIUM, BARREN-WORT, in botany, a genus of the tetrandia monogynia claſs. It has four cap-ſhaped nectaria lying upon the petals; the corolla conſiſts of four petals; and the calix is caducous. There is but one ſpecies, a native of Germany.

EPIPHANY, a Chriſtian feſtival, otherwiſe called the Manifeſtation of Chriſt to the Gentiles, obſerved on the ſixth of January, in honour of the appearance of our Saviour to the three magi, or wiſe-men, who came to adore him and bring him preſents. The feaſt of epiphany was not originally a diſtinct feſtival, but made a part of that of the nativity of Chriſt, which being celebrated twelve days, the firſt and laſt of which were high or chief days of ſolemnity, either of theſe might properly be called epiphany, as that word ſignifies the appearance of Chriſt in the world.

EPIPHONEMA, in rhetoric, a ſententious exclamation containing a lively remark placed at the end of a diſcourſe or narration.

EPIPHORA, in medicine, a preternatural defluxion of the eyes, when they continually diſcharge a ſharp ſerous humour, which excoriates the cheeks. See MEDICINE.

EPIPHYSIS, in anatomy. See ANATOMY, Part I.

EPIPLOCELE, in medicine, is a kind of hernia, or rupture, in which the omentum ſubſides into the ſcrotum.

EPIPLOOMPHALON, in medicine, an hernia umbilicalis, proceeding from the omentum falling into the region of the umbilicus or navel.

EPIPLOON See OMENTUM

EPISCOPACY, the quality of epiſcopal government, or that form of church-diſcipline, wherein dioceſian biſhops are eſtabliſhed diſtinct from and ſuperior to prieſts or preſbyters. See BISHOP.

EPISCOPAL, ſomething belonging to biſhops.

EPISCOPALIANS, in church hiſtory, an appellation given to thoſe who prefer the epiſcopal government and diſcipline to all others.

By the teſt act, none but epiſcopalians, or members of the church of England, are qualified to enjoy any office civil or military.

EPISCOPUS. See BISHOP.

EPISODE, in poetry, a ſeparate incident, ſtory, or action, which a poet invents, and connects with his principal action, that his work may abound with a greater diverſity of events; though, in a more limited ſenſe, all the particular incidents whereof the action or narration is compounded, are called epiſodes. See COMPOSITION.

EPISPASTIC, in medicine, a topical remedy, which being applied to the external parts of the body, attracts the humours to that part.

EPISTATES, in the Athenian government, was the preſident of the proedri. See PROEDRI.

EPISTEMONARCH, in the ancient Greek church, an officer of great dignity, who had the care of every thing relating to faith, in the quality of cenſor. His office anſwered pretty nearly to that of maſter of the ſacred palace at Rome.

EPISTLE, denotes the ſame with a miſſive letter; but is now chiefly uſed in ſpeaking of ancient writings, as the epiſtles of St Paul, epiſtles of Cicero, epiſtles of Pliny, *&c.*

EPISTOLARY, ſomething belonging to an epiſtle. See EPISTLE.

EPISTROPHE, in rhetoric, a figure, wherein that which is ſuppoſed of one thing, is ſtrongly affirmed of another: thus, *Are they Hebrews? ſo am I. Are they Iſraelites? ſo am I. Are they of the ſeed of Abraham? ſo am I*, &c.

EPISTYLE, in the ancient architecture, a term uſed by the Greeks for what we call architrave, *viz.* a maſſive piece of ſtone or wood, laid immediately over the capital of a column.

EPITAPH, a monumental inſcription in honour or memory of a perſon defunct, or an inſcription engraven or cut on a tomb, to mark the time of a perſon's deceaſe, his name, family; and, uſually, ſome eulogium of his virtues, or good qualities.

EPITASIS, in ancient poetry, the ſecond part or diviſion of a dramatic poem, wherein the plot, entered upon in the firſt part, or protaſis, was carried on, heightened, and worked up, till it arrived at its ſtate, or height, called cataſtaſis.

EPITASIS, in medicine, the increaſe of a diſeaſe, or beginning of a paroxyſm, particularly in a fever.

EPITHALAMIUM, in poetry, a nuptial ſong, or compoſition, in praiſe of the bride and bridegroom, praying for their proſperity, for a happy offspring, *&c.*

Among the Greeks, the married couple were no ſooner bedded, than the young men and maids gathered round the door, dancing and ſinging the epithalamium, ſhouting and ſtamping with their feet, with intention to drown the maid's cries.

EPITHEM, in pharmacy, a kind of fomentation, or remedy of a ſpirituous or aromatic kind, applied externally to the regions of the heart, liver, *&c.* to ſtrengthen and comfort the ſame, or to correct ſome intemperature thereof. See FOMENTATION.

EPITHET, in poetry and rhetoric, an adjective expreſſing ſome quality of a ſubſtantive to which it is joined; or ſuch an adjective as is annexed to ſubſtantives by way of ornament and illuſtration, not to make up an eſſential part of the deſcription. Nothing, ſays Ariſtotle, tires the reader more than too great a redundancy of epithets, or epithets placed improperly; and yet nothing is ſo eſſential in poetry as a proper uſe of them. The writings of the beſt poets are full of them, eſpecially Virgil.

EPITOME, in literary hiſtory. See Abridgement.

EPITRITUS, in proſody, a foot conſiſting of three long ſyllables and one ſhort.

EPIZEUXIS, in rhetoric, a figure which repeats the ſame word, without any other intervening; ſuch is that of Virgil, *Nunc, nunc, inſurgite remis.*

EPOCHA, in chronology, a term or fixed point of time, whence the ſucceeding years are numbered or accounted. See Astronomy, p. 487.

EPODE, in lyric poetry, the third or laſt part of the ode; the ancient ode being divided into ſtrophe, antiſtrophe, and epode. See Ode.

EPOPOEIA, in poetry, the ſtory, fable, or ſubject treated of in an epic poem.

EPOTIDES, in the naval architecture of the ancients, two thick blocks of wood, one on each ſide the prow of a galley, for warding off the blows of the roſtra of the enemy's veſſels.

EPPINGEN, a town of Germany, ſituated about ten miles north of Halibron.

EPSOM, a town of Surry, about fifteen miles ſouth-weſt of London; much reſorted to on account of its medicinal waters; from which the bitter purging ſalt being firſt extracted, got the name of Epſom ſalt. At preſent, however, the bitter purging ſalt is procured from the bittern, remaining after the cryſtallization of common ſalt; and this is found to anſwer all the purpoſes of that firſt obtained from Epſom-waters, and goes by its name. See Chemistry.

EPULONES, in Roman antiquity, miniſters who aſſiſted at the ſacrifices, and had the care of the ſacred banquet committed to them.

EQUABLE, an appellation given to ſuch motions as always continue the ſame in degree of velocity, without being either accelerated or retarded. See Mechanics.

EQUAL, a term of relation between two or more things of the ſame magnitude, quantity, or quality.

Mathematicians ſpeak of equal lines, angles, figures, circles, ratios, ſolids.

EQUALITY, that agreement between two or more things, whereby they are denominated equal.

EQUANIMITY, in ethics, denotes that even and calm frame of mind and temper, under good or bad fortune, whereby a man appears to be neither puffed up nor overjoyed with proſperity, nor diſpirited, ſoured, or rendered uneaſy by adverſity.

EQUATION, in algebra. See Algebra, p. 100.

Equation *of time*, in aſtronomy and chronology, the reduction of the apparent time or motion of the ſun, to equable, mean, or true time. See Astronomy, p. 459.

EQUATOR, in geography, a great circle of the terreſtrial globe, equidiſtant from its poles, and dividing it into two equal hemiſpheres; one north, and the other ſouth. See Geography.

EQUERRY, in the Britiſh cuſtoms, an officer of ſtate, under the maſter of the horſe.

There are five equerries, who ride abroad with his majeſty: for which purpoſe they give their attendance monthly, one at a time, and are allowed a table.

As to the equerries of the crown-ſtable, they have this diſtinct appellation, as being employed in mounting, managing, and breaking the ſaddle-horſes for his majeſty's uſe, and holding his ſtirrup.

EQUES auratus, is uſed for a knight batchelor, called *auratus*, q. d. *gilt*, becauſe anciently none but knights were allowed to beautify their armour, or other habiliments for war, with gold.

EQUESTRIAN statue, ſignifies the ſtatue of a perſon mounted on horſeback.

Equestrian order, among the Romans, ſignified their knights, or equites; as alſo their troopers, or horſemen in the field; the firſt of which orders ſtood in contradiſtinction to the ſenators, as the laſt did to the foot, military, or infantry: each of theſe diſtinctions was introduced into the ſtate by Romulus.

EQUIANGULAR, in geometry, an epithet given to figures, whoſe angles are all equal: ſuch are a ſquare, an equilateral triangle, *&c.*

EQUICRURAL, in geometry. See Isosceles.

EQUIDISTANT, an appellation given to things placed at equal diſtance from ſome fixed point, or place, to which they are referred.

EQUILATERAL, in general, ſomething that hath equal ſides, as an equilateral angle.

EQUILIBRIUM, in mechanics, is when the two ends of a lever or balance hang ſo exactly even and level, that neither doth aſcend or deſcend, but keep in a poſition parallel to the horizon; which is occaſioned by their being both charged with an equal weight.

EQUIMULTIPLES, in arithmetic and geometry, are numbers or quantities multiplied by one and the ſame number or quantity. Hence, equimultiples are always in the ſame ratio to each other, as the ſimple quantities before multiplication: thus, if 6 and 8 are multiplied by 4, the equimultiples 24 and 32 will be to each other as 6 to 8.

EQUINOCTIAL, in aſtronomy, a great circle of the celeſtial globe, whoſe poles are the poles of the world. See Astronomy, and Geography.

EQUINOX, the time when the ſun enters either of the equinoctial points, where the ecliptic interſects the equinoctial. See Astronomy.

Preceſſion of the **Equinoxes**. See Astronomy.

EQUISETUM, or horse-tail, in botany, a genus of the cryptogamia filices claſs. The fructification is diſpoſed on an oblong ſpike, and of an orbicular figure. There are ſeven ſpecies, ſix of which are natives of Britain, *viz.* the ſylvaticum, or wood horſe-tail; the arvenſe, or corn horſe-tail; the paluſtre, or marſh horſe-tail; the fluviatile, or river horſe-tail; the limoſum, or ſmooth horſe-tail; and the hyemale, or rough horſe-tail.

EQUITY, in a general ſenſe, the virtue of treating all other men according to common reaſon and juſtice, or as we would be gladly treated ourſelves, when we underſtand aright what is our due. See Justice.

EQUIVALENT, an appellation given to things which agree in nature, or other circumſtances, as force, virtue, *&c.*

EQUIVOCAL TERMS or WORDS, among logicians, are thoſe which have a doubtful or double meaning.

According to Mr Locke, the doubtfulneſs and uncertainty of words has its cauſe more in the ideas themſelves, than in any incapacity of the words to ſignify them; and might be avoided, would people always uſe the ſame term to denote the ſame idea, or collection of ideas: but, adds he, it is hard to find a diſcourſe on any ſubject where this is the caſe; a practice which can only be imputed to folly, or great diſhoneſty; ſince a man, in making up his accounts, might with as much fairneſs uſe the numeral characters ſometimes for one, ſometimes for another collection of unities.

Equivocal generation, the production of animals, without the intercourſe between the ſexes, by the influence of the ſun or ſtars, *&c.*

This kind of generation is now quite exploded by the learned.

EQUULEUS, or ECUULEUS, in antiquity, a kind of rack uſed for extorting a confeſſion, at firſt chiefly practiſed on ſlaves, but afterwards made uſe of againſt the Chriſtians.

The equuleus was made of wood, having holes at certain diſtances, with a ſcrew, by which the criminal was ſtretched to the third, ſometimes to the fourth, or fifth holes, his arms and legs being faſtened on the equuleus with cords; and thus was hoiſted aloft, and extended in ſuch a manner, that all his bones were diſlocated. In this ſtate red-hot plates were applied to his body, and he was goaded in the ſides with an inſtrument called ungula.

Equulus, in aſtronomy. See ASTRONOMY, p. 487.

EQUUS, the HORSE, in zoology, a genus of quadrupeds belonging to the order of belluæ. This genus comprehends the horſe, the aſs, and the zebra; they have ſix erect and parallel fore-teeth in the upper jaw, and ſix ſomewhat prominent ones in the under jaw; the dog-teeth are ſolitary, and at a conſiderable diſtance from the reſt; and the feet conſiſt of an undivided hoof. The horſe is a domeſtic animal, and the figure and dimenſions of his body are ſo well known, that a general deſcription is altogether unneceſſary. We ſhall therefore confine ourſelves to the natural hiſtory of this noble animal.

The horſe, in a domeſtic ſtate, is a bold and fiery animal; equally intrepid as his maſter, he faces danger and death with ardour and magnanimity. He delights in the noiſe and tumult of arms, and ſeems to feel the glory of victory: he exults in the chaſe; his eyes ſparkle with emulation in the courſe. But though bold and intrepid, he is docile and tractable: he knows how to govern and check the natural vivacity and fire of his temper. He not only yields to the hand, but ſeems to conſult the inclination of his rider. Conſtantly obedient to the impreſſions he receives, his motions are entirely regulated by the will of his maſter. He in ſome meaſure reſigns his very exiſtence to the pleaſure of man. He delivers up his whole powers; he reſerves nothing; he will rather die than diſobey. Who could endure to ſee a character ſo noble abuſed! Who could be guilty of ſuch groſs barbarity!

This character, though natural to the animal, is in ſome meaſure the effect of education. His education commences with the loſs of liberty, and it is finiſhed by conſtraint. The ſlavery of the horſe is ſo ancient and ſo univerſal, that he is but rarely ſeen in a natural ſtate. Several ancient writers talk of wild horſes, and even mention the places where they were to be found: Herodotus takes notice of white ſavage horſes in Scythia; Ariſtotle ſays, they are to be found in Syria; Pliny, in the northern regions; and Strabo, in Spain and the Alps. Among the moderns, Leardon ſays, that wild horſes are to be found in the Highlands of Scotland, and the Orkney Iſles; Olaus, in Muſcovy; Dapper, in the iſland of Cyprus; Leo and Marmol, in Arabia and Africa, *&c.* But, as Europe is almoſt equally inhabited, wild horſes are not to be met with in any part of it; and thoſe of America were originally tranſported from Europe by the Spaniards; for this ſpecies of animals did not exiſt in the new world. The Spaniards carried over a great number of horſes, left them in different iſlands, *&c.* with a view to propagate that uſeful animal in their colonies. Theſe have multiplied incredibly in the vaſt deſarts of thoſe thinly peopled countries, where they roam at large, without any reſtraint. M. de Salle relates, that he ſaw, in the year 1685, horſes feeding in the meadows of North America, near the bay of St Louis, which were ſo ferocious that nobody durſt come near them. Oexmelin ſays, that he has ſeen large troops of them in St Domingo running in the valleys; that when any perſon approached, they all ſtopt; and one of them would advance till within a certain diſtance, then ſnort with his noſe, take to his heels, and the whole troop after him. Every author who takes notice of theſe horſes of America, agree that they are ſmaller and leſs handſome than thoſe of Europe. Theſe relations ſufficiently prove, that the horſe, when at full liberty, though not a fierce or dangerous animal, has no inclination to aſſociate with mankind; that all the ſoftneſs and ductility of his temper proceeds entirely from the culture and poliſh he receives in his domeſtic education, which in ſome meaſure commences as ſoon as he is brought forth.

The motions of the horſe are chiefly regulated by the bit and the ſpur; the bit informs him how to direct his courſe, and the ſpur quickens his pace. The mouth of the horſe is endowed with an amazing ſenſibility: the ſlighteſt motion or preſſure of the bit gives him warning, and inſtantly determines his courſe.

The horſe has not only a grandeur in his general appearance, but there is the greateſt ſymmetry and proportion in the different parts of his body. The regularity and proportion of the different parts of the head gives him an air of lightneſs, which is well ſupported by the ſtrength and beauty of his cheſt. He erects his head, as if willing to exalt himſelf above the condition of other quadrupeds: his eyes are open and lively;

Plate LXXV.

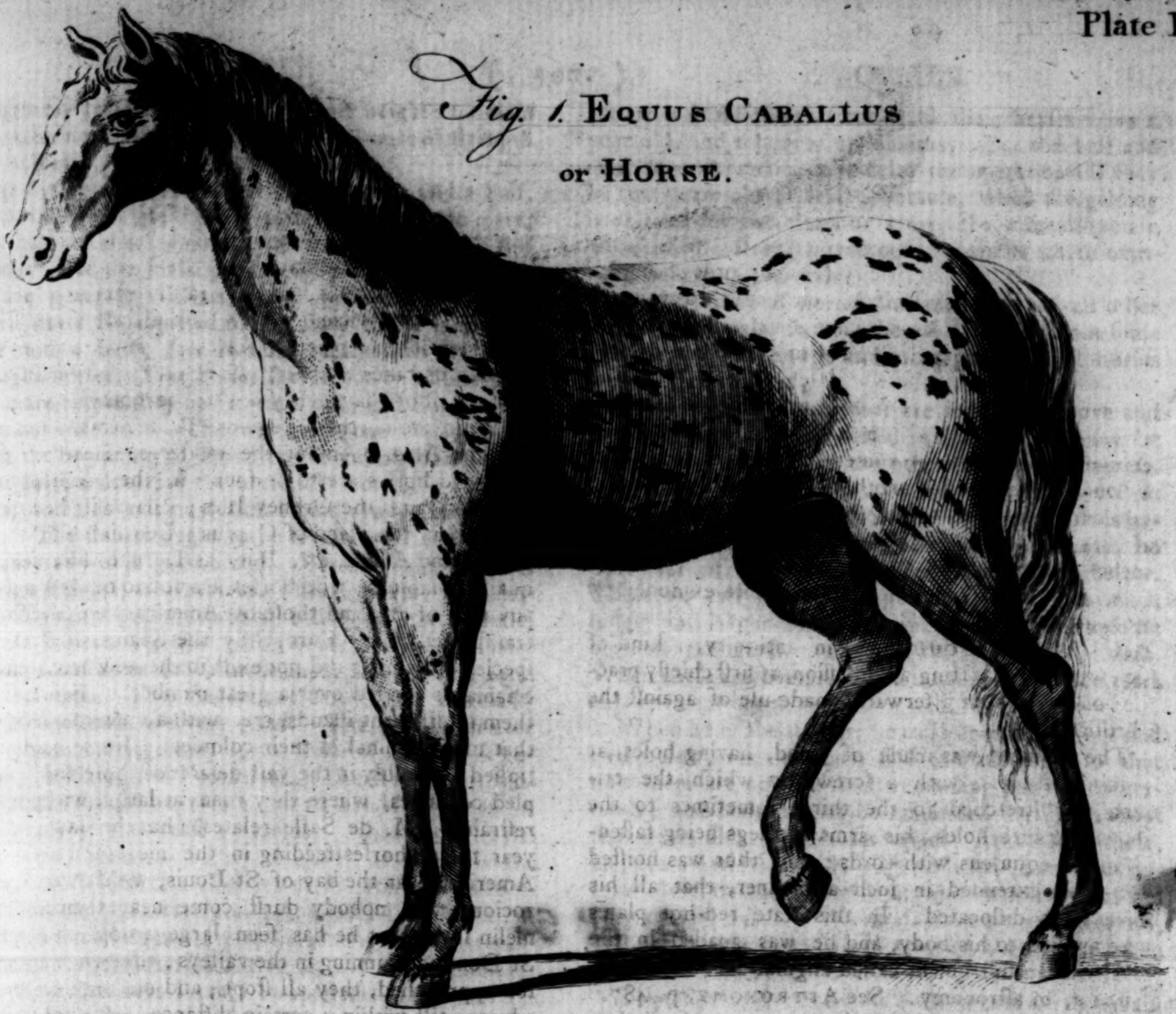

Fig. 1. **Equus Caballus or Horse.**

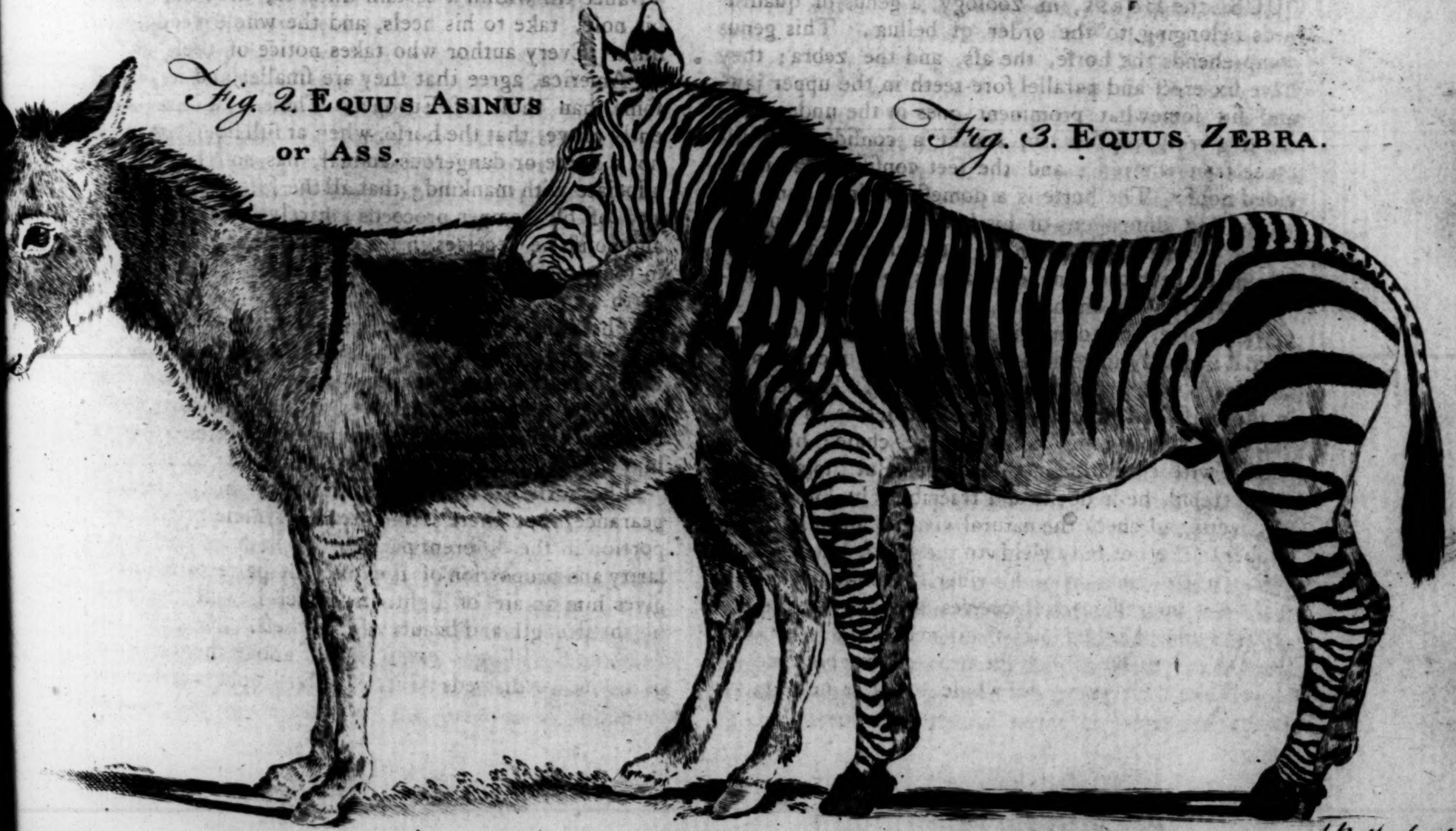

Fig. 2. **Equus Asinus or Ass.**

Fig. 3. **Equus Zebra.**

A. Bell Sculpt.

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his ears are handſome, and of a proper height; his main adorns his neck, and gives him the appearance of ſtrength and boldneſs.

At the age of two years, or two years and a half, the horſe is in a condition to propagate; and the mare, like moſt other females, is ready to receive him ſtill ſooner. But the foals produced by ſuch early embraces are generally ill made and weakly. The horſe ſhould never be admitted to the mare till he is four or four and a half; this is only meant with regard to draught-horſes. Fine horſes ſhould not be admitted to the mare before they be ſix years old; and Spaniſh ſtalions not till ſeven. The mares are generally in ſeaſon from the beginning of April to the end of March; but their chief ardour for the horſe laſts but about 15 or 20 days, and this critical ſeaſon ſhould always be embraced. The ſtalion ought to be ſound, well made, vigorous, and of a good breed. For fine ſaddle horſes, foreign ſtalions, as Arabians, Turks, Barbs, and Andalouſians, are preferable to all others. Next to theſe, Britiſh ſtalions are the beſt; becauſe they originally ſprang from thoſe above mentioned, and are very little degenerated. The ſtalions of Italy, and eſpecially the Neapolitans, are very good. The beſt ſtalions for draught or carriage horſes, are thoſe of Naples, Denmark, Holſtein, and Freezeland. The ſtalions for ſaddle-horſes ſhould be from 14 to 15 hands high, and for draught-horſes at leaſt 15 hands. Neither ought the colour of ſtalions to be overlooked; as a fine black, grey, bay, ſorrel, *&c.* Beſides theſe external qualities, a ſtalion ought to have courage, tractability, ſpirit, agility, a ſenſible mouth, ſure limbs, *&c.* Theſe precautions in the choice of a ſtalion are the more neceſſary, becauſe he has been found by experience to communicate to his offſpring almoſt all his good or bad qualities, whether natural or acquired.

The mare contributes leſs to the beauty of her offſpring than the ſtalion; but ſhe contributes perhaps more to their conſtitution and ſtature: for theſe reaſons, it is neceſſary that the mares for breed be perfectly ſound, and make good nurſes. For elegant horſes, the Spaniſh and Italian mares are beſt; but, for draught-horſes, thoſe of Britain and Normandy are preferable. However, when the ſtalions are good, the mares of any country will produce fine horſes, provided they be well made and of a good breed.

Mares go with young eleven months and ſome days. They bring forth ſtanding; contrary to the courſe of moſt other quadrupeds, who lie during this operation. They continue to bring forth till the age of 16 or 18 years; and both horſes and mares live between 25 and 30 years. Horſes caſt their hair once a year, generally in the ſpring, but ſometimes in the autumn. At this time they are weak, and require to be better fed and taken care of than at any other ſeaſon.

In Perſia, Arabia, and moſt eaſtern countries, they never geld their horſes, as is done in Europe and China. This operation greatly diminiſhes their ſtrength, courage, and ſpirit; but it makes them good humoured, gentle, and tractable. With regard to the time of performing this operation, the practice of different countries is different: ſome geld their horſes when a year old, and others at 18 months. But the beſt and moſt general practice is to delay the operation till they be two years old at leaſt; becauſe, when the gelding is delayed for two years or more, the animals retain more of the ſtrength and other qualities which naturally belong to the male.

As the utility of horſes ſurpaſſes that of all other domeſtic animals, it may be of uſe to ſubjoin ſome marks by which the age and other properties of horſes may be diſtinguiſhed.

The firſt teeth that appear are four, two above and two below, which are called foal-teeth, and may be eaſily diſtinguiſhed from the others by their whiteneſs. The reſt come out aftewards till they are twelve in number, ſix above and ſix below. When a colt is between two years and a half and three years old, he caſts four of theſe teeth, two above and two below. Theſe we call nippers or gatherers, and are much longer and larger than the fore teeth; with theſe he nips off the graſs, and pulls the hay from the rack. When theſe are complete, the horſe will be three years old, or ſomewhat more.

When he is about four, he caſts again two above and two below, one on each ſide the nippers; ſo that now there are no fore-teeth remaining but the corner-teeth; and hence it may be concluded that he is about four years old. The tuſks appear next after theſe, and are a little crooked. Thoſe below come out before thoſe on the upper jaw, and at four years old they are very ſmall. When all the colt-teeth are caſt, and the corner-teeth begin to ſhew themſelves, then the horſe comes five.

From five to five and a half the corner teeth remain hollow within, and are not quite filled up till the horſe is ſix. At five and a half they are about a quarter of an inch high, and when he is full ſix near half an inch. Every thing that is to be examined at ſix years old, are the corner-teeth and the tuſks. That part of the corner-teeth that had fleſh in it firſt turns to a browniſh ſpot, like the eye of a garden-bean. At ſeven the mark or ſpot becomes faint, and the tooth more even. At eight it quite diſappears, though it poſſibly may remain in a very ſmall degree for two or three years more, which has deceived many. The longer the corner teeth are, the older is the horſe; and they are apt to grow foul and turn yellow. When the mark is gone, if you touch the tuſks on the upper jaw with your finger, and find it worn away and equal with the palate, you may certainly judge that the horſe is ten years old at leaſt. Laſtly, when the flanks of a horſe are much ſunk, the feet broken and ſpoiled, the pace bad, and the eye-pits very yellow, you may certainly conclude the horſe is conſiderably advanced in years.

When the horſe is without blemiſh, the legs and thighs are clean, the knees ſtrait, the ſkin and ſhank thin, and the back-ſinew ſtrong and well braced. The ſinews and the bones ſhould be ſo diſtinct, as to make the legs appear thin and lathy, not full and round. The paſtern joints ſhould never be large and round;

nor muſt there be any ſwelling near the coronet. The hocks ſhould be lean and dry, not puffed up with wind. With regard to the hoof, the coronet ſhould be equally thick, and the horn ſhining and greyiſh. A white horn is a ſign of a bad foot, for it will wear out in a ſhort time; and likewiſe when the horn is thin, it is liable to be ſpoiled in ſhoeing, and by travelling hard on ſtony grounds. This is beſt known when the ſhoe is taken off; for then the verge all round the ſole will appear thin, and the horſe will wince at the leaſt touch of the pincers.

A ſtrong foot has the fibres of the hoof very diſtinct running in a direct line from the coronet to the toe, like the grain of wood. In this caſe care muſt be taken to keep the foot moiſt and pliable. The greateſt inconvenience attending a hard ſtrong foot, is its being ſubject to rifts and fiſſures, which cleave the hoof quite through ſometimes from the coronet down to the bottom.

A narrow heel is likewiſe a defect; and when it is not above two fingers in breadth the foot is bad. A high heel cauſes a horſe to trip and ſtumble often; and the low one, with long yielding paſterns, is very apt to be worn quite away on a journey. Too large a foot in proportion to the reſt of the body, renders a horſe weak and heavy.

The head of a horſe ſhould be ſmall, and rather lean than fleſhy. The ears ſhould be ſmall, erect, thin, ſprightly, and pointed. The forehead, or brow, ſhould be neither too broad nor too flat, and ſhould have a ſtar or ſnip thereon. The noſe ſhould riſe a little, and the noſtrils ſhould be wide that he may breath more freely. The muzzle ſhould be ſmall, and the mouth neither too deep nor too ſhallow. The jaws ſhould be thin, and not approach too near together at the throat, nor too high upwards towards the onſet, that the horſe may have ſufficient room to carry his head in an eaſy graceful poſture. The eyes ſhould be of a middle ſize, bright, lively, and full of fire. The tongue ſhould be ſmall, that it may not be too much preſſed by the bit; and it is a good ſign when his mouth is full of white froth, for it ſhews that he will not ſoon be overheated.

The neck ſhould be arched towards the middle, growing ſmaller by degrees from the breaſt and ſhoulders to the head. The hair of the main ſhould be long, ſmall, and fine; and if it be a little frizzled, ſo much the better. The ſhoulders ſhould be pretty long, the withers thin, and enlarge gradually from thence downwards; but ſo as to render his breaſt neither too narrow nor too groſs. A thick-ſhouldered horſe ſoon tires, and trips and ſtumbles every minute; eſpecially if he has a thick large neck at the ſame time. When the breaſt is ſo narrow that the fore-thighs almoſt touch, they are never good for much. A horſe of a middle ſize ſhould have the diſtance of five or ſix inches between his fore-thighs, and there ſhould be leſs diſtance between his feet than his thighs near the ſhoulders when he ſtands upright.

The body or carcaſe of a horſe ſhould be of a middling ſize in proportion to his bulk, and the back ſhould ſink a little below the withers; but the other parts ſhould be ſtrait, and no higher behind than before. He ſhould alſo be home-ribbed; but the ſhort ribs ſhould not approach too near the haunches, and then he will have room to fetch his breath. When a horſe's back is ſhort in proportion to his bulk, and yet otherwiſe well limbed, he will hold out a journey tho' he will travel ſlow. When he is tall, at the ſame time with very long legs, he is but of little value.

The wind ſhould never be overlooked in the choice of a horſe; and it may eaſily be known by his flanks, if he is broken-winded, when he ſtands quiet in the ſtable; becauſe he always pinches them in with a very ſlow motion, and drops them ſuddenly. A thick-winded horſe fetches his breath often, and ſometimes rattles and wheezes. This may be always diſcovered when he is put to briſk exerciſes.

The temper of a horſe ſhould always be obſerved; a vicious horſe generally lays his ears cloſe to his pole, ſhews the whites of his eyes, and looks ſullen and dogged. An angry horſe may be known by his frowning looks; and he generally ſeems to ſtand in a poſture of defence. When he is very vicious, he pays no regard to the groom that feeds him: However, ſome horſes that are tickliſh will lay back their year ears, and yet be of a good diſpoſition. A fearful horſe is apt to ſtart, and never leaves it off till he is old and uſeleſs. A fretful horſe is very unfit for a journey; and you may diſcover his temper as ſoon as he gets out of the ſtable. A dull, heavy, ſluggiſh horſe may be eaſily known, whatever tricks are uſed to rouſe his ſpirits.

With regard to the colour of a horſe, the bright bay, and indeed all kinds of bays in general, are accounted a good colour. The cheſnut horſe is generally preferable to the ſorrel, unleſs the former happens to be bald, or party-coloured with white legs. Brown horſes have generally black manes and tails, and their joints are of a ruſty black. Thoſe of this colour that are dappled are much handſomer than the reſt. Horſes of a ſhining black, and well-marked, without too much white, are in high eſteem for their beauty. A ſtar, or blaze, or white muzzle, or one or more feet tipped with white, are thought to be rather better than thoſe that are quite black.

Of greys, the dappled are accounted beſt; though the ſilver grey makes a more beautiful appearance, and often prove good. The iron grey with white manes and tails are thought not to be ſo hardy. Greys of every kind will turn white ſooner or later; but the nutmeg grey, when the dappled parts incline to bay or cheſnut, are ſaid to be good hardy horſes. Roan horſes have a diverſity of colours mixed together; but the white is more predominant than the reſt. They are all generally hardy, and fit for the road; and ſome are exceeding good. Thoſe of a ſtrawberry colour moſt reſemble the ſorrel, and they are often marked with white on the face and legs. When the bay is blended with it, he ſeems to be tinctured with claret; and ſome of theſe prove to be very good. Dun, ſallow, and cream-coloured horſes have a liſt down their backs; and their manes and tales are black.

Dun horſes are ſeldom choſen by gentlemen, and yet they may be very uſeful to the country farmer. The ſallow and cream-coloured are better eſteemed, both for beauty and uſe. Thoſe horſes that are finely ſpotted with gay colours like leopards are a great rarity, and for that reaſon are only in the hands of great men.

There is ſome difference in horſes according to the different countries where they are bred. For inſtance, in France, thoſe of Bretagne are pretty ſtrong made, and have generally black hair, or brown bay; and they have good legs and feet, with a hardy mouth, and a head ſhort and fleſhy; but in general they are pretty clumſy. The horſes of Franche Compté are ſaid to have the legs of tigers, and the belly of a hind; but they are ſhort and thick, and of a middle ſize; being much more proper for drawing than riding. The horſes of Gaſcony are not unlike thoſe of Spain; but they are not ſo handſome, nor ſo active, and therefore they are more proper to draw carriages. The Limoſin horſes are very vicious, and are good for little till they are ſix years old. Their colour is generally bay, or a bay brown. The horſes of Normandy are much like thoſe of Bretagne; and thoſe of Poitou have good bodies, legs, feet, and eyes; but they are far from being handſome.

The horſes of Germany are much better and more handſome than thoſe of the Low countries. They are of great uſe for carriages; but much more for the army, and for drawing the artillery. They have a great deal of hair, eſpecially about the legs. They are not large, but they are well ſet; and yet they have tender feet. The Hungarian horſes are excellent for the coach, as well as for riding; but they are large, though well proportioned, and they are of all colours, and in general very ſwift.

The Britiſh horſes are of all kinds, they having been brought at firſt from different countries; but for racers no country can equal them, they having been bred from what are called barbs. The Daniſh horſes are low, ſhort, and ſquare; but they have a fine head, and ſhort hair. The horſes of the Low-countries are very fit for the coach, and they are beſt known by the name of Flanders-mares. The Poliſh horſes are like the Daniſh; only they have not ſo fine a fore-hand: their colour is generally a bright bay, and that of the outward peel of an onion; and they are fiery and vicious. The horſes of Switzerland are pretty much like thoſe of Germany; which is no wonder, ſince the Germans purchaſe a great number of them. The horſes of Piedmont are fiery, of a middle ſize, and of all ſorts of colours; their legs are good and handſome, their eyes fine, their ears ſmall, and their mouths good; but they do not carry their heads well.

The horſes of Naples and Italy are generally ill made, and lean; and yet they are good and uſeful, for they are light and proper for racing, though not for a long courſe; they never do well in a colder climate. The Spaniſh horſes are very well made, and handſome, as well as very active and nimble; they have good eyes, handſome legs and heads, and are eaſily managed; they are alſo good for racing if they are well kept: however, they are not ſo good in northern climates as in their own country. The Turkiſh horſes are of different ſhapes; but they are generally ſwift, though their mouths are bad. Moſt of them are white; tho' there are other colours; and they are large, hardy, ſtrong, and fit for the road.

The horſes of Barbary, commonly called barbs, have ſtrong hoofs, and are more proper for racing than any others whatever: ſome have ſaid they never grow old, becauſe they preſerve their vigour to the laſt. They are excellent ſtallions; and ſome of them are uſed as ſuch in Britain: however, the Arabian horſes are not quite ſo good as the Barbary, though ſome think they are both of the ſame kind; only thoſe that are uſed to the deſerts of Arabia are always in action. The horſes of the gold-coaſt of Guinea are very few in number, and in other parts of that coaſt there are none at all; for many of the negroes, when they have been firſt brought over to our American plantations, have expreſſed great admiration at the ſight of a horſe, and even been afraid to come near one.

The horſes of the Cape of Good Hope were originally brought from Perſia; and they are generally ſmall and of a cheſnut colour; for thoſe that are natives of that country are all wild, and could never yet be tamed. The horſes of China are good, and more particularly thoſe in the province Yun Nan, for they are very vigorous, though a little low. The horſes of the Eluth Tartars are good and full of fire; and their ſize is much the ſame as the Poliſh horſes: they are afraid of nothing, not even of lions and tigers; but perhaps this may be owing to uſe. In the country of the Mogul they are very numerous, and of all colours: they are generally of the middle ſize, tho' there are ſome as large and as handſome as thoſe in Europe. The wild horſes of Tartary differ little from the tame; but they are ſo ſwift, that they avoid the arrows of the moſt ſkilful hunters. [Plate LXXV. fig. 1.]

For the method of training and managing horſes, ſee HORSEMANSHIP; and for their diſeaſes and cure, ſee FARRIERY.

2. The aſs is likewiſe a domeſtic animal, and eaſily diſtinguiſhed from the horſe at firſt ſight; we never confound theſe two animals, even though they ſhould happen to be of the ſame colour and ſtature; however, when we view the different parts of the aſs, whether the external or internal, and compare them with the correſponding parts of the horſe, the reſemblance of theſe parts is ſo perfect, that we are ſurpriſed to find the individuals ſo different and ſo eaſily diſtinguiſhable by the eye. From this circumſtance, ſome naturaliſts have conſidered the aſs and the horſe to be the ſame ſpecies of animals; and that the ſmall differences between them are accidental, or owing to the influence of climate, culture, *&c.* Linnæus's ſpecific mark of the horſe is, that the whole tail is covered with long hair; and his ſpecific mark of the aſs is, that the tail has long hair only towards the point, and a black croſs over the ſhoulders. On the other hand, when we conſider the differences in the temper, the manners and diſpoſitions of theſe two animals, and, above all, the

impoſſibility of mixing them ſo as to produce a common or intermediate ſpecies capable of propagating and tranſmitting in the ſame manner as other diſtinct ſpecies, the notion that the horſe and the aſs are the ſame ſpecies will appear to be without any ſolid foundation. Beſides, the aſs differs materially from the horſe in the thickneſs of the head, the length of the ears, the hardneſs of the ſkin, and in the voice, the diſpoſitions, the manner of drinking, *&c.* With regard to animals, there is perhaps but one permanent and uniform ſpecific diſtinction in nature: a male and female of different ſpecies may copulate, may produce a third animal reſembling both, but very different from either: but here nature has put a final ſtop to all further procreation: the third animal, although it be ſeemingly furniſhed with every thing neceſſary for propagating, remains for ever barren. Now, the horſe may be made to copulate with the aſs; a mule, or mixture of the two, is the fruit of the unnatural embrace: but the impregnation of a mule is found by experience to be altogether impoſſible.

The aſs, therefore, is a diſtinct ſpecies, and his race as ancient as that of the horſe. Why then ſhould this uſeful, patient, ſober animal be ſo much deſpiſed? We are apt to compare him, on every occaſion, with the horſe, and from this compariſon are led to very falſe and unfavourable concluſions. The horſe is educated with great care and expence; while the poor aſs, abandoned to the abuſe of the meaneſt ſervants or the cruelty of children, inſtead of deriving benefit from inſtruction, loſes in effect his natural good qualities by the bad treatment he ſuffers. He is the ſport and buffet-block of every ruſtic, who beat and overload him without mercy or diſcretion. They never conſider, that the aſs would be the moſt uſeful, the beſt made, and moſt diſtinguiſhed of all animals, if there were no horſes in the world.

The aſs is as humble, patient, and tranquil, as the horſe is bold, ardent, and impetuous. He ſubmits with firmneſs, perhaps with magnanimity, to ſtrokes and chaſtiſement; he is temperate both as to the quantity and quality of his food; he contents himſelf with the rigid and diſagreeable herbage which the horſe and other animals leave to him, and diſdain to eat: he is more delicate with regard to his drink, never uſing water, unleſs it be perfectly pure. As his maſter does not take the trouble of combing him, he often rolls himſelf on the turf among thiſtles, ferns, *&c.* Without regarding what he is carrying, he lies down to roll as often as he can, ſeeming to reproach his maſter for neglect and want of attention.

When very young, the aſs is a gay, ſprightly, nimble, and gentle animal. But he ſoon loſes theſe qualities, probably by the bad uſage he meets with; and becomes lazy, untractable, and ſtubborn. When under the influence of love, he becomes perfectly furious. The affection of the female for her young is ſtrong: Pliny aſſures us, that when an experiment was made to diſcover the ſtrength of maternal affection in a ſhe-aſs, ſhe run through the flames in order to come at her colt.

Although the aſs be generally ill uſed, he diſcovers a great attachment to his maſter; he ſmells him at a diſtance, ſearches the places and roads he uſed to frequent, and eaſily diſtinguiſhes him from the reſt of mankind. The aſs has a very fine eye, an excellent ſcent, and a good ear. When overloaded, he hangs his head, and ſinks his ears: when too much teaſed or tormented, he opens his mouth and retracts his lips in a diſagreeable manner, which gives him an air of ridicule and deriſion. If you cover his eyes, he will not move another ſtep; if you lay him on his ſide, and place his head ſo that one eye reſts on the ground, and cover the other with a cloth, he will remain in this ſituation without making any attempt to get up. He walks, trots, and gallops in the ſame manner as the horſe; but all his motions are ſlower. Whatever be the pace he is going at, if you puſh him, he inſtantly ſtops.

The cry of the horſe is known by the name of *neighing;* that of the aſs, by *braying*, which is a long, diſagreeable noiſe, conſiſting of alternate diſcords from ſharp to grave and from grave to ſharp: he ſeldom cries but when preſſed with hunger or love: the voice of the female is clearer and more piercing than that of the male.

The aſs is leſs ſubject to vermin than other animals covered with hair; he is never troubled with lice, probably owing to the hardneſs and drineſs of his ſkin; and it is probably for the ſame reaſon, that he is leſs ſenſible to the whip and ſpur than the horſe.

The teeth of the aſs fall out and grow at the ſame age and in the ſame manner as thoſe of the horſe; and he has nearly the ſame marks in his mouth.

Aſſes are capable of propagating when two years old. The females are in ſeaſon during the months of May and June. The milk appears in the dugs ten months after impregnation; ſhe brings forth in the twelfth month, and always one at a time. Seven days after the birth, the ſeaſon of the female returns, and ſhe is again in a condition to receive the male. The colt ſhould be taken from her at the end of five or ſix months, that the growth and nouriſhment of the fœtus may not be obſtructed. The ſtallion or jack-aſs ſhould be the largeſt and ſtrongeſt that can be found; he ſhould be at leaſt three years old, and never ought to exceed ten.

The aſs, like the horſe, takes three or four years in growing, and lives till he be 25 or 30: he ſleeps leſs than the horſe, and never lies down to ſleep but when exceſſively fatigued. He is more robuſt, and leſs ſubject to diſeaſes than the horſe.

Travellers inform us that there are two ſorts of aſſes in Perſia; one of which is uſed for burdens, they being ſlow and heavy; and the other is kept like horſes for the ſaddle, for they have ſmooth hair, carry their head well, and are much quicker in their motion; but when they ride them, they ſit nearer their buttocks than when on a horſe: they are dreſſed like horſes, and are taught to amble like them; but they generally cleave their noſtrils to give them more room for breathing. Dr Ruſſell likewiſe tells us they have two ſorts in Syria, one of which is like ours, and the other very large, with remarkable long ears; but they are both put to the ſame uſe, which is, to carry burdens.

The onager, or wild aſs, has, by ſome authors, been confounded with the zebra; but very improperly, for this laſt is a diſtinct ſpecies; for the onager is not ſtreaked like this, nor is his ſhape ſo beautiful. Wild-aſſes are ſaid to be very ſwift of courſe; and when they ſee a man, they make a bound, and immediately fly away; inſomuch, that there is no taking of them, but by traps and gins. They have much the ſame ſhape as common aſſes; but they are of a brighter colour, and there runs a white liſt from the head to the tail. Of the hide of theſe aſſes, and particularly of that part next the rump, they make that excellent leather which we call ſhagreen, and which is put to ſo many curious uſes.

In America they have no aſſes at all, nor yet horſes; but they have been carried thither long ago, at firſt by the Spaniards, and afterwards by other nations, where they have multiplied greatly; inſomuch, that, in ſome places, there are whole droves of them that run wild, and are very hard to be caught. Aſſes in general carry the heavieſt burdens in proportion to their bulk; and, as their keeping coſts little or nothing, it is a great wonder they are not put to more uſes than they generally are among us.

The fleſh of the common aſs is never eaten in theſe parts of the world; though ſome pretend their colts are tender, and not diſagreeable. [Plate LXXV. fig. 2.]

3. The zebra.—This animal has the figure and gracefulneſs of the horſe, joined to the ſwiftneſs of the ſtag. He is about 7 feet long, from the point of the muzzle to the origin of the tail, and about 4 feet high. The colour of his ſkin is beautiful and uniform, conſiſting of alternate parallel rings of black and white diſpoſed in the moſt regular manner, as repreſented in the plate, [LXXV. fig. 3.] He is generally leſs than the horſe, and larger than the aſs.

The Zebra is found no where but in the eaſtern and ſouthern provinces of Africa, from Æthiopia to the Cape of Good Hope, and from the Cape of Good Hope to Congo. The Dutch have been at great pains to tame and uſe them for domeſtic purpoſes, but with little ſucceſs. He is hard-mouthed, and kicks when any perſon attempts to touch or come near him. He is reſtleſs and obſtinate as a mule: but perhaps the wild horſe is naturally as untractable as the Zebra; for, it is probable, if he were early accuſtomed to obedience and a domeſtic life, he would become as docile as the horſe.

ERANARCHA, a public officer among the ancient Greeks, whoſe buſineſs was to preſide over and direct the alms and proviſions made for the poor. Cornelius Nepos, in his life of Epaminondas, deſcribes his office thus: when any perſon was reduced to poverty, taken captive, or had a daughter to marry, which he could not effect for want of money, *&c.* the eranarcha called an aſſembly of friends and neighbours, and taxed each according to his means and eſtate, to contribute towards his relief.

ERANTHEMUM, in botany, a genus of the diandria monogynia claſs. The calix is divided into five ſegments; the tube is filiform; and the ſtigma is ſimple. There is but one ſpecies, a native of Æthiopia.

ERASED, in heraldry. See Arrache.

ERECTION, in a general ſenſe, the art of raiſing or elevating any thing, as the erection of a perpendicular, *&c.* It is alſo uſed in a figurative ſenſe, as the erection of a biſhopric, marquiſate, *&c.*

ERECTOR clitoris. See Clitoris.

Erector penis. See Penis.

EREMIT. See Hermit.

EREMITA, in zoology. See Scarabæus.

ERFURT, a large and beautiful city of Upper Saxony in Germany, capital of Thuringia, and ſubject to the elector of Mentz: E. long. 11° 6′, N. lat. 51°.

ERGOT, in farriery, is a ſtub, like a piece of ſoft horn, about the bigneſs of a cheſnut, placed behind and below the paſtern-joint, and commonly hid under the tuft of the fetlock.

ERICA, or Heath, in botany, a genus of the octandria monogynia claſs. The calix conſiſts of four leaves, and the corolla of four ſegments; the filaments are inſerted into the receptacle; the antheræ are bifid; and the capſule has four cells. There are thirty-eight ſpecies, five of which are natives of Britain, *viz.* the vulgaris, or common heath; the cinerea, or fine-leaved heath; the tetralix, or croſs-leaved heath; the ciliaris, or rough-leaved heath; and the multiflora, or fir-leaved heath.

ERIDANUS, in aſtronomy. See Vol. I. p. 487.

ERIE, a vaſt lake to the weſtward of Penſilvania, in North America, ſituated between 80° and 87° W. long. and between 41° and 42° N. lat.

ERIGERON, or Sweet flea-bane, in botany, a genus of the ſyngeneſia polygamia ſuperflua claſs. The receptacle is naked; the pappus is hairy; and the radii of the corolla are linear and very narrow. There are ſixteen ſpecies, two of which are natives of Britain, *viz.* the acre, or blue-flowered flea-bane; and the canadenſe, or Canada flea-bane.

ERINACEUS, or Hedge-hog, in zoology, a genus of quadrupeds belonging to the order of feræ, the characters of which are theſe: they have two foreteeth in the upper-jaw, at a conſiderable diſtance from one another, and two in the under jaw, leſs diſtant; and they have two recumbent dog-teeth, one on each ſide. There are three ſpecies, *viz.* 1. The europæus, or common hedge-hog, with round ears, and creſted noſtrils. It is about nine inches long; the upper part of the body is totally covered with ſharp prickles, and the under part is covered with hair. The hedge-hog, even when ſtanding on his legs, has a very ugly aſpect. His body is an oblong maſs, convex above, terminated on the fore-part by a very ſharp muzzle, and mounted on four ſhort legs, of which nothing appears but the feet, and the tail is not diſcernible. His ears are broad, round, and ſhort; and his eyes are ſmall and protuberant. The length of his body, from the point of the muzzle to the anus, is about nine inches.

The hedge-hog has a very uncommon method of defending himſelf from the attacks of other animals: being poſſeſſed of little ſtrength or agility, he does not attempt to fly from or aſſail his enemies; but erects his briſtles, and rolls himſelf up like a ball, expoſing no part of his body that is not furniſhed with ſharp weapons of defence; he will not unfold himſelf, unleſs thrown into water: the more he is frightened or haraſſed, the cloſer he ſhuts himſelf up, and frequently diſcharges his urine, which has a very fœtid an lothſome ſmell. While in this ſtate, moſt dogs, inſtead of biting him, ſtand off and bark, not daring to ſeize him; or, if they attempt it once, their mouths are ſo pricked with his briſtles, that they cannot be prevailed on to attempt it a ſecond time. Both the male and female are covered with briſtles from the head to the tail. Theſe briſtles are of great uſe in defending them from other animals; but muſt be very inconvenient when they incline to copulate. This operation they cannot perform in the manner of other quadrupeds; but do it face to face, either ſtanding on end, or the female lying on her back. The females come in ſeaſon in the ſpring, and bring forth their young in the beginning of ſummer. They commonly bring forth three or four, and ſometimes five, at a time. The young ones are of a whitiſh colour, and only the points of the briſtles appear above the ſkin. It is impoſſible to tame them: the mother and her young have frequently been confined together, and furniſhed with plenty of proviſions: but, inſtead of nouriſhing them, ſhe uniformly devoured them one after another. Males and females have likewiſe been kept in one apartment, where they lived, but never copulated. Hedge-hogs feed upon fallen fruits, ſome roots, and inſects: they are very fond of fleſh-meat, whether raw or roaſted. They frequent woods, and live under the trunks of old trees, in the chinks of rocks, or under large ſtones. Naturaliſts alledge that they go into gardens, mount the trees, and come down with pears, apples, or plumbs, ſtuck upon their briſtles. But this is a miſtake: although kept in a garden, they never attempt to climb trees, or ſtick even fallen fruit upon their briſtles, but lay hold of their food with their mouth. They never come out of their holes in the day, but go about in queſt of food during the night. They eat but little, and can live very long without taking any nouriſhment. They do not lay up any ſtore of proviſions in harveſt; ſuch an inſtinct would be uſeleſs, as they ſleep all the winter. See Plate LXXIV. fig. 6.

2. The inauris, or white hedge-hog, has no external ears. It is a native of America.

3. The malacenſis, has hanging ears, and is a native of Aſia

ERINGO, in botany. See Eryngium.

ERIOCAULON, in botany, a genus of the triandria trigynia claſs. The common calix has an imbricated capitulum; it has three equal petals: and the ſtamina are above the germen. There are five ſpecies, none of them natives of Britain.

ERIOCEPHALUS, in botany, a genus of the ſyngeneſia polygamia neceſſaria claſs. The receptacle is ſomewhat hairy; it has no pappus; the calix conſiſts of ſix equal petals: and there are five floſcules in the radius. There are two ſpecies, none of them natives of Britain.

ERIOPHORUM, in botany, a genus of the triandria monogynia claſs. The gluma is paleaceous, and imbricated on each ſide; the corolla is wanting; and there is but one ſeed, ſurrounded by long down.

ERITHACUS, in ornithology. See Motacilla.

ERIVAN, a city of Perſia, on the frontiers of Turky, ſituated on the ſouth end of a lake of the ſame name: E. long. 45°, N. lat. 40° 16′.

ERKELENS, a city of Weſtphalia, in Germany, ten miles north of Juliers: E. long. 6°, N. lat. 51°.

ERMIN, in zoology. See Mustela.

Ermin, in heraldry, is always argent and ſable, that is, a white field, or fur, with black ſpots. Theſe ſpots are not of any determinate number, but may be more or leſs, at the pleaſure of the painter, as the ſkins are thought not to be naturally ſo ſpotted; but ſerving for lining the garments of great perſons, the furriers were wont, in order to add to their beauty, to ſew bits of the black tails of the creatures that produced them, upon the white of their ſkin, to render them the more conſpicuous, which alteration was introduced into armory. See Plate LXXIV. fig. 7.

Ermin, or Ears of corn, an order of knights in France, inſtituted by Francis the laſt of that name, duke of Britany.

This order was ſo called on account that the collar of it was made up of ears of corn, lying athwart one another in ſaltier, bound together, both above and below, each ear being croſſed twice, the whole of gold. To this collar there hung a little white beaſt, called an ermin, running over a bank of graſs diverſified with flowers.

ERMINE′, or Cross ermine′, is one compoſed of four ermin ſpots, placed as repreſented in Plate LXXIV. fig. 8.

It is to be obſerved, that the colours in theſe arms are not to be expreſſed, becauſe neither this croſs nor theſe arms can be of any other colour but white and black.

ERMINITES ſhould ſignify little ermines, but it is otherwiſe; for it expreſſes a white field powdered with black, only that every ſuch ſpot hath a little red hair on each.

Erminites alſo ſignify a yellow field powdered with black, which the French expreſs much better by *or ſemée d'ermine de ſable*.

EROSION, among phyſicians, denotes much the ſame with corroſion, only in a ſtronger degree. See Corrosion, and Corrosives.

EROTIC, in general, any thing relating to the paſſion love.

ERRATIC, in general, ſomething that wanders, or is not regular: hence it is the planets are called erratic ſtars.

ERRHINES, in pharmacy, medicines which, when ſnuffed up the noſe, promote a diſcharge of mucus from that part.

ERROUR, Error, a miſtake of our judgment, giving aſſent to that which is not true.

Mr Locke reduces the cauſes of error to theſe four;

firſt, want of proofs; ſecondly, want of ability to uſe them: thirdly, want of will to uſe them; and fourthly, wrong meaſures of probability.

ERUCA, in general, denotes caterpillars of all kinds. See Natural History, *Of inſects*.

Eruca, the White rocket, in botany. See Brassica.

Eruca marina. See Aphrodita.

ERUCAGO, in botany. See Bunias.

ERUDITION denotes an extenſive acquaintance with books, eſpecially ſuch as treat of the belles lettres.

ERVI species, in botany. See Sophora.

ERUPTION, in medicine, a ſudden and copious excretion of humours, as pus or blood: it ſignifies alſo the ſame with exanthema, any breaking out, as the puſtules of the plague, ſmall-pox, meaſles, *&c.* See Medicine.

ERVUM, in botany, a genus of the diadelphia decandria claſs. The calix conſiſts of five ſegments of an equal length with the corolla. There are ſix ſpecies, three of which are natives of Britain, *viz.* the ſolonienſe, or ſpring tare; the tetraſpermum, or ſmooth tare; and the hirſutum, or hairy tare.

ERINGIUM, Eringo, in botany, a genus of the pentandria digynia claſs. The flowers are capitated, and the receptacle is paleaceous. There are ten ſpecies, two of which are natives of Britain, *viz.* the maritimum, or ſea-holly eringo; and the campeſtre, or common eringo. The root of the ſea-holly is ſaid to be aperient, diuretic, and aphrodiſiac.

ERYSIMUM, in botany, a genus of the tetradynamia ſiliquoſa claſs. The pod is four-ſided, divided into two cells. There are ſix ſpecies, four of which are natives of Britain, *viz.* the officinale, or hedge-muſtard; the cheirianthoides, or treacle worm-ſeed; the barbarea, rocket, or winter-creſſes; and the alliaria, Jack-by-the-hedge, or ſawce-alone. The leaves of the hedge-muſtard are ſaid to promote expectoration, and to excite urine and other excretions.

ERYSIPELAS, in medicine, an eruption of a fiery or acrid humour, from which no part of the body is exempted, though it chiefly attacks the face. See Medicine.

ERYTHRINA, in botany, a genus of the diadelphia decandria claſs. The calix is bilabiated; and the corolla conſiſts of a long lanceolated vexillum. There are three ſpecies, none of them natives of Britain.

ERYTHRINUS, in ichthyology, a ſpecies of ſparus. See Sparus.

ERYTHROIDES, in anatomy, the firſt of the proper tunics or coats which cover the teſticles. See Anatomy, p. 170.

ERYTHRONIUM, Dog's-tooth violet, in botany, a genus of the hexandria monogynia claſs. The corolla is bell-ſhaped, and conſiſts of ſix petals; there are two nectariferous tubercles at the baſe of every ſecond petal. There is but one ſpecies, a native of Germany.

ERYTHROPHTHALMUS, in ichthyology, a ſpecies of cyprinus. See Cyprinus.

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ESCHAR, in ſurgery, the cruſt or ſcab occaſioned by burns or cauſtic medicines.

ESCHAROTICS, in pharmacy, medicines which produces eſchars. See Eschar.

ESCHEAT, in Scots law, is that forfeiture which is incurred upon a perſon's being denounced rebel. It is either ſingle or liferent: ſingle eſcheat is the forfeiture of the rebel's moveable eſtate; liferent eſcheat is the forfeiture of the rents of his heritable eſtate, during his life. See Scots Law, title 12.

ESCHRAKITES, in matters of religion, a ſect of Mahometans, who believe that man's ſovereign good conſiſts in the contemplation of God. They avoid all manner of vice, and appear always in good humour, deſpiſing the ſenſual paradiſe of Mahomet. The moſt able preachers, in the royal moſques, are of this ſect.

ESCLATTE', in heraldry, ſignifies a thing forcibly broken, or rather a ſhield that has been broken and ſhattered with the ſtroke of a battle-ax.

ESCUAGE, in our old cuſtoms, a kind of knight-ſervice, called ſervice of the ſhield, by which the tenant was bound to follow his lord to the wars at his own charge.

ESCULENT, an appellation given to ſuch plants as may be eaten. See Botany, p. 628.

ESCULUS, in botany. See Quercus.

ESCURIAL, a palace of the king of Spain, twenty-one miles north-weſt of Madrid; being one of the largeſt and moſt beautiful in the world. It has eleven thouſand windows, fourteen thouſand doors, one thouſand eight hundred pillars, ſeventeen cloyſters or piazzas, and twenty-two courts; with every convenience and ornament that can render a place agreeable in ſo hot a climate, as an extenſive park, groves, fountains, caſcades, grottos, *&c*

ESCUTCHEON, or Scutcheon, in heraldry, is derived from the French *eſcuſſon*, and that from the Latin *ſcutum*, and ſignifies the ſhield whereon coats of arms are repreſented.

Moſt nations, of the remoteſt antiquity, were wont to have their ſhields diſtinguiſhed by certain marks painted on them; and to have ſuch on their ſhields was a token of honour, none being permitted to have them till they had performed ſome honourable action.

The eſcutcheon, as uſed at preſent, is ſquare, only rounded off at the bottom.

ESDRAS, the name of two apocryphal books, uſually bound up with the ſcriptures. They were always excluded the Jewiſh canon, and are not admitted as canonical by the papiſts themſelves.

ESENS, a town of Weſtphalia, twenty-five miles north of Embden.

ESK, a river which forms part of the boundary between England and Scotland; and, running from north-eaſt to ſouth-weſt, falls into the Solway frith: it gives name to the country of Eſkdale.

part of his body that is not furniſhed with ſharp weapons of defence; he will not unfold himſelf, unleſs thrown into water: the more he is frightened or haraſſed, the cloſer he ſhuts himſelf up, and frequently diſcharges his urine, which has a very fœtid an lothſome ſmell. While in this ſtate, moſt dogs, inſtead of biting him, ſtand off and bark, not daring to ſeize him; or, if they attempt it once, their mouths are ſo pricked with his briſtles, that they cannot be prevailed on to attempt it a ſecond time. Both the male and female are covered with briſtles from the head to the tail. Theſe briſtles are of great uſe in defending them from other animals; but muſt be very inconvenient when they incline to copulate. This operation they cannot perform in the manner of other quadrupeds; but do it face to face, either ſtanding on end, or the female lying on her back. The females come in ſeaſon in the ſpring, and bring forth their young in the beginning of ſummer. They commonly bring forth three or four, and ſometimes five, at a time. The young ones are of a whitiſh colour, and only the points of the briſtles appear above the ſkin. It is impoſſible to tame them: the mother and her young have frequently been confined together, and furniſhed with plenty of proviſions: but, inſtead of nouriſhing them, ſhe uniformly devoured them one after another. Males and females have likewiſe been kept in one apartment, where they lived, but never copulated. Hedge-hogs feed upon fallen fruits, ſome roots, and inſects: they are very fond of fleſh-meat, whether raw or roaſted. They frequent woods, and live under the trunks of old trees, in the chinks of rocks, or under large ſtones. Naturaliſts alledge that they go into gardens, mount the trees, and come down with pears, apples, or plumbs, ſtuck upon their briſtles. But this is a miſtake: although kept in a garden, they never attempt to climb trees, or ſtick even fallen fruit upon their briſtles, but lay hold of their food with their mouth. They never come out of their holes in the day, but go about in queſt of food during the night. They eat but little, and can live very long without taking any nouriſhment. They do not lay up any ſtore of proviſions in harveſt; ſuch an inſtinct would be uſeleſs, as they ſleep all the winter. See Plate LXXIV. fig. 6.

2. The inauris, or white hedge-hog, has no external ears. It is a native of America.

3. The malacenſis, has hanging ears, and is a native of Aſia

ERINGO, in botany. See ERYNGIUM.

ERIOCAULON, in botany, a genus of the triandria trigynia claſs. The common calix has an imbricated capitulum; it has three equal petals: and the ſtamina are above the germen. There are five ſpecies, none of them natives of Britain.

ERIOCEPHALUS, in botany, a genus of the ſyngeneſia polygamia neceſſaria claſs. The receptacle is ſomewhat hairy; it has no pappus; the calix conſiſts of ſix equal petals: and there are five floſcules in the radius. There are two ſpecies, none of them natives of Britain.

ERIOPHORUM, in botany, a genus of the triandria monogynia claſs. The gluma is paleaceous, and imbricated on each ſide; the corolla is wanting; and there is but one ſeed, ſurrounded by long down.

ERITHACUS, in ornithology See MOTACILLA.

ERIVAN, a city of Perſia, on the frontiers of Turky, ſituated on the ſouth end of a lake of the ſame name: E. long. 45°, N. lat. 40° 16′.

ERKELENS, a city of Weſtphalia, in Germany, ten miles north of Juliers: E. long. 6°, N. lat. 51°.

ERMIN, in zoology. See MUSTELA.

ERMIN, in heraldry, is always argent and ſable, that is, a white field, or fur, with black ſpots. Theſe ſpots are not of any determinate number, but may be more or leſs, at the pleaſure of the painter, as the ſkins are thought not to be naturally ſo ſpotted; but ſerving for lining the garments of great perſons, the furriers were wont, in order to add to their beauty, to ſew bits of the black tails of the creatures that produced them, upon the white of their ſkin, to render them the more conſpicuous, which alteration was introduced into armory. See Plate LXXIV. fig. 7.

ERMIN, or EARS OF CORN, an order of knights in France, inſtituted by Francis the laſt of that name, duke of Britany.

This order was ſo called on account that the collar of it was made up of ears of corn, lying athwart one another in ſaltier, bound together, both above and below, each ear being croſſed twice, the whole of gold. To this collar there hung a little white beaſt, called an ermin, running over a bank of graſs diverſified with flowers.

ERMINE′, or CROSS ERMINE′, is one compoſed of four ermin ſpots, placed as repreſented in Plate LXXIV. fig. 8.

It is to be obſerved, that the colours in theſe arms are not to be expreſſed, becauſe neither this croſs nor theſe arms can be of any other colour but white and black.

ERMINITES ſhould ſignify little ermines, but it is otherwiſe; for it expreſſes a white field powdered with black, only that every ſuch ſpot hath a little red hair on each.

Erminites alſo ſignify a yellow field powdered with black, which the French expreſs much better by or *ſemée d'ermine de ſable.*

EROSION, among phyſicians, denotes much the ſame with corroſion, only in a ſtronger degree. See CORROSION, and CORROSIVES.

EROTIC, in general, any thing relating to the paſſion love.

ERRATIC, in general, ſomething that wanders, or is not regular: hence it is the planets are called erratic ſtars.

ERRHINES, in pharmacy, medicines which, when ſnuffed up the noſe, promote a diſcharge of mucus from that part.

ERROUR, ERROR, a miſtake of our judgment, giving aſſent to that which is not true.

Mr Locke reduces the cauſes of error to theſe four;

firſt, want of proofs; ſecondly, want of ability to uſe them: thirdly, want of will to uſe them; and fourthly, wrong meaſures of probability.

ERUCA, in general, denotes caterpillars of all kinds. See NATURAL HISTORY, *Of inſects*.

ERUCA, the WHITE ROCKET, in botany. See BRASSICA.

ERUCA MARINA. See APHRODITA.

ERUCAGO, in botany. See BUNIAS.

ERUDITION denotes an extenſive acquaintance with books, eſpecially ſuch as treat of the belles lettres.

ERVI SPECIES, in botany. See SOPHORA.

ERUPTION, in medicine, a ſudden and copious excretion of humours, as pus or blood: it ſignifies alſo the ſame with exanthema, any breaking out, as the puſtules of the plague, ſmall-pox, meaſles, *&c.* See MEDICINE.

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ESCULENT, an appellation given to ſuch plants as may be eaten. See BOTANY, p. 628.

ESCULUS, in botany. See QUERCUS.

ESCURIAL, a palace of the king of Spain, twenty-one miles north-weſt of Madrid; being one of the largeſt and moſt beautiful in the world. It has eleven thouſand windows, fourteen thouſand doors, one thouſand eight hundred pillars, ſeventeen cloyſters or piazzas, and twenty-two courts; with every convenience and ornament that can render a place agreeable in ſo hot a climate, as an extenſive park, groves, fountains, caſcades, grottos, *&c*

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ESENS, a town of Weſtphalia, twenty-five miles north of Embden.

ESK, a river which forms part of the boundary between England and Scotland; and, running from north eaſt to ſouth-weſt, falls into the Solway frith: it gives name to the country of Eſkdale.

ESKIMAUX, ſometimes called New Britain, and Terra de Labrador, is an extenſive country of North America, ſituated between 59° and 80° W. long. and between 50° and 64° N. lat.

It is bounded by Hudſon's ſtraits, which ſeparate it from Greenland, on the north; by the Atlantic ocean, on the eaſt; by the river and bay of St Laurence, on the ſouth-eaſt; and by Hudſon's bay, on the weſt.

ESLINGEN, an imperial city of Swabia in Germany, ſeven miles ſouth-eaſt of Stutgard.

ESOX, in ichthyology, a genus belonging to the order of abdominales. The body is elongated; the head is plainiſh above; the upper jaw is plain, and ſhorter than the under one, which is dotted; and the branchioſtege membrane has from ſeven to twelve rays. There are nine ſpecies.

ESPALIERS, in gardening, are rows of trees planted about a whole garden or plantation, or in hedges, ſo as to incloſe quarters or ſeparate parts of a garden; and are trained up regularly to a lattice of wood-work in a cloſe hedge, for the defence of tender plants againſt the injuries of wind and weather.

The trees chiefly planted for eſpaliers, are apples, pears, and ſome plumbs. See Gardening.

ESPERIE, a city of Hungary, forty miles north of Tockay: it is remarkable for its ſalt mines.

ESPINAL, a town of Lorrain on the Moſelle, thirty-five miles ſouth-eaſt of Nancy.

ESPLANADE, in fortification, the ſloping of the parapet of the covered way towards the campaign.

ESPLEES, in law, the general products which lands yield, or the profit or commodity that is to be taken or made of a thing.

ESPOUSALS, in law, ſignify a contract or promiſe made between a man and a woman, to marry each other; and in caſes where marriage may be conſummated, eſpouſals go before. Marriage is termed an eſpouſal *de præſenti*.

ESQUIRE was anciently the perſon that attended a knight in time of war, and carried his ſhield.

This title has not for a long time, had any relation to the office of the perſon, as to carry arms, *&c.* Thoſe to whom the title of eſquire is now of right due, are all noblemens younger ſons, and the eldeſt ſons of ſuch younger ſons; the eldeſt ſons of knights, and their eldeſt ſons; the officers of the king's courts, and of his houſehold; counſellors at law, juſtices of the peace, *&c.* though thoſe latter are only eſquires in reputation: beſides, a juſtice of the peace holds this title no longer than he is in commiſſion, in caſe he is not otherwiſe qualified to bear it: but a ſheriff of a county, who is a ſuperior officer, retains the title of eſquire during life, in conſequence of the truſt once repoſed in him: the heads of ſome ancient families are ſaid to be eſquires by preſcription.

Esquires *of the king*, are ſuch as have that title by creation, wherein there is ſome formality uſed, as the putting about their necks a collar of SS, and beſtowing on them a pair of ſilver-ſpurs, *&c.*

ESSAY, a trial or experiment for proving the quality of any thing; or an attempt to learn, whether or no any invention will ſucceed.

Essay, in literature, a peculiar kind of compoſition, the character whereof is to be free, eaſy, and natural; not tied to ſtrict order or method, nor worked up and finiſhed like a formal ſyſtem.

Essay-hatch is the miner's term for a little trench or hole, which they dig to ſearch for ſhoad or ore.

ESSECK, a town of Hungary, near the confluence of the rivers Drave and Danube, with a bridge five miles over: it lies about eighty miles north-weſt of Belgrade.

ESSEN, a town of Weſtphalia, about ten miles north-eaſt of Duſſeldorp.

ESSENCE, in metaphyſics, that which conſtitutes the particular nature of each genus or kind, and diſtinguiſhes it from all others; being nothing but that abſtract idea to which this name is affixed; ſo that every thing contained in it, is eſſential to that particular kind.

ESSENES, or Essenians, in Jewiſh antiquity, one of the three ancient ſects among that people. They allowed a future ſtate, but denied a reſurrection from the dead. Their way of life was very ſingular: they did not marry, but adopted the children of others, whom they bred up in the inſtitutions of their ſect: they deſpiſed riches, and had all things in common, and never changed their cloaths till they were entirely worn out. When initiated, they were ſtrictly bound not to communicate the myſteries of their ſect to others; and if any of their members were found guilty of enormous crimes, they were expelled.

Pliny tells us, that they dwelt on the weſt ſide of the lake of Aſphaltites; and that they were a ſolitary kind of men, living without women or money, and feeding upon the fruit of the palm-tree: he adds, that they were conſtantly recruited by new-comers, whom the ſurges of ill fortune had made weary of the world; in which manner the ſect was kept up for ſeveral thouſands of years, without any being born among them. The reaſon why we find no mention made of them in the New Teſtament, may be their recluſe and retired way of life, no leſs than their great ſimplicity and honeſty, whereby they lay open to no cenſure or reproof.

ESSENTIAL, ſomething neceſſarily belonging to a thing, from which it cannot be conceived diſtinct: thus the primary qualities of bodies, as extenſion, figure, number, *&c* are eſſential or inſeparable from them in all their changes and alterations.

Essential oil. See Chemistry, p. 93.

ESSEX, a county of England, bounded by Suffolk, on the north; by the German ſea, on the eaſt; by the river Thames, which divides it from Kent, on the ſouth; and by Middleſex and Hertfordſhire, on the weſt.

ESSOIN, in law, an excuſe for a perſon ſummoned to appear and anſwer to an action, on account of the ſickneſs or other juſt cauſe of his abſence.

ESSORANT, in heraldry, denotes a bird ſtanding on the ground with its wings expanded, as if it had been wet, and were drying itſelf.

ESTATE, in law, ſignifies the title or intereſt that a perſon has in lands, tenements, or other effects.

ESTATES, in a political ſenſe, is uſed either to denote the dominions of ſome prince, or the general claſſes into which the people are divided.

In Britain, the eſtates are the king, lords, and commons; or rather the lords and commons, who meet the king in parliament, for reforming abuſes, and enacting good and wholeſome laws.

ELSETE', in heraldry, denotes the heads of beaſts torn off by main force. See ARACHE' and ERASED.

ESTHER, a canonical book of the Old Teſtament, containing the hiſtory of a Jewiſh virgin, dwelling with her uncle Mordecai at Shuſhan, in the reign of Ahaſuerus, one of the kings of Perſia.

ESTOILE'E, or CROSS ESTOILLE'E, in heraldry, a ſtar with only four long rays in form of a croſs; and, accordingly, broad in the centre, and terminating in ſharp points.

ESTONIA, a province ſubject to Ruſſia, on the north of Livonia.

ESTRAY, in law, any beaſt not wild that is found within a lordſhip, and owned by nobody.

ESTREMADURA, a province of Spain, bounded by Leon, on the north; by the two Caſtiles, on the eaſt; by Andaluſia, on the ſouth; and by the province of Alentejo, in Portugal, on the weſt.

ESTREMADURA is alſo a province of Portugal, lying north of Alentejo, and weſtward of Spaniſh Eſtremadura. Liſbon is its capital, as alſo of the kingdom.

ESTREMOS, a town of Alentejo, in Portugal, eighty-five miles ſouth eaſt of Liſbon.

ETCHING, a method of engraving on copper, in which the lines or ſtrokes, inſtead of being cut with a tool or graver, are eaten in with aquafortis.

Etching is done with more eaſe and expedition than engraving: it requires fewer inſtruments, and repreſents moſt kind of ſubjects better and more agreeable to nature, as landſcapes, ruins, grounds, and all ſmall, faint, looſe, remote objects, buildings, *&c.* See ENGRAVING.

The method of etching is as follows: Chuſe the copperplate as directed for engraving, and furniſh yourſelf with a piece of ground, tied up in a bit of thin ſilk, kept very clean, to be laid upon the plate, when both have been warmed; proper needles, to hatch with on the ground; a pencil or bruſh, to wipe away the bits of ground which riſe after its hatching; a poliſher; two or three gravers; a pair of compaſſes, to meaſure diſtances and draw circles; a ruler, to hatch ſtraight lines; green wax, to make the wall round the edges of the plate, to contain the aquafortis; an oil-ſtone; a bottle of aquafortis; ſome red lead, to colour the back ſide of the copy; a ſtift, and a hand-vice, to hold the plate over the candle. See NEEDLE, GRAVER, POLISHER, COMPASS, *&c.*

To make the ground, take three ounces of aſphaltum, two ounces of clean roſin, half an ounce of Burgundy-pitch, three ounces of black wax, and three ounces of virgin-wax: let all theſe be melted in a clean earthern pipkin over a ſlow fire, ſtirring it all the time with a ſmall ſtick; if it burn to the bottom, it is ſpoiled. After the ingredients are well melted, and it boils up, put it into a pan of fair water; and before it be quite cold, take it out, and roll it into ſmall lumps to be kept from duſt: this ground is what others call the varniſh. The next thing is to clean the plate to receive the ground: take a piece of liſting, roll it up as big as an egg, tie it very tight, ſo as to make it a rubber; and having dropped a ſmall quantity of ſweet oil, and added a little powder of rotten ſtone on the plate, rub it with this ball, till it will almoſt ſhew your face. Then wipe it all off with a clean rag; and after that, make it quite dry with another clean rag and a little fine whitening.

The next thing is to lay on the varniſh; to do which aright you muſt take a hand-vice, and fix it at the middle of one part of the plate, with a piece of paper between the teeth of the hand-vice and the plate, to prevent the marks of the teeth: then laying the plate on a chaffing-diſh, with a ſmall charcoal fire in it, till the plate be ſo hot, that, by ſpitting on the back-ſide, the wet will fly off: rub the plate with the ground tied up in ſilk, till it be covered all over; and after that daub the plate with a piece of cotton wrapped up in ſilk, till the ground be quite ſmooth, keeping the plate a little warm all the time. The varniſh being thus ſmoothed upon the plate, it muſt be blacked in the following manner: take a thick tallow candle that burns clear, with a ſhort ſnuff; and having driven two nails into the wall, to let it reſt upon, place the plate againſt the wall with the varniſh ſide downward, and take care not to touch the ground with your fingers: then taking the candle, apply the flame to the varniſh as cloſe as poſſible, without touching the varniſh with the ſnuff of the candle, and guide the flame all over it, till it become perfectly black. After this is done, and the plate dry, the deſign is traced with a needle through the varniſh, and a rim or border of wax is raiſed round the circumference of the plate; and then the artiſt has a compoſition of common varniſh and lamp-black, made very thin, wherewith he covers the parts that are not to be bitten, by means of a hair-pencil. And he is every now and then covering or uncovering this or that part of the deſign, as occaſion may require; the conduct of the aquafortis being the principal concern, on which the effect of the print very much depends. The operator muſt be attentive to the ground, that it does not fail in any part, and where it does to ſtop up the place with the above compoſition. The plate is defended from the aquafortis every where, but in the lines or hatches cut through it with the needle, through which the water eats into the copper to the depth required; remembering to keep it ſtirring with a feather all the while; which done, it is to be poured off again.

Single aquafortis is moſt commonly uſed; and if it be too ſtrong, mix it with vinegar, otherwiſe it will make the work very hard, and ſometimes break up the ground: the aquafortis having done its part, the ground is taken off, and the plate waſhed and dried: after which nothing remains for the artiſt, but to examine the work with his graver, to touch it up, and heighten it where the aquafortis has miſſed.

And, laſtly, it is to be remembered, that a freſh dip of aquafortis is never given, without firſt waſhing out the plate in fair water, and drying it at the fire.

ETERNITY, an attribute of God, expreſſing his infinite or endleſs duration.

According to Mr Locke, we come by the idea of eternity, by being able to repeat any part of time, as a year, as often as we will, without ever coming to an end.

ETHER. See ÆTHER.

ETHICS. See MORALS.

ETHIOPIA, or ÆTHIOPIA, a very extenſive country of Africa, comprehending Abyſſinia, Nubia, and Abex: it is bounded by Egypt, and the deſart of Barca, on the north; by the Red ſea and Indian ocean, on the eaſt; by Anian, and the unknown parts of Africa, on the ſouth; and by other unknown countries on the weſt.

ETHMOIDAL, in anatomy. See ANATOMY, p. 152.

ETHMOIDES os, in anatomy. See ANAT. p. 157.

ETNA, or mount GIBELLO, a vulcano, or burning mountain of Sicily, ſituated fifty miles ſouth-weſt of Meſſina, and twenty weſt of Catania. See VULCANO.

ETYMOLOGY, that part of grammar which conſiders and explains the origin and derivation of words, in order to arrive at their firſt and primary ſignification. See GRAMMAR.

EVACUANTS, in pharmacy, are properly ſuch medicines as diminiſh the animal fluids, by throwing out ſome morbid or redundant humour, or ſuch as thin, attenuate, and promote the motion and circulation thereof.

EVACUATION, in medicine, the art of diminiſhing, emptying, or attenuating the humours of the body. See MEDICINE.

EVANGELIST, a general name given to thoſe who write or preach the goſpel of Jeſus Chriſt.

The word is of Greek origin, ſignifying one who publiſhes glad tiding, or is the meſſenger of good news.

According to Hooker, evangeliſts were preſbyters of principal ſufficiency, whom the apoſtles ſent abroad, and uſed as agents in eccleſiaſtical affairs, whereſoever they ſaw need.

The term evangeliſt however is at preſent confined to the writers of the four goſpels.

EVANID, a name given by ſome authors to ſuch colours as are of no long duration, as thoſe in the rainbow, in clouds before and after ſun ſet, *&c.*

Evanid colours are alſo called fantaſtical and emphatical colours.

EVANTES, in antiquity, the prieſteſſes of Bacchus, thus called, by reaſon, that in celebrating the orgia, they ran about as if diſtracted, crying, *Evan, evan, ohé evan*. See BACCHANALIA.

EVAPORATION, in chemiſtry, the ſetting a liquor in a gentle heat to diſcharge its ſuperfluous humidity, reduce it to a proper conſiſtence, or obtain its dry remainder. See CHEMISTRY.

EVATES, a branch or diviſion of the druids, or ancient Celtic philoſophers. Strabo divides the Britiſh and Gauliſh philoſophers into three ſects; bards, evates, and druids. He adds, that the bards were the poets and muſicians; the evates, the prieſts and naturaliſts; and the druids were moraliſts as well as naturaliſts: But Marcellus and Hornius reduce them all to two ſects, *viz.* the bards and druids.

EUBAGES, an order of prieſts, or philoſophers, among the ancient Celtæ, or Gauls: ſome will have the eubages to be the ſame with the druids and ſaronidæ of Diodorus; and others, that they were the ſame with what Strabo calls evates.

EUCHARIST, the ſacrament of the Lord's ſupper, properly ſignifies giving thanks.

This ſacrament was inſtituted by Chriſt himſelf, and the participation of it called communion.

As to the manner of celebrating the euchariſt among the ancient Chriſtians, after the cuſtomary oblations were made, the deacon brought water to the biſhops and preſbyters, ſtanding round the table, to waſh their hands, according to that of the pſalmiſt, "I will waſh my hands in innocency, and ſo will I compaſs thy altar, O Lord." Then the deacon cried out aloud, "Mutually embrace and kiſs each other;" which being done, the whole congregation prayed for the univerſal peace and welfare of the church, for the tranquillity and repoſe of the world, for the proſperity of the age, for wholeſome weather, and for all ranks and degrees of men. After this followed mutual ſalutations of the miniſter and people; and then the biſhop or preſbyter having ſanctified the elements by a ſolemn benediction, he brake the bread, and delivered it to the deacon, who diſtributed it to the communicants; and after that the cup. Their ſacramental wine was uſually diluted or mixed with water. During the time of adminiſtration, they ſang hymns and pſalms; and, having concluded with prayer and thankſgiving, the people ſaluted each other with a kiſs of peace, and ſo the aſſembly broke up.

EVER-GREEN, in gardening, a ſpecies of perennials, which continue their verdure, leaves, *&c.* all the year: ſuch are hollies, phillyria's, lauruſtinus's, bays, pines, firs, cedars of Lebanon, *&c.*

EVERLASTING PEA, a genus of plants, otherwiſe called lathyrus See LATHYRUS.

EVESDROPPERS, in law, perſons who ſtand under the eves, walls, or windows of a houſe, by day or by night, to liſten after news, and carry it to others, thereby raiſing ſtrife and contention in the neighbourhood.

EVESHAM, a borough town thirteen miles ſouth-eaſt of Worceſter, which ſends two members to parliament.

EUGENIA, the SILVER TREE, in botany, a genus of the icoſandria monogynia claſs. The calix is above the fruit, and conſiſts of four ſegments; the petals are four; and the drupa is quadrangular, and contains one tme ſeed. There are five ſpecies, none of them natives of Britain.

EVIAN, a town of Savoy, ſituated twenty-five miles north eaſt of Geneva, on the ſouth ſide of the lake of Geneva.

EVICTION, in law, ſignifies a recovery of lands, or tenements by law.

EVIDENCE, that perception of truth which ariſes either from the teſtimony of the ſenſes, or from an induction of reaſon. See METAPHYSICS, and MORALS.

EVIDENCE, in law, any proof, whether it be by teſtimony of men on oath, or by writings and records ſo called, becauſe hereby the point in iſſue is made evident by a jury.

EVIL. See MORALS.

King's-EVIL, in medicine. See MEDICINE.

EULOGY, in church-hiſtory, a name by which the Greeks call the *panis benedictus*, or bread over which a bleſſing is pronounced, and which is diſtributed to thoſe who are unqualified to communicate.

EUMENIDES, in antiquity. See FURIES.

EUNOMIANS, in church-hiſtory, Chriſtian heretics, in the fourth century. They were a branch of Arians, and took their name from Eunomius, biſhop of Cyzicus, who was inſtructed by Ætius, in the points which were then controverted in the church, after having at firſt followed the profeſſion of arms. Eunomius ſo well anſwered the deſigns of his maſter, and declaimed ſo vehemently againſt the divinity of the WORD, that the people had recourſe to the authority of the prince, and had him baniſhed; but the Arians obtained his recall, and elected him biſhop of Cyzicus. The manners and doctrines of the Eunomians were the ſame with thoſe of the Arians.

EUNUCH, a caſtrated perſon. See CASTRATION.

EUNUCHS, in church-hiſtory, a ſect of heretics in the third century, who were mad enough to caſtrate, not only thoſe of their own perſuaſion, but even all others that they could lay hold of: they took their riſe from the example of Origen, who, miſunderſtanding the following words of our Saviour,—" And eunuchs who " made themſelves eunuchs for the kingdom of hea- " ven,"—caſtrated himſelf.

EVOLUTION, in algebra. See ALGEBRA, p. 86.

EVOLUTION, in the art of war, the motion made by a body of troops, when they are obliged to change their form and diſpoſition, in order to preſerve a poſt, or occupy another, to attack an enemy with more advantage, or to be in a condition of defending themſelves the better.

EUONYMOIDES, in botany. See CELASTRUS.

EUONYMUS, the SPIDNLE-TREE, in botany, a genus of the pentandria monogynia claſs. The corolla conſiſts of five petals; the capſule is five-ſided, and has five coloured cells; and the ſeeds have calyptra. There are two ſpecies, one of which, *viz.* the europæus, ſpindle-tree, or prickwood, is a native of Britain.

EVORA, or EBORA, a city of Portugal, ſeventy miles ſouth-eaſt of Liſbon.

EUPATORIOPHALACRON, in botany. See VERBESINA.

EUPATORIUM, HEMP-AGRIMONY, in botany, a genus of the ſyngeneſia polygamia æqualis claſs. The receptacle is naked; the pappus is plumoſe; the calix is oblong and imbricated; and the ſtylus is long and ſemi-bifid. There are twenty-one ſpecies, only one of which is a native of Britain, *viz.* the cannabinum, hemp-agrimony, or Dutch agrimony. The leaves are ſaid to ſtrengthen the ſtomach.

EUPHYMISM, in rhetoric, a figure which expreſſes things in themſelves diſagreeable and ſhocking, in terms implying the contrary quality.

EUPHORBIA, in botany, a genus of the dodecandria trigynia claſs. The corolla conſiſts of four or five petals; and the calix has but one leaf. There are ſixty-two ſpecies, twelve of which are natives of Britain, *viz.* the peplus, or ſmall purple ſea-ſpurge; the peplus, or petty ſpurge; the exigua, or dwarf-ſpurge; the ſegetalis, or corn-ſpurge; the helioſcopia, ſun-ſpurge, or wart-wort; the portlandica, or Portland ſpurge; the paralias, or ſea-ſpurge; the verruſca, or rough-fruited ſpurge; the platyphyllus, or broad-leaved ſpurge; the amygdaloides, or wood-ſpurge; the characias, or red ſpurge; and the hyberna, or knotty-rooted ſpurge. The ſpurges are exceedingly acrid, and are now rejected both by the Edinburgh and London diſpenſatories.

EUPHORBIUM, in pharmacy, a gum reſin brought us always in looſe, ſmooth, and gloſſy gold-coloured drops or granules. It is the produce of the euphorbium antiquorum verum, which grows to ten or twelve feet high. Its principal uſe is externally in ſinapiſms, and plaſters applied to the feet, which are intended to ſtimulate, but not abſolutely to raiſe bliſters: for it is obſerved by Aviſenna, that when taken internally in large doſes, it has been found to exulcerate the inteſtines, and bring on death itſelf, after the moſt terrible ſymptoms.

EUPHRASIA, in botany, a genus of the didynamia angioſpermia claſs. The calix is cylindrical, and conſiſts of four ſegments; and the capſule is oblong and bilocular. There are ſix ſpecies, two of which are natives of Britain, *viz.* the officinalis, or eye-bright; and the odentites, or red eye-bright. The eye-bright was formerly celebrated as an ophthalmic, but is now totally diſregarded.

EUPHRATES, the fineſt river in Turky in Aſia, has two ſources, northward of the city of Erzerum, in 40° N. lat. After paſſing through Armenia, it divides Syria from Diarbec or Aſſyria, runs through Eyraca or Chaldea; and uniting with the Tygris, it paſſes by the city of Baſſora, fifty miles below which it falls into the gulf of Perſia.

EUREUX, a city of Normandy in France, twenty-five miles ſouth of Rouen.

EURIPUS, a ſtrait between the iſland of Negropont, and the continent of Greece, remarkable for its irregular tides.

The term euripus is ſometimes uſed, in a more general ſenſe, for any ſtraits where the water is much agitated.

EUROPE, the leaſt of the four grand diviſions of the earth, is ſituated between 36° and 72° N. lat.; and between 10° degrees W. long. and 65° E. long. being about 3000 miles long from north to ſouth, and 2500 miles broad from eaſt to weſt. It is bounded by the frozen ocean on the north, by Aſia on the eaſt, by the Mediterranean, which ſeparates it from Africa, on the ſouth, and by the Atlantic ocean on the weſt.

Europe is commonly ſubdivided into three grand diviſions, north, middle, and ſouth. The north or upper diviſion comprehends Ruſſia, or Muſcovy, Sweden, Denmark, and Norway, and the iſlands of Britain, Iceland, Greenland, and thoſe of the Baltic. The middle diviſion contains Poland, Germany, and the hereditary dominions of the houſe of Auſtria, the Low Countries, or Netherlands, and France. The ſouthern diviſion comprehends Turky in Europe, the ancient Greece chiefly, Switzerland, Italy, Spain and Portugal, and the iſlands of Sicily, Sardinia, Corſica, Majorca, Minorca, Ivica, and thoſe of the Archipelago.

EURYTHMY, in architecture, painting, and ſculpture, is a certain majeſty, elegance, and eaſineſs, appearing in the compoſition of divers members, or parts of a body, painting, or ſculpture, and reſulting from the fine proportion of it.

EUSTACE, or Eustatia, one of the Caribbee iſlands, four miles weſt of St Chriſtopher's, and ſubject to the Dutch.

EUSTYLE, in architecture, a ſort of building in which the pillars are placed at the moſt convenient diſtance one from another, the intercolumniations being juſt two diameters and a quarter of the column, except thoſe in the middle of the face, before and behind, which are three diameters diſtant.

EUTYCHIANS, in church-hiſtory, heretics in the Vth century, who embraced the errors of the monk Eutyches, maintaining that there was only one nature in Jeſus Chriſt.

EUXINE, the ſame with the Black Sea. See Black Sea.

EWAGE, a toll paid for the paſſage of water, and otherwiſe called aquage.

EWE, the Engliſh name of a female ſheep. See Ovis.

EWRY, in the Britiſh cuſtoms, an office in the king's houſhold, which has the care of the table-linen, of laying the cloth, and ſerving up water in ſilver ewers after dinner.

EXACERBATION. See Paroxysm.

EXACUM, in botany, a genus of the tetrandria monogynia claſs. The calix conſiſts of four leaves, and the corolla of four ſegments, with a roundiſh tube; the capſule is biſulcated, and has two cells containing many ſeeds. There are two ſpecies, none of them natives of Britain.

EXÆRESIS, in ſurgery, the operation of extracting or taking away ſomething that is hurtful to the human body.

EXAGGERATION, in rhetoric, a kind of hyperbole, whereby things are augmented or amplified, by ſaying more than the truth, either as to good or bad.

Exaggeration, in painting, a method by which the artiſt, in repreſenting things, changes them too much, or makes them too ſtrong, either in reſpect of the deſign or the colouring.

EXALTATION, in chemiſtry, ſigniſies an operation by which a ſubſtance has its properties changed, and raiſed to a higher degree of dignity and virtue.

EXAMINERS, in chancery, two officers of that court, who examine, upon oath, witneſſes produced in cauſes depending there, by either the complainant or defendant, where the witneſſes live in London, or near it. Sometimes parties themſelves, by particular order, are examined. In the country, above twenty miles from London, on the parties joining in commiſſion, witneſſes are examined by commiſſioners, being uſually counſellors or attornies not concerned in the cauſe.

EXANTHEMA among phyſicians, denotes any kind of efloreſcence or eruption, as the meaſles, purple ſpots in the plague, or malignant fevers, *&c.*

EXARCH, in antiquity, an officer ſent by the emperors of the eaſt into Italy, in quality of vicar, or rather præfect, to defend that part of Italy which was yet under their obedience, and particularly the city of Ravenna, againſt the Lombards. The exarch reſided at Ravenna, which place, with Rome, was all that was left to the emperors of their Italian dominions. The firſt exarch was under Juſtin the younger, in the year 567, after Beliſarius and Narſes had driven the barbarians out of Italy. The laſt was Eutychius, defeated by Adolphus king of the Lombards in 752.

EXCELLENCY, a title anciently given to kings and emperors, but now to embaſſadors, and other perſons who are not qualified for that of *highneſs*, and yet are to be elevated above the other inferior dignities.

EXCENTRIC, in geometry, a term applied to circles and ſpheres which have not the ſame centre, and conſequently are not parallel; in oppoſition to concentric, where they are parallel, having one common centre.

EXCENTRICITY, in aſtronomy, is the diſtance of the centre of the orbit of a planet from the centre of the ſun; that is, the diſtance between the centre of the ellipſis and the focus thereof. See Astronomy.

EXCEPTION, in law, denotes a ſtop or ſtay to an action.

EXCERPTA, in matters of literature. See Extract.

EXCESS, in arithmetic and geometry, is the difference between any two unequal numbers or quantities, or that which is left after the leſſer is taken from or out of the greater. See Arithmetic.

EXCHANGE, in a general ſenſe, a contract or agreement, whereby one thing is given or exchanged for another.

Exchange, in commerce, is the receiving or paying of money in one country for the like ſome in another, by means of bills of exchange.

The ſecurity which merchants commonly take from one another when they circulate their buſineſs, is a bill of exchange, or a note of hand: theſe are looked upon as payment.

The punctuality of acquitting thoſe obligations is eſſential to commerce; and no ſooner is a merchant's accepted bill proteſted, than he is conſidered as a bankrupt. For this reaſon, the laws of moſt nations have given very extraordinary privileges to bills of exchange. The ſecurity of trade is eſſential to every ſociety; and were the claims of merchants to linger under the formalities of courts of law when liquidated by bills of exchange, faith, confidence, and punctuality would quickly diſappear, and the great engine of commerce would be totally deſtroyed.

A regular bill of exchange is a mercantile contract, in which four perſons are concerned, *viz.* 1. The drawer, who receives the value: 2. His debtor in a diſtant place, upon whom the bill is drawn, and who muſt accept and pay it: 3. The perſon who gives value for the bill, to whoſe order it is to be paid: and, 4. The perſon to whom it is ordered to be paid, creditor to the third.

By this operation, reciprocal debts, due in two diſtant parts, are paid by a ſort of transfer, or permutation of debtors and creditors.

(A) in London is creditor to (B) in Paris, value 100*l.* (C) again in London is debtor to (D) in Paris for a like ſum. By the operation of the bill of exchange, the London creditor is paid by the London debtor, and the Paris creditor is paid by the Paris debtor; conſequently, the two debts are paid, and no money is ſent from London to Paris, nor from Paris to London.

In this example, (A) is the drawer, (B) is the acceptor, (C) is the purchaſer of the bill, and (D) receives the money. Two perſons here receive the money, (A) and (D), and two pay the money, (B) and (C); which is juſt what muſt be done when two debtors and two creditors clear accounts.

This is the plain principle of a bill of exchange. From which it appears, that reciprocal and equal debts only can be acquitted by them.

When it therefore happens that the reciprocal debts of London and Paris (to uſe the ſame example) are not equal. there ariſes a balance on one ſide. Suppoſe London to owe Paris a balance, value 100*l.* How can this be paid? Anſwer, It may either be done with or without the intervention of a bill.

With a bill, if an exchanger, finding a demand for a bill upon Paris for the value of 100*l.* when Paris owes no more to London, ſends 100*l.* to his correſpondent at Paris in coin, at the expence (ſuppoſe) of 1*l.* and then, having become creditor on Paris, he can give a bill for the value of 100*l.* upon his being repaid his expence, and paid for his riſk and trouble.

Or it may be paid without a bill, if the London debtor ſends the coin himſelf to his Paris creditor, without employing an exchanger.

This laſt example ſhews of what little uſe bills are in the payment of balances. As far as the debts are equal, nothing can be more uſeful than bills of exchange; but the more they are uſeful in this eaſy way of buſineſs, the leſs profit there is to any perſon to make a trade of exchange, when he is not himſelf concerned either as debtor or creditor.

When merchants have occaſion to draw and remit bills for the liquidation of their own debts, active and paſſive, in diſtant parts, they meet upon change; where, to purſue the former example, the creditors upon Paris, when they want money for bills, look out for thoſe who are debtors to it. The debtors to Paris again, when they want bills for money, ſeek for thoſe who are creditors upon it.

This market is conſtantly attended by brokers, who relieve the merchant of the trouble of ſearching for thoſe he wants. To the broker every one communicates his wants, ſo far as he finds it prudent; and by going about among all the merchants, the broker diſcovers the ſide upon which the greater demand lies, for money, or for bills.

He who is the demander in any bargain, has conſtantly the diſadvantage in dealing with him of whom he demands. This is no where ſo much the caſe as in exchange, and renders ſecrecy very eſſential to individuals among the merchants. If the London merchants want to pay their debts to Paris, when there is a balance againſt London, it is their intereſt to conceal their debts, and eſpecially the neceſſity they may be under to pay them; from the fear that thoſe who are creditors upon Paris would demand too high a price for the exchange over and above par.

On the other hand, thoſe who are creditors upon Paris, when Paris owes a balance to London, are as careful in concealing what is owing to them by Paris, from the fear that thoſe who are debtors to Paris would avail themſelves of the competition among the Paris creditors, in order to obtain bills for their money, below the value of them, when at par. A creditor upon Paris, who is greatly preſſed for money at London, will willingly abate ſomething of his debt, in order to get one who will give him money for it.

From the operation carried on among merchants upon change, we may diſcover the conſequence of their ſeparate and jarring intereſts. They are conſtantly intereſted in the ſtate of the balance. Thoſe who are creditors on Paris, fear the balance due to London; thoſe who are debtors to Paris, dread a balance due to Paris. The intereſt of the firſt is to diſſemble what they fear; that of the laſt, to exaggerate what they wiſh. The brokers are thoſe who determine the courſe of the day: and the moſt intelligent merchants are thoſe who diſpatch their buſineſs before the fact is known.

Now, how is trade in general intereſted in the queſtion, Who ſhall outwit, and who ſhall be outwitted, in this complicated operation of exchange among merchants?

The intereſt of trade and of the nation is principally concerned in the proper method of paying and receiving the balances. It is alſo concerned in preſerving a juſt equality of profit and loſs among all the merchants, relative to the real ſtate of the balance. Unequal competition among men engaged in the ſame purſuit, conſtantly draws along with it bad conſequences to the general undertaking; and ſecrecy in trade will be found, upon examination, to be much more uſeful to merchants in their private capacity, than to the trade they are carrying on.

Merchants endeavour to ſimplify their buſineſs as much as poſſible; and commit to brokers many operations which require no peculiar talents to execute. This of exchange is of ſuch a nature, that it is hardly poſſible for a merchant to carry on the buſineſs of his bills, without their aſſiſtance, upon many occaſions. When merchants come upon change, they are ſo full of fears and jealouſies, that they will not open themſelves to one another, leſt they ſhould diſcover what they want to conceal. The broker is a confidential man, in ſome degree, between parties, and brings them together.

Beſides the merchants who circulate among themſelves their reciprocal debts and credits ariſing from their importation and exportation of goods, there is another ſet of merchants who deal in exchange; which is the importation and exportation of money and bills.

Were there never any balance on the trade of nations, exchangers and brokers would find little employment: reciprocal and equal debts would eaſily be tranſacted openly between the parties themſelves. No man feigns and diſſembles, except when he thinks he has an intereſt in ſo doing.

But when balances come to be paid, exchange becomes intricate; and merchants are ſo much employed in particular branches of buſineſs, that they are obliged to leave the liquidation of their debts to a particular ſet of men, who make it turn out to the beſt advantage to themſelves.

Whenever a balance is to be paid, that payment coſts, as we have ſeen, an additional expence to thoſe of the place who owe it, over and above the value of the debt.

If, therefore, this expence be a loſs to the trading man, he muſt either be repaid this loſs by thoſe whom he ſerves, that is, by the nation; or the trade he carries on will become leſs profitable.

Every one will agree, that the expence of high exchange upon paying a balance, is a loſs to a people, no way to be compenſated by the advantages they reap from enriching the few individuals among them who gain by contriving methods to pay it off: and if an argument is neceſſary to prove this propoſition, it may be drawn from this principle, to wit, whatever renders the profit upon trade precarious or uncertain, is a loſs to trade in general: this loſs is the conſequence of high exchange; and although a profit does reſult from it upon one branch of trade, the exchange-buſineſs, yet that cannot compenſate the loſs upon every other.

We may, therefore, here repeat what we have ſaid above, that the more difficulty is found in paying a balance, the greater is the loſs to the nation.

The courſe of EXCHANGE.

The courſe of exchange is the current price betwixt two places, which is always fluctuating and unſettled, being ſometimes above and ſometimes below par, according to the circumſtances of trade.

When the courſe of exchange riſes above par, the country where it riſes may conclude for certain, that the balance of trade runs againſt them. The truth of this will appear, if we ſuppoſe Britain to import from any foreign place goods to the value of 100,000 l. at par, and export only to the value of 80,000.; in this caſe, bills on the ſaid foreign place will be ſcarce in Britain, and conſequently will riſe in value; and after the 80,0000 l. is paid, bills muſt be procured from other places at a high rate to pay the remainder, ſo that perhaps 120,000 l. may be paid for bills to diſcharge a debt of 100,000 l.

Though the courſe of exchange be in a perpetual flux, and riſes or falls according to the circumſtances of trade, yet the exchanges of London, Holland, Hamburgh, and Venice, in a great meaſure regulate thoſe of all other places in Europe.

I. *Exchange with Holland.*

MONEY-TABLE.

		Par in Sterling.		*s.*	*d.*
8 Pennings, or 2 duytes,	make	1 groat or penny	=	0	0.54
2 Groats, or 16 pennings,		1 ſtiver	=	0	1.09
6 Stivers, or 12 pence,		1 ſchilling	=	0	6.56
20 Schillings,		1 pound Flemiſh	=	10	11.18
20 Stivers, or 40 pence,		1 guilder or florin	=	1	9.36
6 Guilders, or florins,		1 pound Flemiſh	=	10	11.18
2¼ Guilders, or florins,		1 rixdollar	=	4	6.66

In Holland there are two ſorts of money, bank and current. The bank is reckoned good ſecurity; demands on the bank are readily anſwered; and hence bank-money is generally rated from 3 to 6 *per cent.* better than the current. The difference between the bank and current money is called the *agio.*

Bills on Holland are always drawn in bank-money; and if accounts be ſent over from Holland to Britain in current money, the Britiſh merchant pays theſe accounts by bills, and in this caſe has the benefit of the agio.

PROB. I. *To reduce bank money to current money.*

RULE. As 100 to 100+agio, ſo the given guilders to the anſwer.

EXAMPLE. What will 2210 guilders in bank money amount to in Holland currency, the agio being 3½ *per cent.?*

Guild.

As 100 : 103$\frac{1}{8}$ :: 2210

8 8 825

800 825 11050

4420

17680

Guild. *ſt.* *pen.*

8|00)18232|50(2279 1 4 cur.

16··· 20

22 10|00(

16 8

63 2

56 16

72 32

72 32

Or, by practice,

50)2210

44.2 = 2 *per cent.*

22.1 = 1 *per cent.*

2.7625 = $\frac{1}{8}$ *per cent.*

2279.0625

If the agio only be required, make the agio the middle term, thus:

Guil. *ſt.* *pen.*

As 100 : 3$\frac{1}{8}$ :: 2210 : 69 1 4 agio. Or, work by practice, as above.

Prob. II. *To reduce current money to bank money.*

Rule. As 100+agio to 100, ſo the given guilders to the anſwer.

Example. What will 2279 guilders 1 ſtiver 4 pennings, Holland currency, amount to in bank money, the agio being 3$\frac{1}{8}$ *per cent.?*

Guild. *Guild.* *Guild.* *ſt.* *pen.*

As 103$\frac{1}{8}$: 100 :: 2279 1 4

8 8 20

825 800 45581

20 16

16500 273490

16 45581

990 729300

165 800

8)264|000 8)583440|000

3)33 3)72930 *Guild.*

11 11)24310(2210 bank.

In Amſterdam, Rotterdam, Middleburgh, *&c.* books and accounts are kept by ſome in guilders, ſtivers, and pennings, and by others in pounds, ſhillings, and pence, Flemiſh.

Britain gives 1 l. Sterling for an uncertain number of ſhillings and pence Flemiſh. The par is 1 l. Sterling for 36.59 s. Flemiſh; that is, 1 l. 16 s. 7.08 d. Flemiſh.

When the Flemiſh rate riſes above par, Britain gains and Holland loſes by the exchange, and *vice verſa.*

Sterling money is changed into Flemiſh, by ſaying,

As 1 l. Sterling to the given rate,
So is the given Sterling to the Flemiſh ſought.
Or, the Flemiſh money may be caſt up by practice.

Dutch money, whether pounds, ſhillings, pence Flemiſh, or guilders, ſtivers, pennings, may be changed into Sterling, by ſaying,

As the given rate to 1 l. Sterling,
So the given Dutch to the Sterling ſought.

Example. 1. A merchant in Britain draws on Amſterdam for 782 l. Sterling: How many pounds Flemiſh, and how many guilders will that amount to, exchange at 34 s. 8 d. *per* pound Sterling?

L. *s.* *d.* *L.*

If 1 : 34 8 :: 782

12

416

782

832

3328

2912

12)325312

d.

2|0) 2710|9 4

L. 1355 9 4 *Flem.*

Decimally.

L. *s.* *L.*

If 1 : 34 $\dot{6}$ :: 782

782

$69\dot{3}$

$2773\dot{3}$

$242\dot{6}66$

2|0)2710|9.$\dot{3}$

L. 1355 9 4 *Flem.*

By practice.

	L. *s.* *d.*
	782
10 s. = $\frac{1}{2}$	391
4 s. = $\frac{1}{5}$	156 8
8 d. = $\frac{1}{6}$	26 1 4
	1355 9 4 *Fl.*

Or thus:

	L. *s.* *d.*
	782
14 s. = $\frac{7}{10}$	547 8
8 d. = $\frac{1}{30}$	26 1 4
	1355 9 4 *Fl.*

Multiply the Flemiſh pounds and ſhillings by 6, and the product will be guilders and ſtivers; and if there be any pence, multiply them by 8 for pennings; or, divide the Flemiſh pence by 40, and the quot will be guilders, and the half of the remainder, if there be any, will be ſtivers, and 1 penny odd will be half a ſtiver, or 8 pennings, as follows.

L. *s.* *d.*

1355 9 4

6

Guild. 8132 16 *ſtiv.*

Flem. pence.

4|0)32531|2(32 *rem.*

Guild. 8132 16 *ſtiv.*

2. Change 591 l. 5 s. Flemiſh into Sterling money, exchange at 37 s. 6 d. Flemiſh *per* l. Sterling?

Flem. Ster. Flem.

s. d. L. L. s.

If 37 6 : 1 :: 591 5

2 20

5)75 11025

2

4)15

5)23650

3

5) 4730

3) 946

L. s. d. $315\frac{1}{3}$

Anſ. 315 5 8 *Ster.*

Decimally.

5) *L.* *L.* 5) *L.*

If 1.875 : 1 :: 591.25

5) .375 5)118.25

5) .075 5) 23.65

.015 .015) 4.73(313.8

45

23

15

80

75

50

45

* 5

Holland exchanges with other nations as follows, *viz.* with

		Flem d.
Hamburgh, on the dollar,	=	$66\frac{2}{3}$
France, on the crown,	=	54
Spain, on the ducat,	=	$109\frac{4}{5}$
Portugal on the cruſade,	=	50
Venice, on the ducat,	=	93
Genoa, on the pezzo,	=	100
Leghorn, on the piaſtre,	=	100
Florence, on the crown,	=	120
Naples, on the ducat,	=	$74\frac{2}{3}$
Rome, on the crown,	=	136
Milan, on the ducat,	=	102
Bologna, on the dollar,	=	$94\frac{4}{9}$

Exchange between Britain and Antwerp, as alſo the Auſtrian Netherlands, is negociated the ſame way as with Holland, only the par is ſomewhat different, as will be deſcribed in article 2d, following.

II. *Exchange with Hamburgh.*

MONEY-TABLE.

		Par in Sterling.		*s.*	*d.*
12 Phennings	make	1 ſchilling-lub	=	0	$1\frac{1}{8}$
16 Schilling-lubs		1 mark	=	1	6
2 Marks		1 dollar	=	3	0
3 Marks		1 rixdollar	=	4	6
$6\frac{1}{4}$ Marks		1 ducat	=	9	$4\frac{1}{2}$

Books and accounts are kept at the bank, and by moſt people in the city, in marks, ſchilling-lubs, and phennings; but ſome keep them in pounds, ſchillings, and groots Flemiſh.

The agio at Hamburgh runs between 20 and 40 *per cent.* All bills are paid in bank-money.

Hamburgh exchanges with Britain by giving an uncertain number of ſchillings and groots Flemiſh for the pound Sterling. The groot or penny Flemiſh here, as alſo at Antwerp, is worth $\frac{54}{96}$ of a penny Sterling; and ſo ſomething better than in Holland, where it is only $\frac{54}{100}$ d. Sterling.

		Flemiſh.
6 Phennings	make	1 groot or penny
6 Schilling-lubs		1 ſchilling
1 Schilling-lub		2 pence or groots
1 Mark		32 pence or groots
$7\frac{1}{2}$ Marks		1 pound.

The par with Hamburgh, and alſo with Antwerp, is 35 s. $6\frac{2}{3}$ d. Flemiſh for 1 l. Sterling.

EXAMPLES. 1. How many marks muſt be received at Hamburgh for 300 l. Sterling, exchange at 35 s. 3 d. Flemiſh *per* l. Sterling?

L. s. d. L.

If 1 : 35 3 :: 300.

12

423

300

M. ſch.

32)126900(3965 10

96 . . .

309

288

210

192

180

160

(20)

16

)320

32

(00)

Decimally.

	Flem. s.		Marks.		Flem. s.
If	20	:	7.5	::	35.25
	4	:	1.5	::	35.25
					1.5
					17625
					3525
					4)52.875

Marks in 1 l. Sterling 13.21875

300

Marks in 300 l. Sterling 3965.62500

16

3750

625

Schilling-lubs 10.000

2. How much Sterling money will a bill of 3965 marks 10 ſchilling-lubs amount to, exchange at 35 s. 3 d. Flemiſh *per* l. ſterling?

	Fl. s.	d.		L. St.		Mks.	ſch.
If	35	3	:	1	::	3965	10
	12					32	2
	423					7930	20 d.
						11897	

423)126900(300 l. ſter.

Decimally.

4 : 1.5 :: 35.25

1.5

17625

3525

4)52.875(14.21875

13.21875)3965.62500(300 l. ſter.

3965625

III. *Exchange with France.*

MONEY-TABLE.

			Par in Ster.	s.	d.
12 deniers	make	=	1 ſol	0	$0\frac{39}{80}$
20 ſols		=	1 livre	0	$9\frac{3}{4}$
3 livres		=	1 crown	2	$5\frac{1}{4}$

At Paris, Rouen, Lyons, *&c.* books and accounts are kept in livres, ſols, and deniers; and the exchange with Britain is on the crown, or ecu, of 3 livres, or 60 ſols Tournois. Britain gives for the crown an uncertain number of pence, commonly between 30 and 34, the par, as mentioned above, being $29\frac{1}{4}$ d.

Examp. 1. What Sterling money muſt be paid in London to receive in Paris 1978 crowns 25 ſols, exchange at $31\frac{5}{8}$ d. *per* crown?

	Sols.		d.		Cr.	ſols.
If	60	:	$31\frac{5}{8}$	::	1978	25
					60	
			253			
					118705	
					253	
					356115	
					573525	
					237410	

6|0)3003236|5 *Rem.*

8)500539 3

12)62567 11

2|0)521|3 13

L. 260 13 $11\frac{3}{8}$ *Anſ.*

By Practice.

d.		Cr. 1978	ſols. 25,	at $31\frac{5}{8}$ d.
30	$=\frac{1}{8}$	247	5	0
$1\frac{1}{2}$	$=\frac{1}{20}$	12	7	3
$\frac{1}{8}$	$=\frac{1}{12}$	1	0	$7\frac{1}{4}$
Sols 20	$=\frac{1}{3}$	0	0	$10\frac{1}{2}$
5	$=\frac{1}{4}$	0	0	$2\frac{1}{2}$
		260	13	$11\frac{1}{4}$

If you work decimally, ſay,

	Cr.		d. Ster.		Cr.		d. Ster.
As	1	:	31.625	::	1978 41$\dot{6}$	:	62567.42708$\dot{3}$

2. How many French livres will L. 121 : 18 : 6 Sterling amount to, exchange at $32\frac{7}{8}$ d. *per* crown?

	d.		Liv.		L.	s.	d.
If	$32\frac{7}{8}$	:	3	::	121	18	6
			8		20		
	263		24		2438		
					12		
					29262		
					24		
					117048		
					58524		

	Liv.	ſols	den.	
263)702288(	2670	5	11	*Anſ.*

Rem. (78) = 5 ſols 11 deniers.

IV. *Exchange with Portugal.*

MONEY-TABLE.

			Par in Ster.	s. d. f.
			1 ree	= 0 0 0.27
400 rees	make		1 cruſade	= 2 3
1000 rees	make		1 millree	= 5 $7\frac{1}{2}$

In Liſbon, Oporto, *&c.* books and accounts are generally kept in rees and millrees; and the millrees are diſtinguiſhed from the rees by a mark ſet between them thus, 485 ♈ 372; that is, 485 millrees and 372 rees.

Britain, as well as other nations, exchanges with Portugal on the millree, the par, as in the table, being $67\frac{1}{2}$ d. Serling. The courſe with Britain runs from 63 d. to 68 d. Sterling *per* millree.

Examp. 1. How much Sterling money will pay a bill of 827 ♈ 160 rees, exchange at $63\frac{3}{8}$ d. Serling *per* millree?

Rees. *d.* *Rees.*
If 1000 : $68\frac{3}{8}$ :: 827.160
8 507

8000 507 579012
413580 *Rem.*
8000)419370.120 2
12) 52421 — 5 d.
20) 4368 — 8 s.
L. 218 8 $5\frac{1}{4}$ *Anſ.*

By Practice.

Rees.
827.160, at $63\frac{3}{8}$ d.

d.
60 = $\frac{1}{4}$ | 206.790
3 = $\frac{1}{20}$ | 10.3395
$\frac{2}{8}$ = $\frac{1}{12}$ | .861625
$\frac{1}{8}$ = $\frac{1}{2}$ | .4308125
218.4219375

The rees being thouſandth parts of the millrees, are annexed to the integer, and the operation proceeds exactly as in decimals.

2. How many rees of Portugal will 500 l. Sterling amount to, exchange at 5 s. $4\frac{5}{8}$ d. *per* millree?

d. *Rees.* *L.*
If $64\frac{5}{8}$: 1000 :: 500
8 20
517 8000 10000
12
120000
8000
Rees.
517)960000000(1856.866 *Anſ.*

V. *Exchange with Spain.*

MONEY-TABLE.

			Par in Ster.	s. d.
34 mervadies	make		1 rial	= 0 $5\frac{1}{8}$
8 rials	make		1 piaſtre	= 3 7
375 mervadies	make		1 ducat	= 4 $11\frac{1}{4}$

In Madrid, Bilboa, Cadiz, Malaga, Seville, and moſt of the principal places, books and accounts are kept in piaſtres, called alſo *dollars*, rials, and mervadies; and they exchange with Britain generally on the piaſtre, and ſometimes on the ducat. The courſe runs from 35 d. to 45 d. Sterling for a piaſtre or dollar of 8 rials.

Examp. 1. London imports from Cadiz, goods to the value of 2163 piaſtres and 4 rials: How much Sterling will this amount to, exchange at $38\frac{3}{8}$ d. Sterling *per* piaſtre?

Piaſt. *Rials.*
2163 4, at $38\frac{3}{8}$ d.

Rials. | *d.*
| $38\frac{3}{8}$ each.
4 = | $19\frac{3}{16}$

d.
24 = $\frac{1}{10}$ | 216 6
12 = $\frac{1}{2}$ | 108 3
2 = $\frac{1}{6}$ | 18 0 6
$\frac{2}{8}$ = $\frac{1}{8}$ | 2 5 $0\frac{3}{4}$
$\frac{1}{8}$ = $\frac{1}{2}$ | 1 2 $6\frac{3}{8}$
345 17 $1\frac{1}{8}$
1 $7\frac{3}{16}$
L. 345 18 $8\frac{5}{16}$ *Anſ.*

2. London remits to Cadiz 345 l. 18 s. $8\frac{5}{16}$ d. How much Spaniſh money will this amount to, exchange at $38\frac{3}{8}$ d. Sterling *per* piaſtre?

d. *Piaſt.* *L.* *s.* *d.*
If $38\frac{3}{8}$: 1 :: 345 18 $8\frac{5}{16}$
20
307 6918
2 12
614 83024
16
498149
83024
1328389

614)1328389(2193 piaſtres.
1228 ...
1003
614
3898
3684
2149
1842
307
8
614)2456(4 rials.
2446

VI. *Exchange with Venice.*

MONEY-TABLE.

$5\frac{1}{2}$ Soldi	make	1 gros
24 Gros	make	1 ducat = $50\frac{1}{4}$ d. Sterling.

The money of Venice is of three ſorts, *viz.* two of bank money, and the picoli money. One of the banks deals in banco money, and the other in banco current. The bank money is 20 *per cent.* better than the banco current, and the banco current 20 *per cent.* better than the picoli money. Exchanges are always negotiated by the ducat banco, the par being 4 s. 2¼ d. Sterling, as in the table.

Though the ducat be commonly divided into 24 gros, yet bankers and negotiators, for facility of computation, uſually divide it as follows, and keep their books and accounts accordingly.

```
12 Deniers d'or }      { 1 ſol d'or
20 Sols d'or    } make { 1 ducat = 50¾ d. Sterling.
```

The courſe of exchange is from 45 d. to 55 d. Sterling *per* ducat.

Examp. 1. How much Sterling money is equal to 1459 ducats 18 ſols 1 denier, bank money of Venice, exchange at 52¾ d. Sterling *per* ducat?

```
Duc.  d.     Duc. ſol. den.                   d.
If 1 : 52¾ :: 1459  18   1                   52¾ rate.
              52¾              Sols.        |_______
             ______            10 = ½       | 26⅜
              2918              5 = ½       | 13⅛
             7295               2 = ⅕       |    2/8
             ______             1 = ½       |    5/8
       d.    75868        den.  1 = 1/12    |  0 2/8
       ½ =     729 4/8                       _______
       ¼ =     364 6/8                        47⅝
             ________
             76962 2/8
                47⅝
             ___________Rem.
       12)77010(6d.
          ______
       2|0)641|7(17s.
           ______

       L. 320  17  6 Sterling.  Anſ.
```

2. How many ducats at Venice are equal to 385 l. 12 s. 6 d. Sterling, exchange at 4 s. 4 d. *per* ducat?

```
      L.    Duc.  L.
  If .216̇ : 1 :: 385.625
          .216̇)385.625
           21   385625
          ____ ______ ____Duc.
          195)347062.5(1779.8  Anſ.
              195
              ____
              1520
              1365
              _____
               1556
               1365
               _____
                1912
                1755
                _____
                 1575
                 1560
                 _____
                 (15)
```

Bank money is reduced to current money, by allowing for the agio, as was done in exchange with Holland; *viz.* ſay, As 100 to 120, or as 10 to 12, or as 5 to 6, ſo the given bank money to the current ſought. And current money is reduced to bank money by reverſing the operation. And in like manner may picoli money be reduced to current or to bank money, and the contrary.

100 ducats banco of Venice.

In Leghorn	= 93 pezzos	In Lucca	= 77 crowns
In Rome	= 68½ crowns	In Francfort	= 139½ florins

VII. *Exchange with Genoa.*

MONEY-TABLE.

```
12 Denari }      { 1 ſoldi      s. d.
20 Soldi  } make { 1 pezzo  =   4  6 Sterling.
```

Books and accounts are generally kept in pezzos, ſoldi, and denari; but ſome keep them in lires, ſoldi, and denari; and 12 ſuch denari make 1 ſoldi, and 20 ſoldi make 1 lire.

The pezzo of exchange is equal to 5¾ lires; and, conſequently, exchange money is 5¾ times better than the lire money. The courſe of exchange runs from 47 d. to 58 d. Sterling *per* pezzo.

Examp. How much Sterling money is equivalent to 3390 pezzos 16 ſoldi, of Genoa, exchange at 51⅞ d. Sterling *per* pezzo?

```
  Soldi.  d.     Pez. ſoldi.
  If 20 : 51⅞ :: 3390  16
      8   ____          20
   ____   415     _______
    160            67816
                     415
                 _______
                  339080
                  67816
                 271264
                 _______        d.          L.  s.  d.
     160)28143640(175897¾ = 732 18 1¾
```

If Sterling money be given, it may be reduced or changed into pezzos of Genoa, by reverſing the former operation.

Exchange money is reduced to lire money, by being multiplied by 5¾, as follows:

```
        Pez. ſoldi.                 Decimally.
        3390  16                     3390.8
               5¾                      5.75
       __________                  ________
       16954   0                    169550
  ½ =   1695   8                   237356
  ¼ =    847  14                  169540
       __________                 ________
 Lires 19497   2            Lires 19497.100
```

And lire money is reduced to exchange money by dividing it by 5¾.

		Soldi of Genoa.
In Milan, 1 crown	=	80
In Naples, 1 ducat	=	86
In Leghorn, 1 piaſtre	=	20
In Sicily, 1 crown	=	127²⁄₉

VIII. *Exchange with Leghorn.*

MONEY-TABLE.

			s.	d.	
12 Denari	make	1 ſoldi			
20 Soldi		1 piaſtre =	4	6	*Ster.*

Books and accounts are kept in piaſtres, ſoldi, and denari. The piaſtre here conſiſts of 6 lires, and the lire contains 20 ſoldi, and the ſoldi 12 denari, and conſequently exchange money is 6 times better than lire money. The courſe of exchange is from 47 d. to 58 d. Sterling *per* piaſtre.

Example. What is the Sterling value of 731 piaſtres, at $55\frac{1}{2}$d. each.

s. d.	731 piaſtres, at $55\frac{1}{2}$d.		
4 or 48 = $\frac{1}{6}$	146	4	
7 = $\frac{1}{8}$	18	5	6
$1\frac{1}{2}$ = $\frac{1}{4}$	4	11	$4\frac{1}{2}$
	L. 169	0	$10\frac{1}{2}$ *Anſ.*

Sterling money is reduced to money of Leghorn, by reverſing the former operation; and exchange money is reduced to lire money by multiplying by 6, and lire money to exchange money by dividing by 6.

100 piaſtres of Leghorn are

In Naples = 134 ducats. | In Geneva = $185\frac{1}{3}$ crowns.

Soldi of Leghorn.

In Sicily, 1 crown = $133\frac{2}{3}$

In Sardinia, 1 dollar = $95\frac{5}{9}$

The above are the chief places in Europe with which Britain exchanges directly; the exchanges with other places are generally made by bills on Hamburg, Holland, or Venice. We ſhall here however ſubjoin the par of exchange betwixt Britain and moſt of the other places in Europe, with which we have any commercial intercourſe.

Par in Sterling.				*L.*	*s.*	*d.*
Rome	1	crown	=		6	$1\frac{2}{3}$
Naples,	1	ducat	=		3	$4\frac{1}{2}$
Florence,	1	crown	=		5	$4\frac{5}{8}$
Milan,	1	ducat	=		4	7
Bologna,	1	dollar	=		4	3
Sicily,	1	crown	=		5	0
Vienna,	1	rixdollar	=		4	8
Auſburgh,	1	florin	=		3	$1\frac{2}{3}$
Francfort,	1	florin	=		3	0
Bremen,	1	rixdollar	=		3	6
Breſlau,	1	rixdollar	=		3	3
Berlin,	1	rixdollar	=		4	0
Stetin,	1	mark	=		1	6
Embden,	1	rixdollar	=		3	6
Bolſenna,	1	rixdollar	=		3	8
Dantzic,	$13\frac{1}{2}$	florins	=	1	0	0
Stockholm,	$34\frac{4}{7}$	dollars	=	1	0	0
Ruſſia,	1	rubble	=		4	5
Turkey,	1	aſper	=		4	6

The following places, *viz.* Switzerland, Noremburgh, Leipſic, Dreſden, Oſnaburgh, Brunſwic, Cologn, Liege, Straſburgh, Cracow, Denmark, Norway, Riga, Revil, Narva, exchange with Britain, when direct exchange is made, upon the rixdollar, the par being 4s. 6d. Sterling.

IX. *Exchange with America and the Weſt Indies.*

In North America and the Weſt Indies, accounts, as in Britain, are kept in pounds, ſhillings, and pence. In North America they have few coins circulating among them, and on that account have been obliged to ſubſtitute a paper-currency for a medium of their commerce; which having no intrinſic value, is ſubjected to many diſadvantages, and generally ſuffers a great diſcount. In the Weſt Indies coins are more frequent, owing to their commercial intercourſe with the Spaniſh ſettlements.

Exchange betwixt Britain and America, or the Weſt Indies, may be computed as in the following examples:

1. The neat proceeds of a cargo from Britain to Boſton amount to 845 l. 17 s. 6d. currency: How much is that in ſterling money, exchange at 80 *per cent.?*

If 180 : 100			
18 : 10	*L.*	*s.*	*d.*
9 : 5 ::	845	17	6
			5
	9)4229	7	6
	L. 469	18	$7\frac{1}{3}$ Ster. *Anſ.*

2. Boſton remits to Britain a bill of 469 l. 18 s. $7\frac{1}{3}$d. Sterling: How much currency was paid for the bill at Boſton, exchange at 80 *per cent.?*

If 100 : 180	*L.*	*s.*	*d.*
5 : 9 ::	469	18	$7\frac{1}{3}$
			9
	5)4229	7	6
	845	17	6 currency. *Anſ.*

3. How much Sterling money will 1780 l. Jamaica currency amount to, exchange at 40 *per cent.?*

If 140 : 100			
14 : 10	*L.*		
7 : 5 ::	1780		
	5		
	7)8900		
		s.	*d.*
	1271	8	$6\frac{1}{4}$ Ster. *Anſ.*

Bills of exchange from America, the rate being high, is an expenſive way of remitting money to Britain; and therefore merchants in Britain generally chuſe to have the debts due to them remitted home in ſugar, rum, or other produce.

X. *Exchange with Ireland,*

At Dublin, and all over Ireland, books and accounts are kept in pounds, ſhillings, and pence, as in Britain; and they exchange on the 100 l. Sterling.

The par of one ſhilling Sterling is one ſhilling and one penny Iriſh: and ſo the par of 100 l. Sterling is 108 l. 6 s. 8 d. Iriſh. The courſe of exchange runs from 6 to 15 *per cent.*

Examp. 1. London remits to Dublin 586 l. 10 s. Sterling: How much Iriſh money will that amount to, exchange at 9$\frac{5}{8}$ *per cent.?*

L.

If 100 : 109$\frac{5}{8}$ :: 586.5

8 877

800 : 877 41055

41055

46920

800)514360.5

542.950625

Anſ. 642 l. 19 s. Iriſh.

By practice.

p. cent.	586.5
10 = $\frac{1}{10}$	58.65
2 = $\frac{1}{5}$	11.73 ſub.
8 =	46.92
1 = $\frac{1}{8}$	5.865
$\frac{4}{8}$ = $\frac{1}{2}$	2.9325
$\frac{1}{8}$ = $\frac{1}{4}$	.733125
9$\frac{5}{8}$	56.450625 add.
	642.950625

2. How much Sterling will 625 l. Iriſh amount to, exchange at 10$\frac{1}{8}$ *per cent.?*

If 110$\frac{1}{8}$: 100 :: 625

8 800

L. s. d.

883 800 883)500000(566 5 0$\frac{1}{4}$ Ster. *Anſ.*

XI. *Exchange betwixt London and other places in Britain.*

The ſeveral towns in Britain exchange with London for a ſmall premium in favour of London; ſuch as, 1, 1$\frac{1}{4}$, *&c. per cent.* The premium is more or leſs according to the demand for bills.

Examp. Edinburgh draws on London for 860 l. exchange at 1$\frac{3}{8}$ *per cent.*: How much money muſt be paid at Edinburgh for the bill?

per cent.	*L.*
	860
1 = $\frac{1}{100}$	8 12
$\frac{1}{8}$ = $\frac{1}{4}$	2 3
$\frac{2}{8}$ = $\frac{1}{2}$	1 1 6
	11 16 6 premium.
	871 16 6 paid for the bill.

To avoid paying the premium, it is an uſual practice to take the bill payable at London a certain number of days after date; and in this way of doing, 73 days is equivalent to 1 *per cent.*

XII. *Arbitration of Exchanges.*

The courſe of exchange betwixt nation and nation naturally riſes or falls according as the circumſtances and balance of trade happen to vary. Now to draw upon and remit to foreign places, in this fluctuating ſtate of exchange, in the way that will turn out moſt profitable, is the deſign of arbitration. Which is either ſimple or compound.

I. *Simple Arbitration.*

In ſimple arbitration the rates or prices of exchange from one place to other two are given; whereby is found the correſpondent price between the ſaid two places, called the *arbitrated price*, or *par of arbitration*: and hence is derived a method of drawing and remitting to the beſt advantage.

Ehamp. 1. If exchange from London to Amſterdam be 33 s. 9 d. *per* l. Sterling; and if exchange from London to Paris be 32 d. *per* crown; what muſt be the rate of exchange from Amſterdam to Paris, in order to be on a par with the other two?

Ster. *Flem.* *Ster.*

s. *s.* *d.* *d.*

If 20 : 33 9 :: 32

12 12

240 405

32

810

1215

240)12560(54 d. Flem. *per* crown. *Anſ.*

2. If exchange from Paris to London be 32 d. Sterling *per* crown; and if exchange from Paris to Amſterdam be 54 d. Flemiſh *per* crown; what muſt be the rate of exchange between London and Amſterdam, in order to be on a par with the other two?

Ster. *Flem.* *Ster.*

d. *d.* *d.*

If 32. : 54 :: 240.

240

216

108

12) *s. d.*

32)12960(405 (33 9 Flem. *per* l. Ster. *Anſ.*

From theſe operations it appears, that if any ſum of money be remitted, at the rates of exchange mentioned, from any one of the three places to the ſecond, and from the ſecond to the third, and again from the third to the firſt, the ſum ſo remitted will come home entire, without increaſe or diminution.

From the par of arbitration thus found, and the courſe of exchange given, is deduced a method of drawing and remitting to advantage, as in the following example.

3. If exchange from London to Paris be 32 d. Sterling *per* crown, and to Amſterdam 405 d. Flemiſh *per* l. Sterling; and if, by advice from Holland or France, the courſe of exchange between Paris and Amſterdam is fallen to 52 d Flemiſh *per* crown; what may be gained *per cent.* by drawing on Paris, and remitting to Amſterdam?

The par of arbitration between Paris and Amſterdam in this caſe, by Ex. 1. is 54 d. Flemiſh *per* crown. Work as under.

d. St. Cr. L. St. Cr.
If 32 : 1 :: 100 : 750 debit at Paris

Cr. d. Fl. Cr. d. Fl.
If 1 : 52 :: 750 : 39000 credit at Amſterdam.

d. Fl. L. St. d. Fl. L. s. d. Ster.
If 405 : 1 :: 39000 : 96 5 11$\frac{1}{9}$ to be remitted.
100

3 14 0$\frac{8}{9}$

But if the courſe of exchange between Paris and Amſterdam, inſtead of falling below, riſe above the par of arbitration, ſuppoſe to 56 d. Flemiſh *per* crown; in this caſe, if you propoſe to gain by the negotiation, you muſt draw on Amſterdam, and remit to Paris. The computation follows.

L. St. d. Fl. L. St. d. Fl.
If 1 : 405 :: 100 : 40500 debit at Amſterdam.
d. Fl. Cr. d. F. Cr.
If 56 : 1 :: 40500 : 723$\frac{3}{14}$ credit at Paris.
Cr. d. St. Cr. L. s. d. Ster.
If 1 : 32 :: 723$\frac{3}{14}$: 96 8 6$\frac{6}{7}$ to be remitted.
100

3 11 5$\frac{1}{7}$ gained *per cent.*

In negotiations of this ſort, a fund for remittance is afforded out of the ſum you receive for the draught; and your credit at the one foreign place pays your debit at the other.

II. *Compound Arbitration.*

In compound arbitration the rate or price of exchange between three, four, or more places, is given, in order to find how much a remittance paſſing through them all will amount to at the laſt place; or to find the arbitrated price, or par of arbitration, between the firſt place and the laſt. And this may be done by the following

Rules. I. Diſtinguiſh the given rates or prices into antecedents and conſequents; place the antecedents in one column, and the conſequents in another on the right, fronting one another by way of equation.

II. The firſt antecedent, and the laſt conſequent to which an antecedent is required, muſt always be of the ſame kind.

III. The ſecond antecedent muſt be of the ſame kind with the firſt conſequent, and the third antecedent of the ſame kind with the ſecond conſequent, &c.

IV. If to any of the numbers a fraction be annexed, both the antecedent and its conſequent muſt be multiplied into the denominator.

V. To facilitate the operation, terms that happen to be equal or the ſame in both columns, may be dropped or rejected, and other terms may be abridged.

VI. Multiply the antecedents continually for a diviſor, and the conſequents continually for a dividend, and the quot will be the anſwer or antecedent required.

Examp. 1. If London remit 1000 l. Sterling to Spain, by way of Holland, at 35 s. Flemiſh *per* l. Sterling; thence to France, at 58 d. Flemiſh *per* crown; thence to Venice, at 100 crowns *per* 60 ducats; and thence to Spain, at 360 mervadies *per* ducat; how many piaſtres, of 272 mervadies, will the 1000 l. Sterling amount to in Spain?

Antecedents.		*Conſequents.*	*Abridged.*
1 l. Sterling	=	35 s. or 420 d. Fl.	1=210
58 d. Flemiſh	=	1 crown France	29= 1
100 crowns France	=	60 ducats Venice	1= 30
1 ducat Venice	=	360 mervadies Spain	1= 45
272 mervadies	=	1 piaſtre	17= 1
How many piaſtres	=	1000 l. Sterling	= 10

In order to abridge the terms, divide 58 and 420 by 2, and you have the new antecedent 29, and the new conſequent 210; reject two ciphers in 100 and 1000; divide 272 and 360 by 8, and you have 34 and 45; divide 34 and 60 by 2, and you have 17 and 30; and the whole will ſtand abridged as above.

Then, 29 × 17=493 diviſor; and, 210 × 30 × 45 × 10=2835000 dividend; and, 493)2835000(5750$\frac{1}{2}$ piaſtres. *Anſ.*

Or, the conſequents may be connected with the ſign of multiplication, and placed over a line by way of numerator; and the antecedents, connected in the ſame manner, may be placed under the line, by way of denominator; and then abridged, as follows:

$$\frac{420\times60\times360\times100}{58\times100\times272}=\frac{210\times60=360\times10}{29\times1\times272}$$
$$=\frac{210\times60\times45\times100}{29\times34}=\frac{210\times30\times45\times10}{29\times17}$$
$$=\frac{2835000}{493},$$

And, 493)2835000(5750$\frac{1}{2}$ piaſtres. *Anſ.*

The placing the terms by way of antecedent and conſequent, and working as the rules direct, ſave ſo many ſtatings of the rule of three, and greatly ſhortens the operation. The proportions at large for the above queſtion would ſtand as under.

L. St. d. Fl. L. St. d. Fl.
If 1 : 420 :: 1000 : 420000

d. Fl. Cr. d. Fl. Cr.
If 58 : 1 :: 420000 : 7241$\frac{11}{29}$

Cr. *Duc.* *Cr.* *Duc.*
If 100 : 60 :: $7241\frac{21}{29}$: $4344\frac{24}{29}$

Duc. *Mer.* *Duc.* *Mer.*
If 1 : 360 :: $4344\frac{24}{29}$: $1564137\frac{27}{29}$

Mer. *Piaſt.* *Mer.* *Piaſt.*
If 272 : 1 :: $1564137\frac{27}{29}$: $5750\frac{250}{493}$

If we ſuppoſe the courſe of direct exchange to Spain to be $42\frac{1}{2}$ d. Sterling *per* piaſtre, the 1000 l. remitted would only amount to $5647\frac{1}{2}$ piaſtres; and, conſequently, 103 piaſtres are gained by the negociation; that is, about 2 *per cent.*

2. A banker in Amſterdam remits to London 400 l. Flemiſh; firſt to France at 56 d. Flemiſh *per* crown; from France to Venice at 100 crowns *per* 60 ducats; from Venice to Hamburgh at 100 d. Flemiſh *per* ducat; from Hamburgh to Liſbon at 50 d. Flemiſh *per* cruſade of 400 rees; and, laſtly, from Liſbon to London at 64 d. Sterling *per* milree: How much Sterling money will the remittance amount to? and how much will be gained or ſaved, ſuppoſing the direct exchange from Holland to London at 36 s. 10 d. Flemiſh *per* l. Sterling?

Antecedents. *Conſequents.*
56 d. Flem. = 1 crown
100 crowns = 60 ducats.
1 ducat = 100 d. Flem.
50 d. Flem. = 400 rees.
1000 rees = 64 d. Sterling.
How many d. Ster = 400 l. or 96000 d. Flemiſh?

This, in the fractional form, will ſtand as follows.

$$\frac{60\times100\times400\times64\times96000}{56\times100\times50\times1000}=\frac{368640}{7}\text{, and}$$

7)368640($52662\frac{6}{7}$ d. Ster. = 219 l. 8. s. $6\frac{6}{7}$ d. St. *Anſ.*

To find how much the exchange from Amſterdam directly to London, at 36 s. 10 d. Flemiſh *per* l. Sterling, will amount to, ſay,

s. d.		*d. Fl. L. St. d Fl.*	*L.*	*s.*	*d. St.*
36 10	If	442 : 1 :: 96000 :	217	3	$10\frac{1}{2}$
12			219	8	$6\frac{1}{4}$
442		Gained or ſaved,	2	4	$8\frac{1}{4}$

In the above example, the par of arbitration, or the arbitrated price, between London and Amſterdam, *viz.* the number of Flemiſh pence given for 1 l. Sterling, may be found thus:

Make 64 d. Sterling, the price of the milree, the firſt antecedent; then all the former conſequents will become antecedents, and all the antecedents will become conſequents. Place 240, the pence in 1 l. Sterling, as the laſt conſequent, and then proceed as taught above, *viz.*

Antecedents. *Conſequents.*
64 d. Ster. = 1000 rees.
400 rees = 50 d. Flem.
100 d. Flem. = 1 ducat.
60 ducats = 100 crowns.
1 crown = 56 d. Flem.
How many d. Flem. = 240 d. Ster.?

$$\frac{1000\times50\times100\times56\times240}{64\times400\times100\times60}=\frac{875}{2}\text{, and}$$

2)875($437\frac{1}{2}$ d. = 36 s. $5\frac{1}{2}$ d. Flem. *per* l. Ster. *Anſ.*

Or the arbitrated price may be found from the anſwer to the queſtion, by ſaying,

d. Ster. *d. Flem.* *d. St.*
If $\frac{368640}{7}$: 96000 :: 240
7
672000
240
2688
1344
d. *s. d. Flem.*
368640)161280000($437\frac{1}{2}$ = 36 $5\frac{1}{2}$ as before.

The work may be proved by the arbitrated price thus: As 1 l. Sterling to 36 s. $5\frac{1}{2}$ d. Flemiſh, ſo 219 l. 8 s. $6\frac{6}{7}$ d. Sterling to 400 l. Flemiſh.

The arbitrated price compared with the direct courſe ſhows whether the direct or circular remittance will be moſt advantageous, and how much. Thus the banker at Amſterdam will think it better exchange to receive 1 l. Sterling for 36 s. $5\frac{1}{2}$ d. Flemiſh, than for 36 s. 10 d. Flemiſh.

EXCHANGE ſignifies alſo a place in moſt conſiderable trading cities, wherein the merchants, negociants, agents, bankers, brokers, interpreters, and other perſons concerned in commerce, meet on certain days, and at certain times thereof, to confer and treat together of matters relating to exchanges, remittances, payments, adventures, aſſurances, freightments, and other mercantile negociations, both by ſea and land.

EXCHEQUER, in the Britiſh juriſprudence, an ancient court of record, in which all cauſes concerning the revenues and rights of the crown are heard and determined, and where the crown-revenues are received.

It took this name from the cloth that covered the table of the court, which was party-coloured, or chequered.

This court is ſaid to have been erected by William the conqueror, its model being taken from a like court eſtabliſhed in Normandy long before that time. Anciently its authority was ſo great, that it was held in the king's palace, and the acts thereof were not to be examined or controlled in any other of the king's courts; but, at preſent, it is the laſt of the four courts at Weſtminſter.

In the exchequer, ſome reckon ſeven courts, *viz.* thoſe of pleas, accounts, recepts, exchequer-chamber, (which is an aſſembly of all the judges on difficult matters in law) errors in the exchequer, errors in the king's bench, and, laſtly, the court of equity in the exchequer.

But the exchequer, for diſpatch of buſineſs, is generally divided into two parts; one of which is chiefly converſant in the judicial hearing and deciding of all cauſes relating to the king's coffers, formerly termed the exchequer of accounts: the other is called the receipt of the exchequer, as being principally employed in receiving and payment of money.

Officers of the receipt may take one penny in the pound, as their fee for ſums iſſued out; and they are obliged, without delay, to receive the money brought thither; and the money received is to be put in cheſts under three different locks and keys, kept by three ſeveral officers. All ſheriffs, bailiffs, *&c.* are to account in the exchequer; and in the lower part, termed the receipt, the debtors of the king, and perſons in debt to them, the king's tenants, and the officers and miniſters of the court, are privileged to ſue one another, or any ſtranger, and to be ſued in the like actions as are brought in the courts of king's bench and common-pleas.

The judicial part of the exchequer, is a court both of law and equity. The court of law is held in the office of pleas, according to the courſe of common law, before the barons: in this court, the plaintiff ought to be a debtor or accountant to the king; and the leading proceſs is either a writ of ſubpœna, or quo minus, which laſt goes into Wales, where no proceſs out of our courts of law ought to run, except a capias utlagatum.

The court of equity is held in the exchequer-chamber before the treaſurer, chancellor, and barons; but, generally, before the barons only; the lord chief baron being the chief judge to hear and determine all cauſes. The proceedings in this part of the exchequer, are by Engliſh bill and anſwer, according to the practice of the court of chancery; with this difference, that the plaintiff here muſt likewiſe ſet forth that he is a debtor to the king, whether he be ſo or not. It is in this court of equity that the clergy exhibit bills for the recovery of their tythes, *&c.* Here too the attorney-general exhibits bills for any matters concerning the crown; and a bill may be exhibited againſt the king's attorney by any perſon aggrieved in any cauſe proſecuted againſt him on behalf of the king, to be relieved therein: in which caſe, the plaintiff is to attend on the attorney-general with a copy of the bill, and procure him to give in an anſwer thereto; in the making of which he may call in any perſon intereſted in the cauſe, or any officer, or others, to inſtruct him, that the king be not prejudiced thereby, and his anſwer is to be put in without oath.

But beſides the buſineſs relating to debtors, farmers, receivers, accountants, *&c.* all penal puniſhments, intruſion, and forfeitures upon popular actions, are matters likewiſe cognizable by this court; where there alſo ſits a puiſne baron, who adminiſters the oaths to high-ſheriffs, bailiffs, auditors, receivers, collectors, comptrollers, ſurveyors and ſearchers of all the cuſtoms, *&c.*

The exchequer in Scotland, has the ſame privileges and juriſdiction as that of England; and all matters competent to the one, are likewiſe competent to the other.

Black book of the EXCHEQUER, a book containing a deſcription of the court of England in 1175, and its officers, with their ranks, wages, privileges, perquiſites, *&c.* alſo the revenues of the crown, both in money and cattle.

EXCIPIENT, in pharmacy, denotes the ingredient, which, in compound medicines, receives all the reſt; as the conſerve in electuaries, the ſyrup in boluſes, *&c.*

EXCISE, a certain duty or impoſt charged upon liquors, as beer, ale, cyder, *&c.* malt, and ſeveral other commodities, within the kingdom of Great Britain, and town of Berwick upon Tweed.

The exciſe is one of the moſt conſiderable branches of the king's revenue. It was formerly farmed out, but is now managed for the king by commiſſioners in both kingdoms, who receive the whole product of the exciſe, and pay it into the exchequer. Theſe commiſſioners are nine in number in England, and four in Scotland. The former have a ſalary of 1000 l. a year, the later 500 l. They are obliged by oath to take no fee or reward but from the king himſelf; and from them there lies an appeal to five other commiſſioners called commiſſioners of appeals.

The duty of exciſe was firſt granted to king Charles II. by act of parliament in the year 1660, during the life of that monarch. 1. It was 15 d. *per* barrel upon every barrel of beer or ale above 6 s. the barrel, and 3 d. *per* barrel for every barrel of 6 s. or under, brewed for retail; 15 d. for every hogſhead of cyder or perry ſold by retail; 1 d. for every gallon of ſtrong water, aqua vitæ, *&c.* 2. A new exciſe was granted for ever by the fifth money-act of William and Mary, being for every barrel of beer or ale above 6 s. the barrel, 9 d; and for every barrel of 6 s. or under, 3 d.; for every hogſhead of cyder or perry, 1 s. *per* hogſhead. In this exciſe, the price of the liquor is to be reckoned excluſive of the duty. 3. An exciſe was granted of 6 d. a buſhel on malt in the reign of king William, which by ſubſequent ſtatutes has been continued yearly ever ſince. But ſuch malt as ſhall be made for exportation, and be ſo entered and kept ſeparate from other malt, is exempted from the payment of this duty. 4. Another new exciſe upon home-made liquors was granted in queen Anne's reign; being an additional exciſe upon every barrel of beer or ale brewed for ſale above 6s. the barrel, 3 d. excluſive of the duties; and for every barrel at 6s. or under, 1 d.; for every hogſhead of cyder or perry, 5 d.; for every gallon of ſtrong waters or aqua vitæ, 1 d. This exciſe was not laid upon any ſuch liquors imported. 5. An exciſe on candles was firſt granted in the reign of queen Anne, and continued for ever, being a duty of 4 d. a pound on wax, and a halfpenny the pound on tallow candles, made in Great Britain for ſale or not for ſale; but makers for their own uſe may compound for 1 s. a head for every perſon in their family. An additional exciſe on candles was afterwards granted, being the ſame with the former in every reſpect. 6. An exciſe upon hides and ſkins tanned in Britain, firſt granted in queen Anne's reign, was an exciſe of ſeventeen different kinds, upon ſo many different kinds of hides and ſkins particularly named, and upon all others not named, 13 l. *per cent. ad valorem.* An additional exciſe was afterwards granted, being an additional duty of different kinds, upon ſo many different ſorts of hides and ſkins particularly named, and on all others not named, 15 l. *per cent.* on the value. 7. An exciſe on home-made vellum and parchment, firſt granted by the ſame act, being 1 s. *per* dozen on vellum, and 6 d. the dozen on parchment. And afterwards an additional exciſe on vellum, *&c.* was granted, being an additional duty of 2 s. the dozen on vellum, and 1 s. the dozen on parchment. 8. An exciſe on hops of home growth was firſt granted in queen Anne's reign, being 1 d. *per* pound. 9. An exciſe on paper, paſteboards, milled-boards, and ſcale-boards, was firſt granted in the reign of queen Anne, being a duty of eleven different kinds on ſo many different ſorts of paper particularly named, made in Great Britain; on paſteboards, *&c.* 3 s. the hundred weight, and on all ſorts of paper not named, 12 l. *per cent* on the value. An additional duty on paper, *&c* was granted of eleven different kinds, *&c.* on paſteboard, 1 s. 6 d. the hundred weight, and on all ſorts of paper not named, 6 l. *per cent.* on the value; and on painted paper for hangings, a halfpenny the yard ſquare. 10. An exciſe of 1 d. *per* pound on ſoap made in Great Britain, was granted by the ſame act; to which an additional exciſe has been added of a halfpenny *per* pound. 11. An exciſe upon printed ſilks, callicoes, linens and ſtuffs made in Great Britain, and printed, painted, ſtained or dyed here, was firſt granted in queen Anne's reign, being a duty of 3 d. on ſilks and callicoes, and 1½ d. on linen and ſtuffs the yard ſquare, excepting ſilk handkerchiefs, linens and fuſtains dyed of one colour, and ſtuffs made of woollen, or the greateſt part in value of woollen. And an additional exciſe was granted of 6 d. the yard of half-yard broad ſilks; 1 d. the yard ſquare of ſilk handkerchiefs; 3 d. the yard ſquare of callicoes, and 1½ d the yard ſquare of linens and ſtuffs, excepting, as before, callicoes, *&c.* dyed of one colour, and woollen ſtuffs. 12. An exciſe on ſtarch was firſt granted for 1 d. the pound; and afterwards an additional exciſe of 1 d. the pound. 13. The exciſe on gilt and ſilver wire made in Great Britain, is 8 d. the ounce on gilt wire, and 6 d. the ounce on ſilver wire.

If any brewers do not make true entries of their liquors brewed, once a-week at the exciſe-office, they forfeit 10 l. but this is ſubject to mitigation, ſo as not to be leſs than double the duty; and the retailers of beer and ale and ſtrong waters, neglecting to make their entries once a-month of what liquors they retail, are liable to 40 s. penalty. In caſe any brewer erects or alters any back, copper, cooler, *&c.* or keeps a private ſtore-houſe, or if any maltſter keeps any private veſſel for ſteeping barley, without giving proper notice to the officers of exciſe, ſuch brewer or maltſter forfeit 50 l. and where they bribe a gauger, it is 10 l. The officers of exciſe may go on board ſhips, and ſearch for any exciſeable liquors, as officers of the cuſtoms do, and ſeize commodities forfeited, *&c.* and complaints made at the chief office of exciſe are to be heard by three or more commiſſioners; but two juſtices of the peace have the power to determine in ſeizures out of the limits of the exciſe-office in London.

EXCLAMATION, in rhetoric, a figure that expreſſes the violent and ſudden breaking out, and vehemence of any paſſion.

EXCOMMUNICATION, an eccleſiaſtical penalty or cenſure, whereby ſuch perſons as are guilty of any notorious crime or offence, are ſeparated from the communion of the church, and deprived of all ſpiritual advantages.

Excommunication among the Jews, according to Elias, a German rabbin, was diſtinguiſhed into three kinds: 1. Niddui, which was a ſeparation of but a few days; 2. Cherem, a ſeparation attended with execration and malediction; and, 3. Shammatha, which was the laſt and greater excommunication. But Selden ſays, that niddui and ſhammatha are the ſame thing; and therefore that there were but two kinds of excommunication among the Jews, *viz.* the greater and the leſſer. They made alſo another diſtinction in excommunication, into total or univerſal, by which a man was excommunicated with regard to all men; and partial, by which a man was excommunicated in one city, and with regard to certain perſons, and not others.

It is obſervable, that not only the judges had the power of excommunicating, but that each particular perſon in converſation might excommunicate another, and himſelf likewiſe; and this excommunication, if well grounded, was of force: nay, if a man dreamed that he was excommunicated by himſelf or by another, he was conſidered as an excommunicated perſon, becauſe this dream was ſuppoſed to be ſent from God

As to the effects of the Jewiſh excommunication, the leſſer excluded the excommunicated perſon from the ſociety of men; that is, he was not to come nearer them than four cubits, neither he, his wife, children, or domeſtics, according to Buxtorf. The greater abſolutely ſequeſtered the perſon from the converſation of others; and ſometimes he was ſhut up in a ſmall chamber or priſon, where he lived alone. Baronius and Beza pretend, that the greater excommunication excluded men from the uſe of ſacred things. Selden, on the contrary, affirms, that they were allowed to be preſent in the temple, and partake of the public worſhip. Buxtorf, who is of the ſame opinion, adds, that whereas others came into the temple at the right hand, and went out at the left, the excommunicated were obliged both to go in and out at the left.

Excommunication, among the modern Jews, is attended with the moſt terrible conſequences. The excommunicated perſon is refuſed all human aſſiſtance: if there be a corpſe in his houſe, or a child to be circumciſed, none muſt help him. He is curſed by the book of the law, by the curſe of Joſhua againſt Jericho, by that of Eliſha againſt the children, by heaven and earth, and God is beſought that a whirlwind may daſh him to pieces. He is pelted with ſtones if he appear in the ſtreets; and if he obtains abſolution, it is upon the moſt mortifying conditions; for he is publicly tied to a poſt and whipped, after which he lays himſelf down at the door of the ſynagogue, and all thoſe who go out paſs over him. This was the very caſe of the famous Jew Acoſta.

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The greater excommunication, called *panteles aphoriſmos*, total ſeparation and anathema, conſiſted in an abſolute and intire excluſion from the church and the participation of all its rites. When any perſon was thus excommunicated, notice was given of it by circular letters to the moſt eminent churches all over the world, that they might all confirm this act of diſcipline, by refuſing to admit the delinquent to their communion. The conſequences of this latter excommunication was very terrible. The excommunicated perſon was avoided in civil commerce and outward converſation. No one was to receive him into his houſe, nor eat at the ſame table with him; and when dead, he was denied the ſolemn rites of burial. It has been a queſtion, whether the ancient church uſed to add execration to her cenſures. Grotius thinks this was done, though very ſeldom, as in the caſe of Julian the apoſtate, for whoſe deſtruction the ancient Chriſtians abſolutely prayed to God St Chryſoſtom was utterly againſt this practice, affirming that we ought not to pray againſt the ſinner, but againſt his opinions or actions.

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Excommunication in the Greek church, cuts the offender off from all communion with the 318 fathers of the firſt council of Nice, and with the ſaints; conſigns him over to the devil, and the traitor Judas; and condemns his body to remain after death as hard as a flint or piece of ſteel, unleſs he humbles himſelf and makes atonement for his ſins by a ſincere repentance. The form abounds with dreadful imprecations; and the Greeks aſſert, that if a perſon dies excommunicated, the devil enters into the lifeleſs corpſe; and therefore, in order to prevent it, the relations of the deceaſed cut his body in pieces, and boil them in wine. It is a cuſtom for the patriarch of Jeruſalem annually to excommunicate the pope and the church of Rome; on which occaſion, together with a great deal of idle ceremony, he drives a nail into the ground with a hammer, as a mark of malediction.

The form of excommunication in the church of England anciently ran thus: "By the authority of God the Father Almighty, the Son and Holy Ghoſt, and of Mary the bleſſed mother of God, we excommunicate, anathematize, and ſequeſter from the pale of holy mother church," *&c.* The cauſes of excommunication in England are, contempt of the biſhop's court, hereſy, neglect of public worſhip and the ſacraments, incontinency, adultery, ſimony, *&c.* It is publiſhed in the church; and if the offender does not ſubmit in forty days, the civil magiſtrate interpoſes, and the excommunicated perſon is impriſoned till he ſubmits and obtains abſolution. Excommunication diſables a perſon from doing any judicial act, as ſuing in an action at law, being a witneſs, *&c.*

Excommunication, among the Pagans, excluded the perſon from the ſacrifices and the temples, and delivered him over to the furies, which was called *exſecrare*, and *diris devovere*. When Marcus Craſſus ſet out on his expedition againſt the Parthians, Atteius, tribune of the people, not being able to prevent him, ran to the gate of the city through which the general was to paſs, and ſetting a chaffing-diſh in the middle of the way with fire in it, when Craſſus drew near, he threw ſome perfumes into the chaffing diſh, and pronounced curſes againſt Craſſus with great exclamation, and thus excommunicated him.

EXCORIATION, in medicine and ſurgery, the galling or rubbing off of the cuticle, eſpecially of the parts between the thighs, and about the anus.

EXCREMENT, whatever is diſcharged out of the body of animals after digeſtion, or the fibrous parts of the aliment, mixed with the bile, ſaliva, and other fluids. Urine and the fæces are the groſs excrements that are diſcharged out of the bladder or belly. Other excrements are the various humours that are ſecreted from the blood through the various ſtrainers in the body, and which ſerve for ſeveral uſes, ſuch as the ſaliva, ſweat, bile, the pancreatic juice, lymph, the ſemen, nails, the hair, the horns and hoofs of animals.

EXCRESCENCE, in ſurgery, denotes every preternatural tumour which ariſes upon the ſkin, either in the form of a wart or tubercle. If they are born with a perſon, as they frequently are, they are called *nævi materni*, or marks from the mother; but if the tumour is large, ſo as to depend from the ſkin like a fleſhy maſs, it is then called a ſarcoma.

EXCRETION, or SECRETION, in medicine, a ſeparation of ſome fluid, mixed with the blood, by means of the glands. Excretions, by which we mean thoſe that evacuate ſuperfluous and heterogeneous humours, purify the maſs of blood: the humours which are generated in the blood are excreted by the glands, and are replaced by a ſufficient quantity of aliment.

EXCRETORY, in anatomy, a term applied to certain little ducts or veſſels, deſtined for the reception of a fluid, ſecreted in certain glandules, and other viſcera, for the excretion of it in the appropriated places.

Letters of **Exculpation**, in Scots law, a writ or ſummons iſſued by authority of the court of juſticiary, at the inſtance of a panel, for citing witneſſes to prove his defences, or his objections to any of the jury or witneſſes cited againſt him. See tit. 33.

EXCURSION, in aſtronomy, is uſed in a ſynonymous ſenſe with elongation. See Elongation.

EXECRATION, in antiquity, a kind of puniſhment, conſiſting of direful curſes and marks of infamy: ſuch was that uſed againſt Philip king of Macedon, by the Athenians. A general aſſembly of the people being called, they made a decree, that all the ſtatues and images of that king, and of all his anceſtors, ſhould be demoliſhed, and their very names razed; that all the feſtivals, ſacred rites, prieſts, and whatever elſe had been inſtituted in honour of him, ſhould be prophaned; that the very places where there had been any monument or inſcription to his honour, ſhould be deteſtable; that nothing ſhould be ſet up, or dedicated in them, which could be done in clean places: and, laſtly, that the prieſts, as often as they prayed for the Athenian people, allies, armies, and fleets, ſhould as many times deteſt and execrate Philip, his children, kingdom, land and ſea forces, and the whole race and name of the Macedonians.

EXECUTION, in a general ſenſe, the act of accompliſhing, finiſhing, or atchieving any thing.

Execution of ſummonſes or letters, in Scots law, ſee Law, tit. 12. Execution of teſtaments; ſee tit. 28. Execution of civil ſentences and decrees; ſee tit. 32. Execution of criminal ſentences; ſee tit. 33.

EXECUTOR, in Scots law, ſignifies either the perſon intitled to ſucceed to the moveable eſtate of one deceaſed, or who by law or ſpecial appointment is intruſted with the adminiſtration of it. See tit 28.

EXECUTRY, in Scots law, is the moveable eſtate falling to the executor. Under executry, or moveables, is comprehended every thing that moves itſelf, or can be moved; ſuch as corns, cattle, furniture, ready money, *&c.* See tit. 9. and 28.

EXEDRÆ, in antiquity, a general name for ſuch buildings as were diſtinct from the main body of the churches, and yet within the limits of the church taken in its largeſt ſenſe. Among the exedræ the chief was the baptiſtory. See Baptistory.

EXEGESIS, a diſcourſe by way of explanation or comment upon any ſubject. In the Scotch univerſities, there is an exerciſe among the ſtudents in divinity, called an exegeſis, in which a queſtion is ſtated by the reſpondent, who is then oppoſed by two or three other ſtudents in their turns; during which time the profeſſor moderates, and ſolves the difficulties which the reſpondent cannot overcome.

EXEMPLAR, denotes much the ſame with model. See Model.

EXEMPLIFICATION *of letters patent*; a tranſcript or duplicate of them, made from the inrollment thereof, and ſealed with the great ſeal.

EXEMPTION, in law, a privilege to be free from ſome ſervice or appearance: thus, barons and peers of the realm are, on account of their dignity, exempted from being ſworn upon inqueſts; and knights, clergymen, and others, from appearing at the ſheriff's turn. Perſons of ſeventy years of age, apothecaries, *&c.* are alſo by law exempted from ſerving on juries; and juſtices of the peace, attorneys, *&c.* from pariſh-offices.

EXERCISE, among phyſicians, ſuch an agitation of the body, as produces ſalutary effects in the animal œconomy. See Medicne.

Exercise, in military affairs, is the ranging a body of ſoldiers in form of battle, and making them perform the ſeveral motions and military evolutions with different management of their arms, in order to make them expert therein.

EXERCITOR, in Scots law, he who employs a ſhip in trade, whether he be owner, or only freights her from the owner.

EXERGUM, among antiquarians, a little ſpace around or without the figures of a medal, left for the inſcription, cypher, device, date, *&c.*

EXETER, the capital city of Devonſhire, ſituated on the river Ex, ten miles north of the Britiſh channel: W. long. 3° 40′, N. lat. 50° 44′.

EXFOLIATION, a term uſed by ſurgeons for the ſcaling of a bone, or its riſing and ſeparating into thin laminæ or ſcales.

EXHALATION, a general term for all effluvia or ſteams raiſed from the ſurface of the earth in form of vapour.

EXHIBIT, in law, is where a deed, or other writing, being produced in a chancery ſuit, to be proved by witneſſes, the examiner, or commiſſioner appointed for the examination of any ſuch, certifies on the back of the deed or writing, that the ſame was ſhewn to the witneſs at the time of his examination, and by him ſworn to.

EXHORTATION, in rhetoric, differs only from ſuaſion, as being more directly addreſſed to the paſſions.

EXIGENT, in law, a writ which lies where the defendant in a perſonal action cannot be found, nor any effects of his within the county, by which he may be attached or diſtrained.

EXIGENTERS, four officers in the court of common-pleas, who make all exigents and proclamations, in all actions where proceſs of outlawry lies. Writs of ſuperſedeas, as well as the prothonotaries upon exigents, were likewiſe drawn up in their office.

EXILE. See Banishment.

EXISTENCE, that whereby any thing has an actual eſſence, or is ſaid to be. See Metaphysics.

EXIT, in a theatrical ſenſe, the action of a player in going off the ſtage, after he has played his part.

EXLEGALITUS, among lawyers, the ſame with an outlawed perſon.

EXOCOETUS, the Flying-fish, in ichthyology, a genus belonging to the order of abdominales. The head is ſcaly, and it has no teeth; it has ten radii in the branchioſtege membrane; the body is whitiſh, and earth, and God is beſought that a whirlwind may daſh him to pieces. He is pelted with ſtones if he appear in the ſtreets; and if he obtains abſolution, it is upon the moſt mortifying conditions; for he is publicly tied to a poſt and whipped, after which he lays himſelf down at the door of the ſynagogue, and all thoſe who go out paſs over him. This was the very caſe of the famous Jew Acoſta.

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The Romiſh pontifical takes notice of three kinds of excommunication. 1. The minor, incurred by thoſe who have any correſpondence with an excommunicated perſon. 2. The major, which falls upon thoſe who diſobey the commands of the holy ſee, or refuſe to ſubmit to certain points of diſcipline; in conſequence of which they are excluded from the church militant and triumphant, and delivered over to the devil and his angels. 3. Anathema, which is properly that pronounced by the pope againſt heretical princes and countries. In former ages, theſe papal fulminations were moſt terrible things; but at preſent, they are formidable to none but a few petty ſtates of Italy.

Excommunication in the Greek church, cuts the offender off from all communion with the 318 fathers of the firſt council of Nice, and with the ſaints; conſigns him over to the devil, and the traitor Judas; and condemns his body to remain after death as hard as a flint or piece of ſteel, unleſs he humbles himſelf and makes atonement for his ſins by a ſincere repentance. The form abounds with dreadful imprecations; and the Greeks aſſert, that if a perſon dies excommunicated, the devil enters into the lifeleſs corpſe; and therefore, in order to prevent it, the relations of the deceaſed cut his body in pieces, and boil them in wine. It is a cuſtom for the patriarch of Jeruſalem annually to excommunicate the pope and the church of Rome; on which occaſion, together with a great deal of idle ceremony, he drives a nail into the ground with a hammer, as a mark of malediction.

The form of excommunication in the church of England anciently ran thus: "By the authority of God the Father Almighty, the Son and Holy Ghoſt, and of Mary the bleſſed mother of God, we excommunicate, anathematize, and ſequeſter from the pale of holy mother church," *&c.* The cauſes of excommunication in England are, contempt of the biſhop's court, hereſy, neglect of public worſhip and the ſacraments, incontinency, adultery, ſimony, *&c.* It is publiſhed in the church; and if the offender does not ſubmit in forty days, the civil magiſtrate interpoſes, and the excommunicated perſon is impriſoned till he ſubmits and obtains abſolution. Excommunication diſables a perſon from doing any judicial act, as ſuing in an action at law, being a witneſs, *&c.*

Excommunication, among the Pagans, excluded the perſon from the ſacrifices and the temples, and delivered him over to the furies, which was called *exſecrare*, and *diris devovere*. When Marcus Craſſus ſet out on his expedition againſt the Parthians, Atteius, tribune of the people, not being able to prevent him, ran to the gate of the city through which the general was to paſs, and ſetting a chaffing-diſh in the middle of the way with fire in it, when Craſſus drew near, he threw ſome perfumes into the chaffing diſh, and pronounced curſes againſt Craſſus with great exclamation, and thus excommunicated him.

EXCORIATION, in medicine and ſurgery, the galling or rubbing off of the cuticle, eſpecially of the parts between the thighs, and about the anus.

EXCREMENT, whatever is diſcharged out of the body of animals after digeſtion, or the fibrous parts of the aliment, mixed with the bile, ſaliva, and other fluids. Urine and the fæces are the groſs excrements that are diſcharged out of the bladder or belly. Other excrements are the various humours that are ſecreted from the blood through the various ſtrainers in the body, and which ſerve for ſeveral uſes, ſuch as the ſaliva, ſweat, bile, the pancreatic juice, lymph, the ſemen, nails, the hair, the horns and hoofs of animals.

EXCRESCENCE, in ſurgery, denotes every preternatural tumour which ariſes upon the ſkin, either in the form of a wart or tubercle. If they are born with a perſon, as they frequently are, they are called *nævi materni*, or marks from the mother; but if the tumour is large, ſo as to depend from the ſkin like a fleſhy maſs, it is then called a ſarcoma.

EXCRETION, or SECRETION, in medicine, a ſeparation of ſome fluid, mixed with the blood, by means of the glands. Excretions, by which we mean thoſe that evacuate ſuperfluous and heterogeneous humours, purify the maſs of blood: the humours which are generated in the blood are excreted by the glands, and are replaced by a ſufficient quantity of aliment.

EXCRETORY, in anatomy, a term applied to certain little ducts or veſſels, deſtined for the reception of a fluid, ſecreted in certain glandules, and other viſcera, for the excretion of it in the appropriated places.

Letters of Exculpation, in Scots law, a writ or ſummons iſſued by authority of the court of juſticiary, at the inſtance of a panel, for citing witneſſes to prove his defences, or his objections to any of the jury or witneſſes cited againſt him. See tit. 33.

EXCURSION, in aſtronomy, is uſed in a ſynonymous ſenſe with elongation. See Elongation.

EXECRATION, in antiquity, a kind of puniſhment, conſiſting of direful curſes and marks of infamy: ſuch was that uſed againſt Philip king of Macedon, by the Athenians. A general aſſembly of the people being called, they made a decree, that all the ſtatues and images of that king, and of all his anceſtors, ſhould be demoliſhed, and their very names razed; that all the feſtivals, ſacred rites, prieſts, and whatever elſe had been inſtituted in honour of him, ſhould be prophaned; that the very places where there had been any monument or inſcription to his honour, ſhould be deteſtable; that nothing ſhould be ſet up, or dedicated in them, which could be done in clean places: and, laſtly, that the prieſts, as often as they prayed for the Athenian people, allies, armies, and fleets, ſhould as many times deteſt and execrate Philip, his children, kingdom, land and ſea forces, and the whole race and name of the Macedonians.

EXECUTION, in a general ſenſe, the act of accompliſhing, finiſhing, or atchieving any thing.

Execution of ſummonſes or letters, in Scots law, ſee Law, tit. 12. Execution of teſtaments; ſee tit. 28. Execution of civil ſentences and decrees; ſee tit. 32. Execution of criminal ſentences; ſee tit. 33.

EXECUTOR, in Scots law, ſignifies either the perſon intitled to ſucceed to the moveable eſtate of one deceaſed, or who by law or ſpecial appointment is intruſted with the adminiſtration of it. See tit. 28.

EXECUTRY, in Scots law, is the moveable eſtate falling to the executor. Under executry, or moveables, is comprehended every thing that moves itſelf, or can be moved; ſuch as corns, cattle, furniture, ready money, *&c.* See tit. 9. and 28.

EXEDRÆ, in antiquity, a general name for ſuch buildings as were diſtinct from the main body of the churches, and yet within the limits of the church taken in its largeſt ſenſe. Among the exedræ the chief was the baptiſtory. See Baptistory.

EXEGESIS, a diſcourſe by way of explanation or comment upon any ſubject. In the Scotch univerſities, there is an exerciſe among the ſtudents in divinity, called an exegeſis, in which a queſtion is ſtated by the reſpondent, who is then oppoſed by two or three other ſtudents in their turns; during which time the profeſſor moderates, and ſolves the difficulties which the reſpondent cannot overcome.

EXEMPLAR, denotes much the ſame with model. See Model.

EXEMPLIFICATION *of letters patent*, a tranſcript or duplicate of them, made from the inrollment thereof, and ſealed with the great ſeal.

EXEMPTION, in law, a privilege to be free from ſome ſervice or appearance: thus, barons and peers of the realm are, on account of their dignity, exempted from being ſworn upon inqueſts; and knights, clergymen, and others, from appearing at the ſheriff's turn. Perſons of ſeventy years of age, apothecaries, *&c.* are alſo by law exempted from ſerving on juries; and juſtices of the peace, attorneys, *&c.* from pariſh-offices.

EXERCISE, among phyſicians, ſuch an agitation of the body, as produces ſalutary effects in the animal œconomy. See Medicne.

Exercise, in military affairs, is the ranging a body of ſoldiers in form of battle, and making them perform the ſeveral motions and military evolutions with different management of their arms, in order to make them expert therein.

EXERCITOR, in Scots law, he who employs a ſhip in trade, whether he be owner, or only freights her from the owner.

EXERGUM, among antiquarians, a little ſpace around or without the figures of a medal, left for the inſcription, cypher, device, date, *&c.*

EXETER, the capital city of Devonſhire, ſituated on the river Ex, ten miles north of the Britiſh channel: W. long. 3° 40′, N. lat. 50° 44′.

EXFOLIATION, a term uſed by ſurgeons for the ſcaling of a bone, or its riſing and ſeparating into thin laminæ or ſcales.

EXHALATION, a general term for all effluvia or ſteams raiſed from the ſurface of the earth in form of vapour.

EXHIBIT, in law, is where a deed, or other writing, being produced in a chancery ſuit, to be proved by witneſſes, the examiner, or commiſſioner appointed for the examination of any ſuch, certifies on the back of the deed or writing, that the ſame was ſhewn to the witneſs at the time of his examination, and by him ſworn to.

EXHORTATION, in rhetoric, differs only from ſuaſion, as being more directly addreſſed to the paſſions.

EXIGENT, in law, a writ which lies where the defendant in a perſonal action cannot be found, nor any effects of his within the county, by which he may be attached or diſtrained.

EXIGENTERS, four officers in the court of common-pleas, who make all exigents and proclamations, in all actions where proceſs of outlawry lies. Writs of ſuperſedeas, as well as the prothonotaries upon exigents, were likewiſe drawn up in their office.

EXILE. See Banishment.

EXISTENCE, that whereby any thing has an actual eſſence, or is ſaid to be. See Metaphysics.

EXIT, in a theatrical ſenſe, the action of a player in going off the ſtage, after he has played his part.

EXLEGALITUS, among lawyers, the ſame with an outlawed perſon.

EXOCOETUS, the Flying-fish, in ichthyology, a genus belonging to the order of abdominales. The head is ſcaly, and it has no teeth; it has ten radii in the branchioſtege membrane; the body is whitiſh, and the belly is angular: the pectoral fins are very large. When purſued by any other fiſh, it raiſes itſelf from the water by means of theſe long fins, and flies in the air to a conſiderable diſtance, till the fins dry, and then it falls down into the water. There are two ſpecies, *viz.* 1. The volitans, with the belly carinated on each ſide. It is a native of the European and American ſeas. 2. The evolans, with a cylindrical belly. It is a native of the German ocean.

EXODIARY, in the ancient Roman tragedy, was the perſon who, after the drama or play was ended, ſung the exodium. See Exodium.

EXODIUM, in the ancient Greek drama, one of the four parts or diviſions of tragedy, being ſo much of the piece as included the cataſtrophe and unravelling of the plot, and anſwering nearly to our fourth and fifth acts.

Exodium, among the Romans, conſiſted of certain humourous verſes rehearſed by the exodiary at the end of the Fabulæ Atellanæ.

Exodium, in the Septuagint, ſignifies the end or concluſion of a feaſt. Particularly it is uſed for the eighth day of the feaſt of tabernacles, which, it is ſaid, had a ſpecial view to the commemoration of the exodus, or departure out of Egypt.

EXODUS, a canonical book of the Old Teſtament; being the ſecond of the pentateuch, or five books of Moſes.

It is ſo called, from the Greek, [*exodos*], the going out, or departure of the children of Iſrael from the land of Egypt; the hiſtory of which is delivered in this book, together with the many miracles wrought on that occaſion.

EX OFFICIO, among lawyers, ſignifies the power a perſon has, by virtue of his office, to do certain acts without being applied to.

EXOMPHALUS, in ſurgery, called alſo omphalocele, and hernia umbilicalis, is a preternatural tumour of the abdomen, at the navel, from a rupture, or diſtenſion of the parts which inveſt that cavity. See Surgery.

EXORCISM, among eccleſiaſtical writers, the expelling devils from perſons poſſeſſed, by means of conjurations and prayers.

Exorciſm makes a conſiderable part of the ſuperſtition of the church of Rome, the rituals of which forbid the exorciſing any perſon without the biſhop's leave.

The ceremony is performed at the lower end of the church, towards the door. The exorciſt firſt ſigns the poſſeſſed perſon with the ſign of the croſs, makes him kneel, and ſprinkles him with holy water. Then follow the litanies, pſalms, and prayer; after which the exorciſt aſks the devil his name, and adjures him by the myſteries of the Chriſtian religion not to afflict the perſon any more: then, laying his right hand on the dæmoniac's head, he repeats the form of exorciſm, which is this: "I exorciſe thee, unclean ſpirit, in "the name of Jeſus Chriſt: tremble, O Satan! "thou enemy of the faith, thou foe of mankind, who "haſt brought death into the world, who haſt deprived men of life, and haſt rebelled againſt juſtice; "thou ſeducer of mankind, thou root of evil, thou "ſource of avarice, diſcord, and envy."

The Romaniſts likewiſe exorciſe houſes and other places, ſuppoſed to be haunted by unclean ſpirits; and the ceremony is much the ſame with that for perſons poſſeſſed.

EXORCISTS, in church-hiſtory, an order of men, in the ancient church, whoſe employment it was to exorciſe or caſt out devils. See the preceding article.

EXORDIUM, in rhetoric, is the preamble or beginning, ſerving to prepare the audience for the reſt of the diſcourſe.

Exordiums are of two kinds, either juſt and formal, or vehement and abrupt. The laſt are moſt ſuitable on occaſions of extraordinary joy, indignation, or the like.

EXOTIC, an apellation denoting a thing to be the produce of foreign countries.

EXPANSION, among metaphyſicians, denotes the idea we have of laſting diſtance, all whoſe parts exiſt together.

Expansion, in phyſiology, the ſwelling or increaſe of the bulk of bodies when heated.

EXPECTORANTS, in pharmacy, medicines which promote expectoration. See the next article.

EXPECTORATION, the act of evacuating or bringing up phlegm or other matters out of the trachea, lungs, *&c.* by coughing, hauking, ſpitting, *&c.*

EXPERIENCE, a kind of knowledge acquired by long uſe, without any teacher. Mr Locke ſays, that men receive all the materials of knowledge from experience and obſervation.

EXPERIMENT, in philoſophy, is the trial of the reſult or effect of the applications and motions of certain natural bodies, in order to diſcover ſomething of their motions and relations, whereby to aſcertain ſome of their phænomena, or cauſes.

EXPERIMENTAL philosophy, that philoſophy which proceeds on experiments, which deduces the laws of nature, and the properties and powers of bodies, and their actions upon each other, from ſenſible experiments and obſervations. The buſineſs of experimental philoſophy is to inquire into, and to inveſtigate the reaſons and cauſes of, the various appearances and phænomena of nature; and to make the truth or probability thereof obvious and evident to the ſenſes, by plain, undeniable, and adequate experiments, repreſenting the ſeveral parts of the grand machinery and agency of nature. See Mechanics, Hydrostatics, Optics, and the other branches of Natural Philosophy.

EXPIATION, a religious act, by which ſatisfaction, atonement, or amends, is made for the commiſſion of ſome crime, the guilt done away, and the obligation to puniſhment cancelled.

The method of expiation among the Jews was chiefly by ſacrifice, whether for ſins of ignorance, or to purify themſelves from certain pollutions.

Great day of **Expiation**, an annual ſolemnity of the Jews, upon the tenth day of the month Tiſri, which anſwers to our September. On this occaſion the high-prieſt laid aſide his breaſt-plate and embroidered ephod, as being a day of humiliation. He firſt offered a bullock and a ram for his own ſins, and thoſe of the prieſts; then he received from the heads of the people two goats for a ſin-offering, and a ram for a burnt-offering, to be offered in the name of the whole multitude. It was determined by lot which of the goats ſhould be ſacrificed, and which ſet at liberty. After this he perfumed the ſanctuary with incenſe, and ſprinkled it with blood: then, coming out, he ſacrificed the goat upon which the lot had fallen. This done, the goat which was to be ſet at liberty being brought to him, he laid his hands upon its head, confeſſed his ſins, and the ſins of the people, and then ſent him away into ſome deſart place: it was called azazel, or the ſcape-goat.

As to the expiations among the heathens, they were of ſeveral kinds, as ſacrifices, and religious waſhings.

Expiation, in a figurative ſenſe, is applied by divines to the pardon procured to mens ſins, by the merits of Chriſt's death.

EXPIRATION, in phyſic, that part of reſpiration whereby the air is expelled, or driven out of the lungs.

EXPLICITE, in the ſchools, ſomething clear, diſtinct, formal, and unfolded.

EXPLOSION, in phyſics, is properly applied to the going off of gun-powder and the report made thereby. Hence, it is uſed to expreſs ſuch ſudden actions of bodies as generate air inſtantaneouſly.

EXPONENT, in algebra. See Algebra.

Exponent is alſo uſed in arithmetic, in the ſame ſenſe as index or logarithm.

EXPORTATION, the ſhipping and carrying out of the the kingdom wares and commodities for other countries. See Commerce.

EXPOSITION, in general, denotes the ſetting a thing open to public view: thus it is the Romaniſts ſay, the hoſt is expoſed, when ſhewn to the people.

Exposition, in a literary ſenſe, the explaining an author, paſſage, writing, or the like, and ſetting their meaning in an obvious and clear light.

EXPOSITOR, or **Expository**, a title given to ſmall dictionaries, ſerving to explain the hard words of a language.

EXPOSTULATION, in rhetoric, a warm addreſs to a perſon, who has done another ſome injury, repreſenting the wrong in the ſtrongeſt terms, and demanding redreſs.

EXPOSURE, in gardening, the ſituation of a garden, wall, or the like, with reſpect to the points of the compaſs, as ſouth or eaſt.

EXPRESS, ſomething that is determinate or preciſe, or in ſuch formal terms as leaves no room for doubt.

Express alſo denotes a courier. See Courier.

EXPRESSED oils, in chemiſtry. See Chemistry, p. 93.

Expression, in rhetoric, the elocution, diction, or choice of words in a diſcourſe. See Composition.

Expression, in painting, a natural and lively repreſentation of the ſubject, or of the ſeveral objects intended to be ſhewn.

The expreſſion conſiſts chiefly in repreſenting the human body and all its parts, in the action ſuitable to it: in exhibiting in the face the ſeveral paſſions proper to the figures, and obſerving the motions they impreſs on the external parts.

EXPULSION, in a general ſenſe, the act of violently driving a perſon out of any city, ſociety, *&c.*

Expulsion, in medicine, the act whereby any thing is forcibly driven out of the place in which it is: thus we ſay, the expulſion of the fœtus in delivery.

EXTASY, a tranſport which ſuſpends the function of the ſenſes, by the intenſe contemplation of ſome extraordinary or ſupernatural object.

Extasy, in medicine, a ſpecies of catalepſy, when a perſon perfectly remembers, after the paroxyſm is over, the ideas he conceived during the time it laſted.

EXTENSION, in philoſophy, one of the common and eſſential properties of body, or that by which it poſſeſſes or takes up ſome part of univerſal ſpace, which is called the place of that body. See Metaphysics.

EXTENSOR, an appellation given to ſeveral muſcles, from their extending or ſtretching the parts to which they belong. See Anatomy, Part II.

Old and new **EXTENT**, in Scots law. The *old extent* was a valuation or eſtimate of the annual value of all the lands in Scotland, taken (it is thought before the reign of Alexander III.) for the purpoſe of proportionating the public ſubſidies, and aſcertaining the rates of certain feudal caſualties. By improvement, and the alteration in the nominal value of money, this valuation, or old extent, became, in length of time, too low a ſtandard for computing their feudal caſualties; wherefore, about the reign of Robert I. all inqueſts for ſerving heirs were ordained to take proof alſo of the *preſent value* of the lands contained in the brief. This laſt was called the *new extent.* See Scots Law, title 12.——None of theſe extents is the rule by which the land-tax is now proportioned in Scotland. See Valuation, or Valued Rent.

EXTERIOR, or **External**. See External.

EXTERMINATION, in general, the extirpating or deſtroying ſomething.

Extermination, in Algebra. See Algebra, p. 104.

EXTERNAL, a term of relation applied to the ſurface or outſide of a body; or that part which appears or preſents itſelf to the eye, touch, *&c.* in contradiſtinction to internal.

External is alſo uſed to ſignify any thing that is without-ſide a man, or that is not within himſelf, particularly in his mind, in which ſenſe we may ſay external objects, *&c.*

EXTINCTION, in general, denotes the putting out or deſtroying ſomething, as a fire or flame.

EXTINGUISHMENT, in law, is a conſolidation or union, as where one has due to him a yearly rent out of lands, and afterwards purchaſes the lands out of which the rent ariſes: in this caſe, both the property and the rent being united in one poſſeſſor, the rent is ſaid to be extinguiſhed.

EXTIRPATION, the ſame with extermination. See Extermination.

EXTISPEX, in antiquity, the perſon who drew preſages from viewing the intrails of animals offered in ſacrifice.

criſice. See Sacrifice, Haruspex, and Divination.

EXTORTION, in law, is an illegal manner of wreſting any thing from a man either by force, menace, or authority.

EXTRACT, in pharmacy, is a ſolution of the purer parts of a mixed body inſpiſſated, by diſtillation or evaporation, nearly to the conſiſtence of honey. See Chemistry.

Extract, in matters of literature, is ſomething copied or collected from a book or paper.

EXTRACTION, in chemiſtry and pharmacy, the operation by which eſſences, tinctures, *&c.* are drawn from natural bodies. See Chemistry.

Extraction, in ſurgery, is the drawing any foreign matter out of the body by the hand, or by the help of inſtruments. See Surgery.

Extraction, in genealogy, implies the ſtock or family from which a perſon is deſcended.

Extraction *of roots*, in algebra and arithmetic. See Algebra, p. 86. and Arithmetick, p. 420.

EXTRACTOR, in midwifery, an inſtrument, or forceps, for extracting children by the head. See Midwifery.

EXTRAVAGANTES, thoſe decretal epiſtles, which were publiſhed after the clementines. See Clementines.

They were ſo called becauſe, at firſt, they were not digeſted, or ranged, with the other papal conſtitutions, but ſeemed to be, as it were, detached from the canon law. They continued to be called by the ſame name when they were afterwards inſerted in the body of the canon law. The firſt extravagantes are thoſe of John XXII. ſucceſſor of Clement V. the laſt collection was brought down to the year 1483, and was called the common extravagantes, notwithſtanding that they were likewiſe incorporated with the reſt of the canon law.

EXTRAVASATION, in contuſions, fiſſures, depreſſions, fractures, and other accidents of the cranium, is when one or more of the blood-veſſels, that are diſtributed on the dura mater, is broke or divided, whereby there is ſuch a diſcharge of blood as greatly oppreſſes the brain, and diſturbs its office; frequently bringing on violent pains, and other miſchiefs; and at length death itſelf, unleſs the patient is timely relieved. See Surgery, and Medicine.

EXTREMES, in logic, the terms expreſſing the two ideas whoſe relation we inquire after in a ſyllogiſm.

Extreme unction. See Unction.

EXTRINSIC, among metaphyſicians, is taken in various ſenſes: ſometimes it ſignifies a thing's not belonging to the eſſence of another; in which ſenſe, the efficient cauſe and end of a thing are ſaid to be extrinſic. Sometimes it ſignifies a thing's not being contained within the capacity of another; in which ſenſe, theſe cauſes are called extrinſic which introduce ſomething into a ſubject from without, as when a fire introduces heat. Sometimes it ſignifies a thing added or applied to another; in which ſenſe accidents and adherents are ſaid to be extrinſic to the ſubjects to which they adhere. Sometimes the viſion is ſaid to be extrinſic from ſome form which does not exiſt in that thing, but is adjacent to it, or by ſome means or other without it.

EXULCERATION, in ſurgery. See Ulcer.

EXUVIÆ, among naturaliſts, denote the caſt-off parts or coverings of animals, as the ſkins of ſerpents, caterpillars, and other inſects.

EYE, in anatomy. See Anatomy, p. 289.

Bull's Eye, in aſtronomy. See Aldebaran.

Eye-glass, in the microſcope. See Microscope and Optics.

EYEMOUTH, or Aymouth, a port-town of Scotland, about ſix miles north of Berwick.

EYRAC, or Izaca-arabic, a province of Aſiatic Turky, ſituated on the river Euphrates, being the ancient Chaldea or Babylonia.

Eyrac, or Irac-agem, the ancient Parthia, now the principal province of Perſia, is ſituated almoſt in the centre of that kingdom, its capital city being Iſpahan, the metropolis of the whole kingdom.

EYRE, or Eire, in law, the court of itinerant juſtices. See Justices.

EYSENACH, a city of Germany, in the circle of Upper Saxony: E. long. 10° 12', and N. lat. 51°.

EZEKIEL, a canonical book of the Old Teſtament, referring chiefly to the degenerate manners and corruptions of the Jews of thoſe times.

It abounds with fine ſentences and rich compariſons, and diſcovers a good deal of learning in profane matters.

Ezekiel was carried captive to Babylon with Jechoniah, and began his prophecies in the fifth year of the captivity. He was cotemporary with Jeremiah, who propheſied at the ſame time in Judea He foretold many events, particularly the deſtruction of the temple, the fatal cataſtrophe of thoſe who revolted from Babylon to Egypt, and the happy return of the Jews to their own land.

EZRA, a canonical book of the Old Teſtament, comprehending the hiſtory of the Jews from the time of Cyrus's edict for their return, to the twentieth year of Artaxerxes Longimanus. It ſpecifies the number of Jews who returned, and Cyrus's proclamation for the rebuilding the temple, together with the laying its foundation, the obſtructions it met with, and the finiſhing thereof in the reign of Darius.

The illuſtrious author of this book, was alſo the reſtorer and publiſher of the canon of the Old Teſtament.

F

FABA, in botany. See Vicia.

FABAGO, in botany. See Zygophillum.

FABER, in ichthyology. See Zeus.

FABLE, a tale, or feigned narration, deſigned either to inſtruct or divert, diſguiſed under the allegory of an action, *&c.*

Fables were the firſt pieces of wit that made their appearance in the world, and have been ſtill highly valued, not only in times of the greateſt ſimplicity, but among the moſt polite ages of the world. Jotham's fable of the trees is the oldeſt that is extant, and as beautiful as any that have been made ſince. Nathan's fable of the poor man is next in antiquity. We find Æſop, in the moſt diſtant ages of Greece; and in the early days of the Roman commonwealth, we read of a mutiny appeaſed by the fable of the belly and the members. As fables had their riſe in the very infancy of learning, they never flouriſhed more than when learning was at its greateſt height; witneſs Horace, Boileau, and Fontaine.

Fable, is alſo uſed for the plot of an epic or dramatic poem; and is, according to Ariſtotle, the principal part, and, as it were, the ſoul of a poem. See Composition.

FACE, in anatomy, comprehends all that part of the head which is not covered with the common long hair. See Anatomy, Part I. II. and VI.

Face, in the military art, a word of command, intimating to turn about: thus, *face to the right*, is to turn upon the left heel a quarter-round to the right; and, *face to the left*, is to turn upon the right heel a quarter-round to the left.

FACET, or **Facette**, among jewellers, is the name of the little faces or planes to be found in brilliant and roſe diamonds.

FACTION, a cabal or party formed in a ſtate, city, or company.

Faction, in antiquity, a name given to the different companies of combatants in the circus. They were four, *viz.* the white, the red, the green, and the blue; to which Domitian added another of purple colour. They were ſo denominated from the colour of the liveries they wore, and were dedicated, according to M. Aur. Caſſiodorus, to the four ſeaſons of the year, the green being conſecrated to ſpring, the blue to winter, the red to ſummer, and the white to autumn. It appears from ancient inſcriptions, that each faction had its procurators and phyſician; and from hiſtory, that party rage ran ſo high among them, that in a diſſenſion between two factions, in the time of Juſtinian, almoſt forty thouſand men loſt their lives in the quarrel.

FACTITIOUS, any thing made by art, in oppoſition to what is the produce of nature. Thus, factitious cinnabar is oppoſed to native cinnabar.

FACTOR, in commerce, is an agent or correſpondent reſiding beyond the ſeas, or in ſome remote part, commiſſioned by merchants to buy or ſell goods on their account, or aſſiſt them in carrying on their trade.

A factor receives from the merchants, his conſtituents, in lieu of wages, a commiſſion or factorage, according to the uſage of the place where he reſides, or the buſineſs he tranſacts, this being various in different countries, on the purchaſes and ſales of different commodities. He ought to keep ſtrictly to the tenor of his orders; as a deviation from them, even in the moſt minute particular, expoſes him to make ample ſatisfaction for any loſs that may accrue from his non-obſervance of them. When unlimited orders are given to factors, and they are left to ſell or buy on the beſt conditions they can, whatever detriment occurs to their conſtituents, they are excuſed, as it is to be preſumed they acted for the beſt, and were governed by the dictates of prudence. But a bare commiſſion to ſell is not ſufficient authority for the factor to truſt any perſon, wherefore he ought to receive the money on the delivery of the goods; and, by the general power, he may not truſt beyond one, two, or three months, *&c.* the uſual time allowed for ſales, otherwiſe he ſhall be anſwerable out of his own eſtate. If a factor ſells on the uſual truſt to a perſon of good credit, who afterwards becomes inſolvent, he is diſcharged; but not if the man's credit was bad at the time of ſale. If a factor gives a man time for payment of money contracted on ſale of his principal's goods, and, after that time is elapſed, ſell him goods of his own for ready money, and the man becomes inſolvent, the factor in equity ought to indemnify his principal; but he is not compellable by the common law. A factor ſhould always be punctual in the advices of his tranſactions, in ſales, purchaſes, freights, and more eſpecially in draughts by exchange. If he purchaſes goods for another at a price limited, and afterwards they riſe, and he fraudulently takes them for his own account, and ſends them to another part, in order to ſecure an advantage that ſeemingly offers, he will, on proof, be obliged, by the cuſtom of merchants, to ſatisfy his principal for damages. If a factor, in conformity with a merchant's orders, buys with his money, or on his credit, a commodity he ſhall be directed to purchaſe; and, without giving advice of the tranſaction, ſells it again to profit, and appropriates to himſelf the advantage, the merchant ſhall recover it from him, and beſides have him amerced for his fraud. When factors have obtained a profit for their principal, they muſt be cautious how they diſpoſe of it; for, if they act without commiſſion, they are reſponſible: and if a merchant remits goods to his factor, and about a month after draws a bill on him, the factor, having effects in his hands, accepts the bill, then the principal breaks, and the goods are ſeized in the factor's hands for the behalf of the creditors, it has been conceived the factor muſt anſwer the bill notwithſtanding, and come in a creditor for ſo much as he was obliged, by reaſon of his acceptance, to pay. A factor who enters into a charter-party with a maſter for freight, is obliged by the contract; but if he loads aboard generally, the principal and the lading are liable for the freightment, and not the factor. If a factor, having money in his hands belonging to his principal, neglect to inſure a ſhip and goods, according to order; if the ſhip miſcarry, the factor, by the cuſtom of merchants, ſhall make good the damage; and if he make any compoſition with the inſurers after inſurance, without orders ſo to do, he is anſwerable for the whole inſurance.

As fidelity and diligence are expected from the factor, ſo the law requires the like from the principal: if, therefore, a merchant remits counterfeit jewels to his factor, who ſells them as if true; if he receive loſs or prejudice by impriſonment or other puniſhment, the principal ſhall not only make full ſatisfaction to the factor, but to the party who bought the jewels.

What is here ſaid of factors, is meant of ſuch as reſide abroad to act for merchants, and may be applied to ſupercargoes, who go a voyage to diſpoſe of a cargo, and afterwards return with another to their principals: but it is alſo the cuſtom of the merchants of the higheſt credit throughout the world, to act mutually in the capacity of factors for each other. The buſineſs ſo executed is called commiſſion buſineſs, and is generally deſirable by all merchants, provided they have always effects in their hands, as a ſecurity for all the affairs which they tranſact for the account of others. And this claſs of traders of eſtabliſhed reputation, have current as well as commiſſion account, conſtantly between them, and draw on, remit to, and ſend commiſſions to each other only by the intercourſe of letters, which, among men of honour, are as obligatory and authoritative as all the bonds and ties of law.

Factor, in arithmetick. See Arithmetick, p. 371.

FACTORAGE, called alſo commiſſion, is the allowance given to factors by the merchant who employs them. The gain of factorage is certain, however the voyage or ſale prove to the merchant: but the commiſſions vary; at Jamaica, Barbadoes, Virginia, and moſt of the weſtern parts of the world, the commiſſion runs at 8 *per cent.* generally through Italy, $2\frac{1}{2}$; in France, Spain, and Portugal, &c. 2; and in Holland and other places near home, $1\frac{1}{2}$ *per cent.*

FACTORY is a place where a conſiderable number of factors reſide, to negociate for their maſters or employers. See Factor.

The moſt conſiderable factories belonging to the Britiſh are thoſe eſtabliſhed in the Eaſt-Indies, Portugal, Turky, &c.

FACTUM, in arithmetic, the product of two quantities multiplied by each other.

FACULÆ, in aſtronomy, certain bright and ſhining parts, which the modern aſtronomers have, by means of teleſcopes, obſerved upon or about the ſurface of the ſun: they are but very ſeldom ſeen.

FACULTY, in law, a privilege granted to a perſon, by favour and indulgence, of doing what, by law, he ought not to do.

For granting theſe privileges, there is a court under the archbiſhop of Canterbury, called the court of the faculties, the chief officer whereof is ſtyled maſter of the faculties; who has a power of granting diſpenſations in divers caſes, as to marry without the bans being firſt publiſhed; to eat fleſh on days prohibited; to ordain a deacon under age; for a ſon to ſucceed his father in his benefice; a clerk to hold two or more livings, &c.

Faculty, in the ſchools, a term applied to the different members of an univerſity, divided according to the arts and ſciences taught there: thus in moſt univerſities there are four faculties, *viz.* 1. Of arts, which include humanity and philoſophy. 2. Of theology. 3. Of phyſic. And 4. Of civil law.

Faculty *of Advocates*. See Advocates.

Faculty is alſo uſed to denote the powers of the human mind, *viz.* underſtanding, will, memory, and imagination. See Metaphysics.

FÆCES, in chemiſtry, the groſs matter, or ſediment, that ſettles at the bottom after diſtillation, fermentation, and the like.

Fæces, in medicine, the excrements voided by ſtool.

FÆCULENT, in general, is applied to things abounding with fæces, or dregs: thus the blood and other humours of the human body, are ſaid to be fæculent, when without that purity which is neceſſary to health.

FAENSA, a city and biſhop's ſee of Italy, ſituated in the pope's territories, about thirty miles eaſt of Bologna: E. long. 12° 38′, and N. lat. 44° 30′.

FAGARA, in botany, a genus of the tetrandria monogynia claſs. The calix conſiſts of four ſegments, and the corolla of four petals; and the capſule has four cells, two valves, and contains one ſeed. There are three ſpecies, none of them natives of Britain.

FAGGOT, in times of popery here, was a badge worn on the ſleeve of the upper garment of ſuch perſons as had recanted, or abjured what was then termed hereſy; being put on after the perſon had carried a faggot, by way of penance, to ſome appointed place of ſolemnity. The leaving off the wear of this badge was ſometimes interpreted a ſign of apoſtacy.

Faggots, among military men, perſons hired by officers, whoſe companies are not full, to muſter and hide the deficiencies of the company; by which means they cheat the king of ſo much money.

FAGONIA, in botany, a genus of the decandria monogynia claſs. The calix conſiſts of five leaves, and the corolla of five cordated petals; the capſule has five cells with one ſeed in each, and ten valves. There are three ſpecies, none of them natives of Britain.

FAGOPYRUM. See Polygonum.

FAGUS, the beech, in botany, a genus of the monœcia polyandria claſs. The calix of the male is bell-ſhaped, and conſiſts of five ſegments; it has no corolla, but twelve ſtamina: the calix of the female conſiſts of four teeth; it has no corolla; the ſtyli are three; and the capſule is muricated, has four cells and two ſeeds. There are three ſpecies, two of them natives of Britain, *viz.* the caſtanea, or cheſnut-tree; and the ſylvatica, or beech-tree.

FAINTING. See LIPOTHYMIA.

FAIR, a greater kind of market, granted to a town, by privilege, for the more ſpeedy and commodious providing of ſuch things as the place ſtands in need of. See MARKET.

It is incident to a fair, that perſons ſhall be free from being arreſted in it for any other debt contracted than what was contracted in the ſame; or, at leaſt, promiſed to be paid there. Theſe fairs are generally kept once or twice a year, and, by ſtatute, they ſhall not be held longer than they ought, by the lords thereof, on pain of their being ſeized into the king's hands, *&c.* Alſo proclamation is to be made how long they are to continue; and no perſon ſhall ſell any goods after the time of the fair is ended, on forfeiture of double the value, one fourth to the proſecutor, and the reſt to the king. There is a toll uſually paid in fairs, on the ſale of things, and for ſtallage, picage, *&c.* See TOLL.

FAIRFIELD, a town of New England, in the province of Connecticut, about an hundred miles ſouth-weſt of Boſton: W. long. 72°, and N. lat. 41°.

FAIRFORD, a market-town about nineteen miles ſouth-eaſt of Gloceſter.

FAIRY, in ancient traditions and romances, ſignifies a ſort of deity, or imaginary genius, converſant on earth, and diſtinguiſhed by a variety of fantaſtical actions, either good or bad.

The fairies are a peculiar ſpecies of divinities, that have but little relation to any of thoſe of the ancient Greeks or Romans, unleſs perhaps to the larvæ; tho' others, with great reaſon, will not have them ranked among gods, but ſuppoſe them an intermediate kind of beings, neither gods, angels, men, or devils. They are of oriental extraction, and ſeem to have been invented by the Perſians and Arabs, whoſe religion and hiſtory abound with relations concerning them: theſe have a particular country which they ſuppoſe the fairies to inhabit, called Fairy-land.

Spencer's Fairy Queen is an epic poem, under the perſons and characters of fairies. In this ſort of writing the poet loſes ſight of nature, and entertains the reader's imagination with the characters of fairies, witches, magicians, dæmons, and departed ſpirits. It requires an odd turn of thought, and a peculiar caſt of fancy, with an imagination naturally fruitful and ſuperſtitious.

This ſort of poetry raiſes a pleaſing kind of horror in the mind of the reader, and amuſes his imagination with the ſtrangeneſs and novelty of the perſons who are repreſented in it; but the judicious object to it, as not having probability enough to affect the imagination.

FAIRY CIRCLE OR RING, a phænomenon pretty frequent in the fields, *&c.* ſuppoſed by the vulgar to be traced by the fairies in their dances: there are two kinds of it, one of about ſeven yards in diameter, containing a round bare path, a foot broad, with green graſs in the middle of it. The other is of different bigneſs, encompaſſed with a circumference of graſs. Meſſ. Jeſſop and Walker, in the Philoſophical Tranſact. aſcribe them to lightning, which is confirmed by their being moſt frequently produced after ſtorms of that kind, as well as by the colour and brittleneſs of the graſs roots, when firſt obſerved.

Lightning, like all other fires, moves round, and burns more in the extremity than in the middle: the ſecond circle ariſes from the firſt, the graſs burnt up growing very plentifully afterwards. Others maintain that theſe circles are made by ants, which are frequently found in great numbers therein.

FAITH, in divinity and philoſophy, the firm belief of certain truths upon the teſtimony of the perſon who reveals them.

The grounds of a rational faith are, 1. That the things revealed be not contrary to, though they may be above natural reaſon. 2. That the revealer be well acquainted with the things he reveals. 3. That he be above all ſuſpicion of deceiving us.

Where theſe criterions are found, no reaſonable perſon will deny his aſſent: thus, we may as well doubt of our own exiſtence, as of the truth of a revelation coming from God, who can neither be deceived himſelf, nor deceive others by propoſing things to be believed that are contradictory to the faculties he has given us. Whatever propoſitions, therefore, are beyond reaſon, but not contrary to it, are, when revealed, the proper matter of faith.

Confeſſion of **FAITH.** See CONFESSION.

FAITHFUL, an appellation aſſumed by the Mahometans. See MAHOMETANS.

FAKENHAM, a market-town of Norfolk, about ſixteen miles north-weſt of Norwich.

FAKIR, in Pagan theology, a kind of Indian monks, who even outdo the mortifications and ſeverities of the ancient Chriſtian anachorets. See ANACHORET.

Some of them mangle their bodies with ſcourges and knives; others never lie down; and others remain all their lives in one poſture.

There are alſo another kind of fakirs, who do not practice ſuch ſeverities: theſe flock together in companies, and go from village to village, propheſying and telling fortunes. It is ſaid that even perſons of fortune, in India, become fakirs, and that there are more than two millions of them.

FALCADE, in the menage, the motion of a horſe when he throws himſelf upon his haunches two or three times, as in very quick corvets; which is done in forming a ſtop and half ſtop. See STOP.

FALCATED, ſomething in the form of a ſickle: thus, the moon is ſaid to be falcated when ſhe appears horned. See MOON and PHASES.

FALCO, in ornithology, a genus belonging to the order of accipitres, the characters of which are theſe: the beak is crooked, and furniſhed with wax at the baſe; the head is thick-ſet with feathers, and the tongue is cloven, There are thirty-two ſpecies, *viz.* 1. The coronatus, or crowned eagle of Edwards, with aſh-coloured wax; the legs are covered with white downy feathers, interſperſed with black ſpots; the breaſt is reddiſh; and there are black belts on the ſides. It is a native of Guinea. 2. The melanætus, or black eagle of Ray, has yellowiſh-wax on the beak; the legs are half covered with feathers; and the body is aſh-coloured and ſtreaked with yellow. It is a native of Europe. 3. The leucocephalus, or white-headed eagle of Cateſby, is aſh-coloured, with the head and tail white; the iris of the eye is white, over which is a prominence covered with a yellow ſkin; the bill and the ſear or wax are yellow, as are likewiſe the legs and feet; and the talons are black. Though it is an eagle of ſmall ſize, it weighs nine pounds, is ſtrong and full of ſpirit, preying on lambs, pigs, and fawns. They always make their neſts near the ſea, or great rivers, and uſually upon old, dead pine or cypreſs trees, continuing to build annually on the ſame tree till it falls. Tho' he is ſo formidable to all birds; yet he ſuffers them to build near his royal neſt without moleſtation; particularly the fiſhing hawk, herons, *&c.* which all build on high-trees, and in ſome places are ſo near one another that they appear like a rookery. It is a native both of Europe and America. *Pl.* 76. *fig.* 1. 4. The oſſifragus, with yellow wax, and half-feathered legs; it is about the ſize of a peacock; the feathers are white at the baſe, iron-coloured in the middle, and black at the points; and the legs are yellow: it is a native of Europe. 5. The chryſaëtos, or golden eagle, has yellow wax on the beak, and feathered legs; the body is variegated with a brown and iron colour; and the baſe of the tail is undulated with an aſh-colour: it is a bird of Europe. 6. The fulvus, with yellow wax, feathered legs, a brown back, and a white ſtreak on the tail; the face is bare betwixt the eyes and noſtrils: it is a native of Europe and Canada. 7. The ruſticolus, with a yellow wax, yellow ring round the eyes, and yellow legs; the body is aſh-coloured undulated with white, and a white ring round the neck: it is a native of Sweden. 8. The barbarus, with yellow wax, and yellow legs; the body is blueiſh, and ſpotted with brown: it is a native of Barbary. 9. The cærulefcens, with yellow wax, a yellow ring round the eyes, and the feet yellow underneath; the back is of a blackiſh blue colour; and the temples are ſurrounded with a white line. This is the ſmalleſt bird of the genus, and is a native of Aſia. 10. The cyaneus, with white wax, yellow legs, a whitiſh blue body, and a white ring round the eyes and throat. It is the blue hawk of Edwards, and is a native of Europe and Africa. 11. The pygargus, with yellow wax and legs; the body is aſh-coloured, with pale red ſpots along the belly, and white orbits. It is a bird of Europe. 12. The milvus, or kite, with yellow wax on the back, a forked tail, and iron-coloured bill, and the head of a lighter colour. It is a bird of Europe, Aſia, and Africa. Bellonius relates, that, about the end of April, in leſs than fourteen days, incredible numbers of them are ſeen flying over the Black Sea into Aſia. They feed upon offals, young-birds, *&c.* Like all the ſpecies of this genus, they fly remarkably high, and are endowed with uncommon acuteneſs of viſion. 13. The gentilis, with yellow wax and legs; the body is aſh-coloured, with brown ſpots; and the tail has four blackiſh ſtreaks. It is a native of the Alps, and is peculiarly fond of larks. 14. The ſubbuteo, with yellow wax and legs; the back is brown, the nape of the neck white, and the belly is pale, with oblong brown ſpots. It is called the hobby by Engliſh authors, and is a native of Europe. 15. The buteo, with yellowiſh wax and legs, a brown body, and a pale belly, with brown ſpots. He feeds upon rabbits, toads, *&c.* and is a bird of Europe. 16. The tinnunculus, with yellow wax and legs; the back is reddiſh, and ſpotted with black; it has browniſh ſtreaks on the breaſt, and a roundiſh tail. It inhabits old buildings, and lives upon ſmall birds and mice. 17. The ſufflator, with yellowiſh wax and legs; the body is of a browniſh white colour; and the covers of the eyes are bony. He has a fleſhy lobe between the noſtrils, which, when angry or terrified, he inflates till his head becomes as large as his whole body. He is a native of Surinam. 18. The cachinnans, or laughing hawk, has yellowiſh legs and wax, and white eye-brows; the body is variegated with brown and white; and it has a black ring round the top of the head. It makes a laughing kind of noiſe when it obſerves any perſon, and is a native of America. 19. The hudſonius, has yellow wax, and yellow legs, a brown back, and white eye-brows. It is found at Hudſon's bay. 20. The ſparverius, has yellow wax, a brown head, a red belly, and blueiſh wings. It is a native of America. 21. The columbarius, or pigeon-hawk of Cateſby, weighs about ſix ounces. The bill is black at the point, and whitiſh at the baſe; the iris of the eye is yellow; the baſe of the upper mandible is covered with a yellow ſear or wax; all the upper part of the body, wings, and tail, are brown. The interior vanes of the quill-feathers have large red ſpots. The tail is marked with four regular tranſverſe white lines; the throat, breaſt, and belly are white, mixed with brown; the ſmall feathers that cover the thighs reach within half an inch of the feet, and are white, with a tincture of red, beſet with long ſpots of brown; the legs and feet are yellow. It is a very ſwift and bold hawk, preying on pigeons, young turkeys, *&c* and is a native of Carolina. *Pl.* 76. *fig.* 3. 22. The ſuperciliosſus has yellow legs and wax, and yellow eye-brows; and the body is brown, waved with white. It is a native of Surinam. 23. The veſpertinus, is about the ſize of a pigeon; the body is of a blueiſh brown colour; and the bill is yellow, and brown at the point. It is a native of Ingria, and flies both in the day and in the night. 24. The lanarius, has yellowiſh wax, and the bill and legs, which are ſhort, are blueiſh. It is a native of Europe. 25. The furcatus, or ſwallow-tailed hawk, weighs about 14 ounces; the bill is black; the eyes are large and black, with a red iris; the head, neck, breaſt, and belly are white; the upper part of the back and wings a dark purple; but more duſky towards the lower parts, with a tincture of green. The wings are long in proportion to the body and, when extended, are four feet. The tail is dark purple mixed with green, and remarkably forked Like ſwallows, they continue long on the wing, catching, as they fly, beetles, flies, and other inſects. They are ſaid to prey upon lizards and ſerpents, and are found in America. *Pl.* 76. *fig.* 2. 26. haliætus, or fiſhing hawk of Cateſby, weighs three pounds and a quarter; it meaſures, from one end of the wing to the other, five feet and a half. The bill is black, with a blue ſear or wax; the iris of the eye is yellow, and the crown of the head brown, with a mixture of white feathers; from each eye, backwards, runs a brown ſtripe:

the

Plate LXXVI

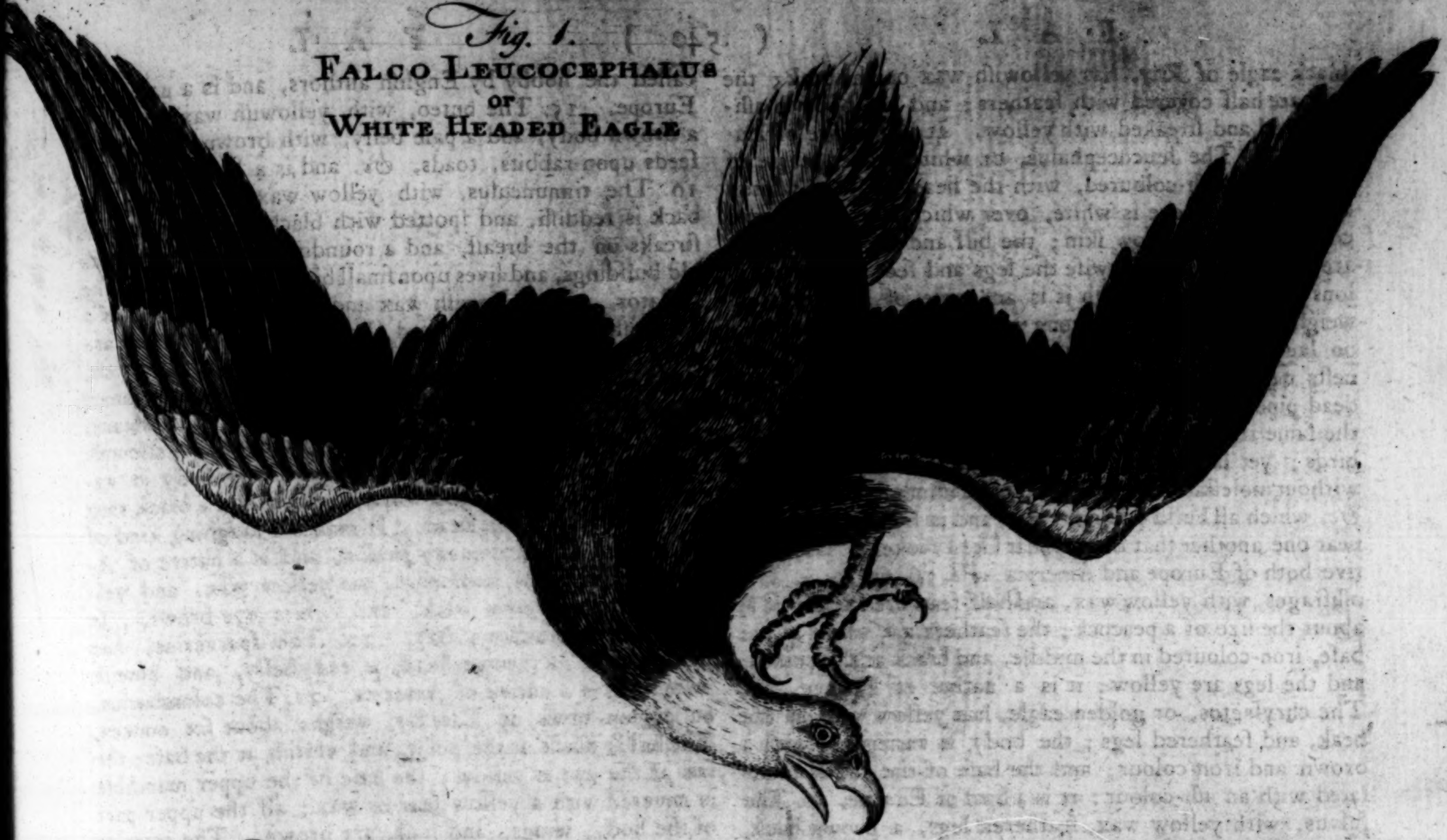


Fig. 1.

Falco Leucocephalus
or
White Headed Eagle

Fig. 2.

Falco Furcatus
or
Swallow Taild Hawk

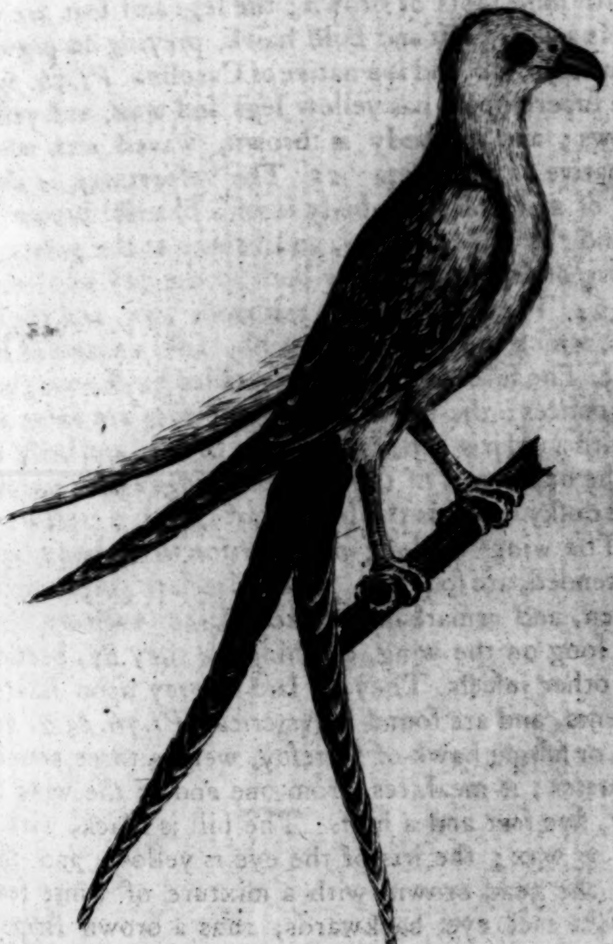
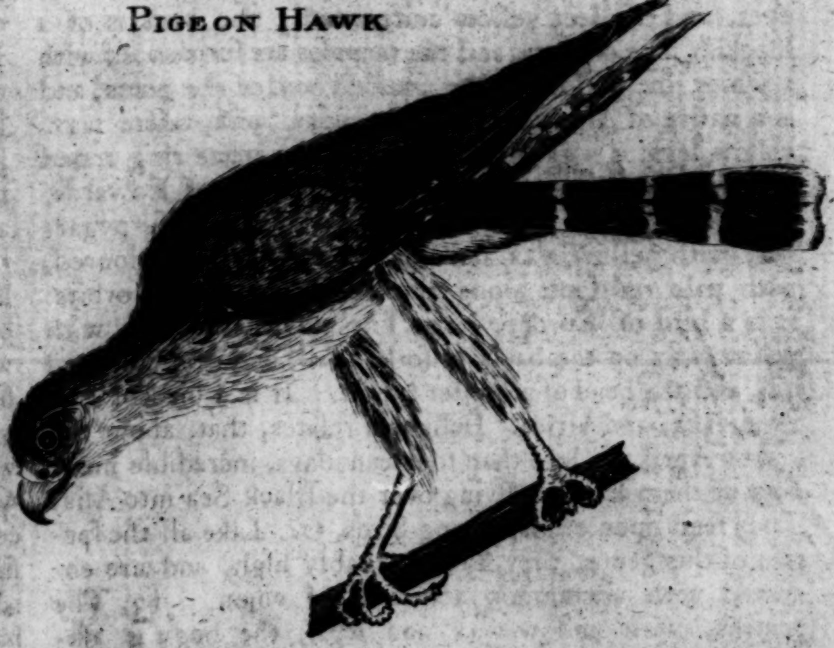


Fig. 3.

Falco Columbarius
or
Pigeon Hawk



A. Bell Sculpt.

4 AP 54

4 AP 54

Plate. LXXVII

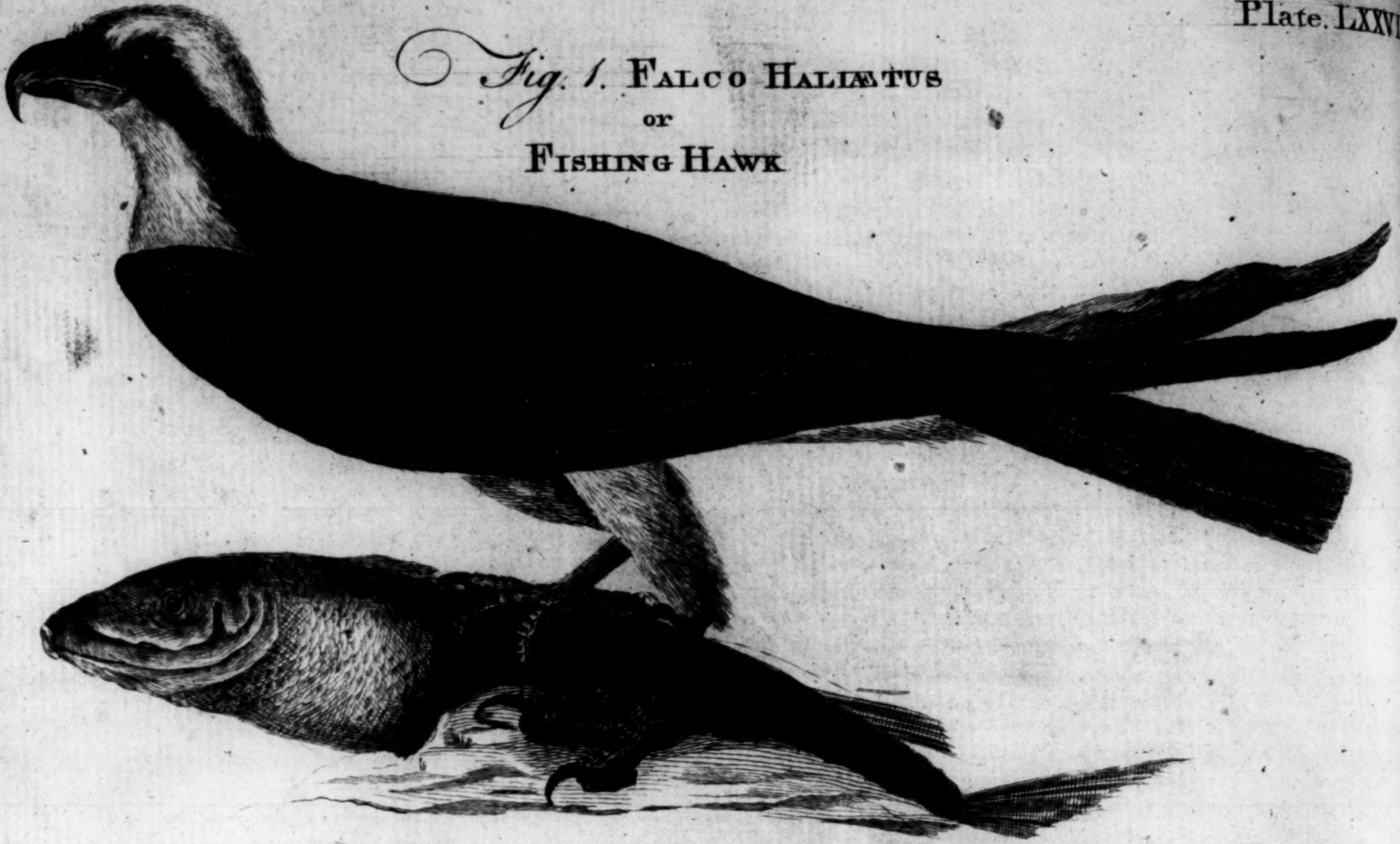


Fig. 1. FALCO HALIÆTUS
OR
FISHING HAWK

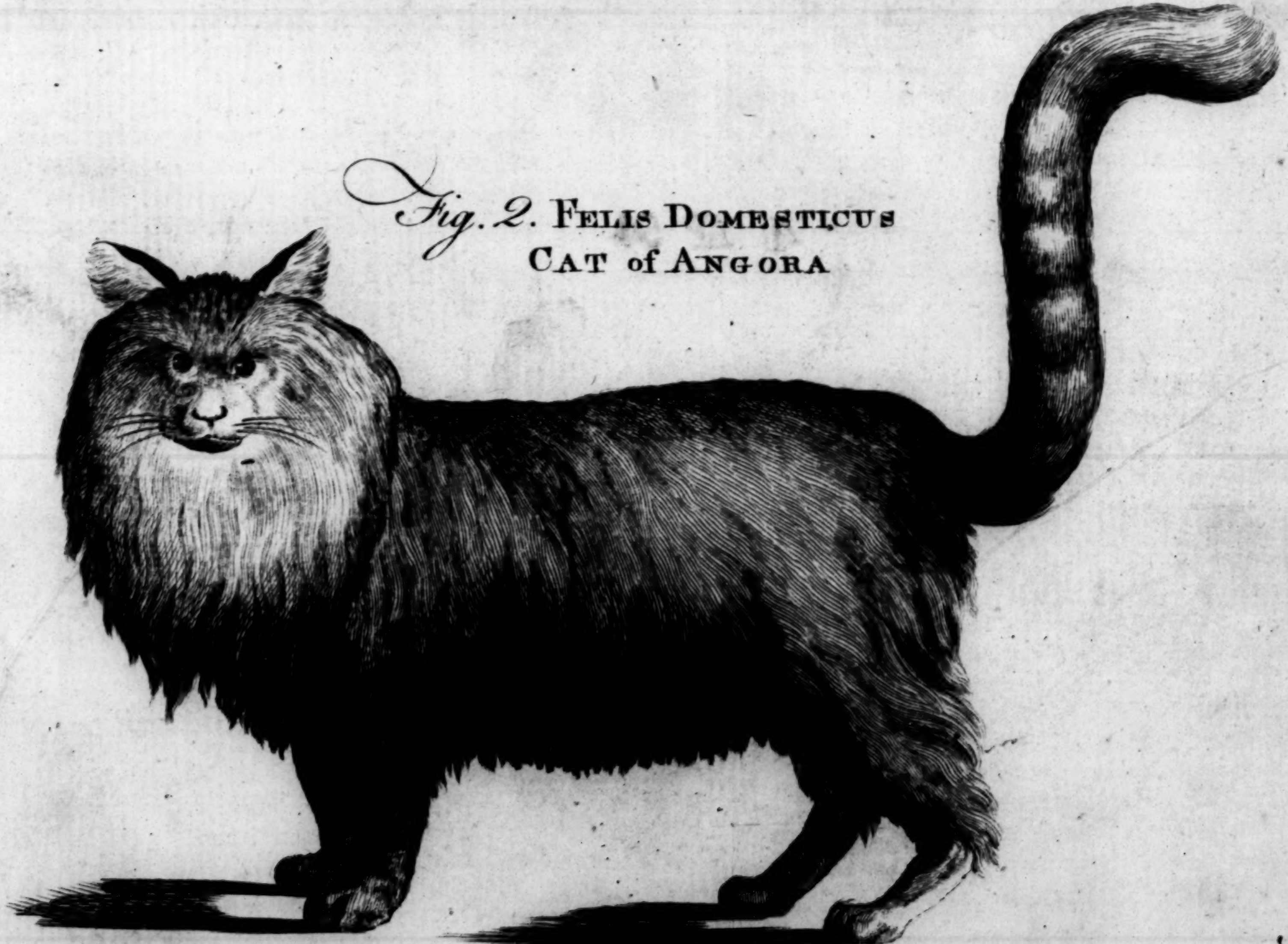


Fig. 2. FELIS DOMESTICUS
CAT of ANGORA

A Bell Sculpt

the back, wings, and tail, are of a dark brown; the throat, neck, and belly white; the legs and feet are rough and ſcaly, and of a pale blue colour; the talons are black, and nearly of an equal ſize; the feathers of the thighs are ſhort, and adhere cloſe to them, contrary to others of the hawk-kind, which nature ſeems to have deſigned for their more eaſy penetrating the water. Their manner of fiſhing is, after hovering a while over the water, to precipitate into it with prodigious ſwiftneſs, where they remain for ſome minutes, and ſeldom riſe without a fiſh. The white-headed eagle, who is generally on the watch, no ſooner ſpies him with his fiſh, than he flies furiouſly upon him: the hawk immediately mounts, and ſcreams out; but the eagle always ſoars above him, and compells him to let the fiſh fall; the eagle inſtantly darts down upon the fiſh, and ſeldom fails to catch it before it reaches the water. It is remarkable, that, whenever the hawk catches a fiſh, he calls out, as if it were to give warning to his enemy the eagle, who always obeys the call when within hearing. The lower parts of the rivers and creeks near the ſea in America, abound with thoſe eagles and hawks, where theſe diverting conteſts are frequently ſeen. *Pl.* 77. *fig.* 1. 27. The gyrfalco, with blue wax on the beak, yellow legs, a brown body, marked with aſh-coloured ſtreaks underneath, and the ſides of the tail white. It is the gyrfalco of Ray, lives upon cranes, pigeons, *&c.* and is a native of Europe. 28. The aviporus, with black wax, yellow legs, half naked, the head of an aſh-colour, and having an aſh-coloured ſtripe on the tail, which is white at the end. It is the honey-buzzard of Ray, and is a native of Europe; it feeds upon mice, lizards, frogs, bees, and other inſects. 29. The æruginoſus, with greeniſh wax, a greyiſh body; and the top of the head, nape of the neck, and legs, are yellowiſh. It is a native of Europe, and builds its neſt in marſhes. 30. The palumbarius, with black wax edged with yellow, yellow legs, a brown body, and the prime feathers of the tail are marked with pale ſtreaks, and the eye-brows are white. It is the gooſe-hawk of Ray, is an inhabitant of Europe, and an enemy to domeſtic fowls. 31. The niſus, with green wax, yellow legs, and a white belly undulated with grey; the tail is marked with blackiſh belts. It is the ſparrow-hawk of Ray, and a native of Europe. It is peculiarly fond of pigeons, ſparrows, and larks. 32. The minutus, with brown wax, yellow legs, and the body is white underneath. It is the leaſt hawk of Briſſonius, being about the ſize of a thruſh, and is found at Melita.

FALCONER, one who tames, manages, and looks after falcons, or other hawks. See the next article.

FALCONRY, the art of training all manner of hawks, but more eſpecially the larger ſort, to the exerciſe of hawking. See Hawking.

When a falcon is taken, ſhe muſt be ſeeled in ſuch a manner, that as the ſeeling ſlackens, ſhe may ſee what proviſion lies before her; but care ought to be taken, not to ſeel her too hard. A falcon or hawk newly taken, ſhould have all new furniture, as new jeſſes of good leather, mailled leaſhes with buttons at the end, and new bewets. There ſhould alſo be provided a ſmall round ſtick, to ſtroke the hawk; becauſe the oftener this is done, the ſooner and better will ſhe be manned. She muſt alſo have two good bells, that ſhe may be found when ſhe ſcattereth. Her hood ſhould be well faſhioned, raiſed and emboſſed againſt her eyes, deep, and yet ſtrait enough beneath, that it may faſten about her head without hurting her; and her beak and talons muſt be a little copied, but not ſo near as to make them bleed.

FALKIRK, a town of Scotland: W. long. 3° 48′, N. lat. 56° 20′.

FALL, the deſcent of a heavy body towards the center of the earth; it is alſo the name of a meaſure of length uſed in Scotland, containing ſix ells.

FALLACY, a deception, fraud, or falſe appearance.

The Epicureans deny that there is any ſuch thing as a fallacy of the ſenſes: for, according to them, all our ſenſations and perceptions, both of ſenſe and phantaſy, are true: whence they make ſenſe the primary criterion of truth.

FALLING SICKNESS. See Medicine.

FALLOPIAN TUBES. See Anatomy, p. 275.

FALLOW, a pale red colour, like that of brick half burnt: ſuch is that of a fallow-deer.

Fallow-field, or **Fallow-ground**, land laid up, or that has lain untilled for a conſiderable time.

FALLOWING *of land*, a particular method of improving land. See Agriculture.

FALMOUTH, a port-town of Cornwall, in England, ſituated in W. long. 5° 30′, N. lat. 50° 15′, on a fine bay of the Engliſh channel, the entrance whereof is guarded by two forts.

FALSE, in general, ſomething contrary to truth, or not what it ought to be; thus we ſay, a falſe witneſs, falſe action, falſe weights, falſe claim, *&c.*

FALSHOOD, in philoſophy, is the repreſenting a thing otherwiſe than it is.

Crimen falſi, in the civil law, is fraudulent ſubornation or concealment with deſign to darken or hide the truth, and make things appear otherwiſe than they are. The crimen falſi is committed, 1. By words, as when a witneſs ſwears falſely. 2. By writing, as when a man antedates a contract, or the like. 3. By deed, as when he ſells by falſe weights and meaſures.

FALX, in anatomy. See Anatomy, p. 284.

FAN, a machine uſed to raiſe wind and cool the air by agitating it. The cuſtom which now prevails of wearing fans, was borrowed from the Eaſt, where they are almoſt indiſpenſably neceſſary for keeping off the ſun and the flies. Fans are made of a thin ſkin or piece of paper, taffaty, or other light ſtuff, cut ſemicircularly, and mounted on ſeveral little ſticks of wood, ivory, tortoſe-ſhell, or the like. The paper, *&c.* is uſually painted, and in mounting is plaited in ſuch a manner, as that the plaits may be alternately inward and outward.

Fan is alſo an inſtrument uſed in winnowing corn.

Fans for corn pay on importation, 1 s. $3\frac{40}{100}$d. and draws back on exportation, 1 s. $1\frac{50}{100}$d. India fans pay for every 100 l. groſs value at the ſale 26 l. 14 s $2\frac{52\frac{5}{8}}{100}$d.

The draw-back on exportation is 25 l. 2 s. $11\frac{51\frac{3}{8}}{100}$d.

FANATICS, wild, enthuſiaſtic, viſionary perſons, who pretend to revelation and inſpiration.

FANCY, or IMAGINATION. See IMAGINATION.

FANIONS, in the military art, ſmall flags carried along with the baggage.

FANO, a biſhop's ſee and port-town of Italy, ſituated on the gulph of Venice, in 14° E. long. and 44° N. lat.

FAR, in horſemanſhip, an appellation given to any part of a horſe's right ſide: thus the far foot, far ſhoulder, *&c.* is the ſame with the right foot, right ſhoulder, *&c.*

FARCE, was originally a droll or petty ſhew exhibited by mountebanks and their buffoons in the open ſtreets, to gather the people together. At preſent it is of more dignity: it is removed from the ſtreet to the theatre, and inſtead of being performed by merry-andrews to amuſe the rabble, is acted by comedians, and become the entertainment of a polite audience. Poets have reformed the wildneſs of the primitive farces, and brought them to the taſte and manner of comedy. The difference between the two on our ſtage is, that comedy keeps to nature and probability, and therefore is confined to certain laws preſcribed by ancient critics; whereas farce diſallows of all laws, or rather ſets them aſide on occaſion. Its end is purely to make merry; and it ſticks at nothing which may contribute thereto, however wild and extravagant. Hence the dialogue is uſually low, the perſons of inferior rank, the fable or action trivial or ridiculous, and nature and truth every where heightened and exaggerated to afford the more palpable ridicule.

FARCIN, FARCY, or FASHIONS, in farriery, a creeping ulcer, and the moſt loathſome, ſtinking, and filthy diſeaſe that a horſe can be affected with.

For the cure, firſt bleed the horſe well; then take oil of bay and euphorbium mixed together, and anoint the knots with it; or bathe the place with the ſtale of an ox or cow, and the herb called lion's foot, all boiled together. Some apply tallow and horſe-dung, burn the knots with a hot iron, or waſh the ſore with ſalt, vinegar, alum, verdigreaſe, green copperas, and gun-powder, boiled in chamber-lee. Others again anoint the ſores with a ſalve made of a penny-worth of tar, two penny worth of white mercury, and two handfuls of pigeon's dung.

FARDING-DEAL, the fourth part of an acre of land. See ACRE.

FARE, moſt commonly ſignifies the money paid for a voyage, or paſſage by water; but, in London, it is what perſons pay for being conveyed from one part of the town to another in a coach or chair.

FAREHAM, a market town of Hampſhire, ten miles eaſt of Southampton.

FAREWELL CAPE, the moſt ſoutherly promontory of Greenland, in 50° W. long. and 60° N. lat.

FARINA FOECUNDANS, among botaniſts, the ſuppoſed impregnating meal or duſt on the apices or antheræ of flowers. See BOTANY, Sect. III.

FARINGTON, a market town of Berkſhire, twenty-five miles north-weſt of Reading.

FARM, or FERM, ſignifies the chief meſſuage in a village; or any large meſſuage, whereto belongs land, meadow, paſture, wood, common, *&c.* and which has been uſed to let for term of life or years, under a certain yearly rent payable by the tenant for the ſame.

FARNHAM, a market-town in the county of Surry, ten miles weſt of Guilford, remarkable for its large plantations of hops.

FARO, a ſea-port town of Portugal, in the province of Algarva: W. long. 9°, N. lat. 36° 50′.

FARREATION, in antiquity. See CONFARREATION.

FARRIER, one whoſe emoloyment is to ſhoe horſes, and cure them when diſeaſed or lame.

FARRIERY.

FARRIERY, the art of curing the diſeaſes of horſes.

The practice of this uſeful art has been hitherto almoſt entirely confined to a ſet of men who are totally ignorant of anatomy, and the general principles of medicine. It is not therefore ſurpriſing, that their preſcriptions ſhould be equally abſurd as the reaſons they give for adminiſtering them. It cannot indeed be expected that farriers, who are almoſt univerſally illiterate men, ſhould make any real progreſs in their profeſſion. They preſcribe draughts, they rowel, cauteriſe, *&c.* without being able to give any other reaſon for their practice, but becauſe their fathers did ſo before them. How can ſuch men deduce the cauſe of a diſeaſe from its ſymptoms, or form a rational method of cure, when they are equally ignorant of the cauſes of diſeaſes and the operation of medicines?

The miſerable ſtate of this uſeful art, eſpecially in this country, has determined us to ſelect, from the beſt authors, ſuch a ſyſtem of practice as ſeemed to be formed on rational principles; this, we hope, will be a ſufficient apology for being ſo full upon this article.

General Directions with regard to the Management of Horſes.

IT ought to be laid down as a general rule, to give horſes as few medicines as poſſible; and by no means to comply with the ridiculous cuſtom of ſome, who are frequently bleeding, purging, and giving balls, though their horſes be in perfect health, and have no indication that requires ſuch treatment.

Proper management in their feeding, exerciſe, and dreſſing, will alone cure many diſorders, and prevent moſt; for the ſimplicity of a horſe's diet, which chiefly conſiſts of grain and herbage, when good in kind, and diſpenſed with judgment, ſecures him from thoſe complicated diſorders, which are the general effects of intemperance in the human body.

In France, Germany, and Denmark, horſes are ſeldom purged; there they depend much on alteratives; the uſe of the liver of antimony, we have from the French, which is in general a good medicine for that purpoſe, and may, in many caſes, be ſubſtituted in the room of purging.

As hay is ſo material an article in a horſe's diet, great care ſhould be taken to procure the beſt: when it is not extraordinary, the duſt ſhould be well ſhook out before it is put in the rack; for ſuch hay is very apt to breed vermin.

Beans afford the ſtrongeſt nouriſhment of all grain, but are fitteſt for laborious horſes; except on particular occaſions. In ſome ſeaſons they breed a kind of vermin called the red bugs, which is thought to be dangerous; the beſt method in ſuch a caſe, is to procure them well dried and ſplit.

Bran ſcalded is a kind of panada to a ſick horſe; but nothing is worſe than a too frequent uſe of it, either dry or ſcalded; for it relaxes and weakens the bowels too much. The bots in young horſes may be owing to too much muſty bran and chaff, given with other foul feed to make them up for ſale: particular care therefore ſhould be taken that the bran be always ſweet and new.

Oats, well ripened, make a more hearty and durable diet than barley, and are much better ſuited to the conſtitutions of Britiſh horſes. A proper quantity of cut ſtraw and hay mixed with them, is ſometimes very uſeful to horſes troubled with bots, indigeſtion, *&c.*

Horſes who eat their litter, ſhould particularly have cut ſtraw and powdered chalk given them with their feed; as it is a ſign of a depraved ſtomach, which wants correcting.

The ſalt-marſhes are good paſture for horſes who have been ſurfeited, and indeed for many other diſorders; they purge more by dung and urine than any other paſture, and make afterwards a firmer fleſh: their water is for the moſt part brackiſh, and of courſe, as well as the the graſs, ſaturated with ſalts from the ſea-water.

A ſummer's graſs is often neceſſary; more particularly to horſes glutted with food, and which uſe little execiſe; but a month or two's running is proper for moſt: thoſe eſpecially who have been worked hard, and have ſtiff limbs, ſwelled legs, or wind-galls. Horſes whoſe feet have been impaired by quitters, bad ſhoeing, or any other accidents, are alſo beſt repaired at graſs. Thoſe lameneſſes particularly require turning out to graſs, where the muſcles or tendons are contracted or ſhrunk; for by the continual gentle excerciſe in the field, with the aſſiſtance of a pattin ſhoe on the oppoſite foot, the ſhortened limb is kept on the ſtretch, the waſted parts are reſtored to their uſual dimenſions, and the limb again recovers its uſual tone and ſtrength.

The fields which lie near great towns, and are much dunged, are not proper paſture for horſes; but on obſervation appear very injurious to them, if they feed thereon all the ſummer.

Horſes may be kept abroad all the year, where they have a proper ſtable or ſhed, to ſhelter them from the weather, and hay at all times to come to. So treated, they are ſeldom ſick, their limbs are always clean and dry; and, with the allowance of corn, will hunt, and do more buſineſs than horſes kept conſtantly within doors.

If horſes, when taken from graſs, ſhould grow hot and coſtive, mix bran and chopt hay with their corn; and give them ſometimes a feed of ſcalded bran for a fortnight, or longer: let their exerciſe and diet be moderate for ſome time, and increaſe both by degrees.

When horſes are ſoiled in the ſtable, care ſhould be taken that the herbage is young, tender, and full of ſap; whether it be green barley, tares, clover, or any thing elſe the ſeaſon produces, and that it be cut freſh once every day at leaſt, if not oftener.

When horſes loſe their fleſh much in ſoiling, they ſhould in time be taken to a more ſolid diet; for it is not in ſoiling as in grazing; where, though a horſe loſes his fleſh at firſt, yet, after the graſs has purged him, he ſoon grows fat.

Young horſes who have not done growing, muſt be indulged more in their feeding, than thoſe come to their maturity; but if their exerciſe is ſo little, as to make it neceſſary to abridge their allowance of hay, a little freſh ſtraw ſhould conſtantly be put in their racks, to prevent their nibbling the manger, and turning cribbiters; they ſhould alſo ſometimes be ſtrapped back in order to cure them of this habit.

It is obvious to every one, what care ſhould be taken of a horſe after violent exerciſe, that he cools not too faſt, and drinks no cold water, *&c.* for which reaſon we ſhall wave particular directions.

Moſt horſes fed for ſale, have the interſtices of their muſcles ſo filled with fat, that their true ſhapes are hardly known. For which reaſon, a horſe juſt come out of the dealer's hands, ſhould at firſt be gently uſed. He ought to loſe blood, and have his diet lowered, though not too much: walking exerciſe is moſt proper at firſt, two hours in a day; in a week or fortnight two hours at a time, twice a-day; after this uſage for a month, bleed him again, and give him two or three times a-week ſcalded bran, which will prepare him for purging phyſic, that may now be given ſafely, and repeated at the uſual intervals.

When a horſe comes out of a dealer's hands, his cloathing muſt be abated by degrees, and care taken to put him in a moderately warm ſtable; otherwiſe the ſudden tranſition would be attended with the worſt conſequences.

Some General Directions in regard to Bleeding, Purging, *&c.*

Horſes who ſtand much in ſtable, and are full fed, require bleeding now and then, eſpecially when their eyes look heavy, dull, red, and inflamed; as alſo, when they feel hotter than uſual, and mangle their hay.

Young horſes ſhould be bled when they are ſhedding their teeth, as it takes off thoſe feveriſh heats they are then ſubject to. But the caſes that chiefly require bleeding, are colds, fevers of moſt kinds, falls, bruiſes, hurts of the eyes, ſtrains, and all inflammatory diſorders, *&c.*

It is right to bleed a horſe, when he begins to grow fleſhy at graſs, or at any other time when he looks heavy: and it is generally proper to bleed before purging.

Let your horſe always be bled by meaſure, that you may know what quantity you take away: two or three quarts is always enough at one time; when you repeat it, allow for the diſorder, and the horſe's conſtitution.

Let the blood, when cold, be carefully examined, both as to colour and conſiſtence, whether black, florid, ſizey, *&c.*

Purging is often neceſſary in groſs full horſes, in ſome diſorders of the ſtomach, liver, *&c.* but ſhould be directed with caution. Before a purge is given to any horſe, it is neceſſary ſome preparation ſhould be made for it, in order to render the operation more ſafe and efficacious; thus a horſe that is full of fleſh ſhould firſt be bled, and at the ſame time have his diet lowered for a week, eſpecially thoſe that have been pampered for ſale; ſeveral maſhes of ſcalded bran ſhould alſo previouſly be given, in order to open the bowels, and unload them of any indurated excrement; which ſometimes proves an obſtacle to the working of the phyſic, by creating great ſickneſs and griping.

Let it be remembered, that a horſe is purged with difficulty; that the phyſic generally lies twenty-four hours in the guts before it works; and, that the tract of bowels it has to paſs through, is above thirty yards; and lying horizontally, conſequently reſinous and other improper drugs may, and often do, by their violent irritations, occaſion exceſſive gripings and cold ſweats, ſhave off the very mucus or lining of the guts, and bring on inflammations, which often terminate in mortifications, and death.

It is remarkable too, that the ſtomach and guts of a horſe are but thin, compared to ſome other animals of the ſame bulk, and therefore muſt be more liable to inflammation and irritation.

Horſes kept much in the ſtable, who have not the proper benefit of air, and exerciſe, in proportion to their food, ſhould in ſpring have a mild purge or two, after a previous preparation by bleeding, lowering their diet, and ſcalded maſhes.

Horſes that fall off in their ſtomach, whether it proceeds from too full feeding, or ingendering crudities and indigeſted matter, ſhould have a mild purge or two.

Horſes of a hot temperament, will not bear the common aloetic purges; their phyſic therefore ſhould be mild and cooling.

Purging is always found very beneficial in ſtubborn dry coughs: but mild mercurials joined with them, make them yet more efficacious.

Horſes of a watery conſtitution, who are ſubject to ſwelled legs, that run a ſharp briny ichor, cannot have the cauſes removed any way ſo effectually as by purging.

The firſt purge you give to a horſe ſhould be mild, in order to know his conſtitution.

It is a miſtaken notion, that if a proper prepared purge does not work to expectation, the horſe will be injured by it; for though it does not paſs by ſtool, its operation may be more efficacious, as an alterative to purify the blood, and it may paſs by urine, or other ſecretions.

Purging medicines are very ſucceſsfully given in ſmall quantities, mixed with others; and act then as alteratives.

If mercurial phyſic is given, care ſhould be taken that it be well prepared; and warmer cloathing, and greater circumſpection is then required.

Purges ſhould be given early in the morning upon an empty ſtomach: about three or four hours after the horſe has taken it, he ſhould have a feed of ſcalded bran; and a lock or two of hay may then be put into his rack. The ſame day give him two more maſhes; but ſhould he refuſe warm meat, he may be allowed raw bran.

All his water ſhould be milk warm, and have a handful of bran ſqueezed in it; but if he refuſes to drink white water, give it him without bran.

Early the next morning, give him another maſh; but if he refuſes to eat it, give him as much warm water as he will drink: let him be properly cloathed, and rode gently about. This ſhould be done two or three times a-day, unleſs he purges violently, once or twice will then be ſufficient: at night give him a feed of oats mixed with bran.

During the working, a horſe ſhould drink plentifully; but, if he will not drink warm water, he muſt be indulged with cold, rather than not drink at all.

We ſhall here inſert ſome general forms of purges,

Take ſuccotrine aloes ten drams, jallap and ſalt of tartar each two drams, grated ginger one dram, oil of cloves thirty drops; make them into a ball with ſyrup of buckthorn.

Or,

Take aloes and cream of tartar each one ounce, jallap two drams, cloves powdered one dram, ſyrup of buckthorn a ſufficient quantity.

Or,

The following, which has an eſtabliſhed character among ſportſmen.

Take aloes, from ten drams to an ounce and an half, myrrh and ginger powdered each half an ounce, ſaffron and oil of anniſeed each half a dram.

Mr Gibſon recommends the following,

Take ſuccotrine aloes ten drams, myrrh finely powdered half an ounce, ſaffron and freſh jallap in powder of each a dram, make them into a ſtiff ball with ſyrup of roſes, then add a ſmall ſpoonful of rectified oil of amber.

The ſuccotrine aloes ſhould always be preferred to the Barbadoes or plantation aloes; though the latter may be given to robuſt ſtrong horſes, but even then ſhould always be prepared with the ſalt, or cream of tartar; which by opening its parts, prevents its adheſion to the coats of the ſtomach, and bowels; from whence horrid gripings, and even death itſelf has often enſued. This caution is well worth remarking, as many a horſe hath fallen a ſacrifice to the neglect of it.

Half an ounce of Caſtile ſoap, to a horſe of a groſs conſtitution, may be added to any of the above; and the proportions may be increaſed for ſtrong horſes.

When mercurial phyſic is intended, give two drams of calomel over night, mixed up with half an ounce of a diapente and a little honey, and the purging ball the next morning.

The following, when it can be afforded, is a very gentle and effectual purge, particularly for fine delicate horſes; and if prepared with the Indian rhubarb, will not be expenſive.

Take of the fineſt ſuccotrine aloes one ounce, rhubarb powdered half an ounce or ſix drams, ginger grated one dram; make into a ball with ſyrup of roſes.

The following purging drink may be given with the utmoſt ſafety; it may be quickened, or made ſtronger, by adding an ounce more ſenna, or two drams of jalap.

Take ſenna two ounces, infuſe it in a pint of boiling water two hours, with three drams of ſalt of tartar; pour off, and diſſolve in it four ounces of Glauber's ſalts, and two or three of cream of tartar.

This laſt phyſic is cooling, eaſy, and quick in its operation; and greatly preferable in all inflammatory caſes to any other purge, as it paſſes into the blood, and operates alſo by urine.

When horſes loſe their apetites after purging, it is neceſſary to give them a warm ſtomach-drink, made of an infuſion of chamomile flowers, anniſeeds and ſaffron: or the cordial ball may be given for that purpoſe.

Should the purging continue too long, give an ounce of dioſcordium in an Engliſh pint of Port wine, and repeat it once in twelve hours, if the purging continues. Plenty of gum arabic water ſhould alſo be given; and in caſe of violent gripes, fat broth glyſters, or tripe liquor, ſhould be often thrown up, with an hundred drops of laudanum in each.

The arabic ſolution may be thus prepared.

Take of gum arabic and tragacanth of each four ounces, juniper-berries and carraway-ſeeds of each an ounce, cloves bruiſed half an ounce; ſimmer gently in a gallon of water, till the gums are diſſolved: give a quart at a time in half a pail of water; but if he will not take it freely this way, give it him often in a horn.

When a purge does not work, but makes the horſe ſwell, and refuſe his food and water, which is ſometimes the effect of bad drugs, or catching cold, warm diuretics are the only remedy; of which the following are recommended.

Take a pint of white wine, nitre one ounce; mix with it a dram of camphire, diſſolved in a little rectified ſpirit of wine; then add two drams of oil of juniper, and the ſame quantity of unrectified oil of amber, and four ounces of honey, or ſyrup of marſhmallows.

When a horſe ſwells much with phyſic, do not ſuffer him to be rode about till he has ſome vent; but rather lead him gently in hand, till ſome evacuation is obtained.

As it is obſerved, that horſes more willingly take ſweet and palatable things, than thoſe that are bitter and of an ill taſte; care ſhould be taken, that the latter are given in balls; and that their drinks are always contrived to be as little nauſeous as poſſible, and ſweetened either with honey or liquorice. Thoſe that are prepared with groſs powders, are by no means ſo agreeable to a horſe, as thoſe made by infuſion; as the former often clam the mouth, irritate the membranes about the palate and throat, and frequently occaſion the cough they are intended to prevent.

Balls ſhould be of an oval ſhape, and not exceed the ſize of a pullet's egg; when the doſe is larger, it ſhould be divided into two; and they ſhould be dipt in oil, to make them ſlip down the eaſier.

As we have given ſome general forms of purges, we ſhall obſerve the ſame rule in regard to glyſters, with ſome few cautions and remarks.

Let it be obſerved then, that, before the adminiſtring emollient clyſters in coſtive diſorders, a ſmall hand, well oiled, ſhould be paſſed up the horſe's fundament, in order to bring away any hardened dung, which otherwiſe would be an obſtacle to the glyſter's paſſage.

A bag and pipe of a proper form, is to be preferred to a ſyringe, which throws up the glyſter with ſo much force, that it often ſurpriſes a horſe, and makes him reject it as faſt as it goes in; whereas the liquor, when preſſed gently from the bag, gives him no ſurprize or uneaſineſs, but paſſes eaſily up into the bowels, where it will ſometimes remain a long time, and be extremely uſeful, by cooling and relaxing them; and will ſometimes incorporate ſo with the dung, as not eaſily to be diſtinguiſhed from the other contents of the guts. Theſe emollient glyſters are extremely ſerviceable in moſt fevers, and greatly preferable to purging ones; which in general are too pungent, and ſtimulate too much, eſpecially if aloes are a part of the compoſition.

Nutritive glyſters are very neceſſary, and often ſave a horſe from ſtarving, when his jaws are ſo locked up by convulſions that nothing can be conveyed by the mouth.

They ſhould not exceed a quart or three pints at a time, but be often repeated: nor ſhould they be too fat; but made of ſheeps heads, trotters, or any other meat-broths, milk pottage, rice-milk ſtrained, and many other ſuch nouriſhing things. For an emollient glyſter, take the following.

Take marſhmallows and chamomile flowers each a large handful, bay-berries and ſweet fennel-ſeeds bruiſed each an ounce; boil in a gallon of water to three quarts, pour off into a pan, and diſſolve in it half a pound of treacle, and a pint of lint-ſeed oil, or any common oil.

To make it more laxative, add four ounces of lenitive electuary, or the ſame quantity of cream of tartar, or common purging ſalts.

Purging Glyſter.

Take two or three handful of marſhmallows, ſenna one ounce, bitter apple half an ounce, bay berries and anniſeed bruiſed each an ounce, ſalt of tartar half an ounce; boil a quarter of an hour in three quarts of water; pour off, and add four ounces of ſyrup of buckthorn, and half a pint of oil.

This glyſter will purge a horſe pretty briſkly; and may be given ſucceſsfully, when an immediate diſcharge is wanting; eſpecially in ſome fevers with inflamed lungs, or other diſorders, which require ſpeedy relief.

But it is neceſſary to caution againſt a ſolution of courſe aloes for this purpoſe, as it has been found to gripe horſes violently, and excite feveriſh, and ſometimes convulſive ſymtoms; and indeed all pungent and ſtimulating medicines, as the ſtronger purgatives generally are, ſhould be given in this form with great caution.

But the generality of emollient glyſters, may be prepared with much leſs trouble: as two quarts of water-gruel, with a half a pound of treacle, a pint of oil, and a handful of common ſalt, will as effectually anſwer every purpoſe. The following is a reſtringent glyſter.

TAKE pomegranate-bark or oak-bark two ounces, red roſe-leaves freſh or dry a handful, balauſtines an ounce; boil in two quarts of water, till one is near conſumed; pour off and diſſolve in it four ounces of diaſcordium; to which may be added a pint of Port wine.

This will anſwer in all common caſes, where reſtringents are neceſſary, but ſhould never be given in larger quantities; for the longer glyſters of this kind lie in the bowels, the more efficacious they are.

Of COLDS.

BY taking cold, we mean that the pores and outlets of the ſkin (which in a natural healthy ſtate of body are continually breathing out a fine fluid, like the ſtream ariſing from hot water, or ſmoke from fire) are ſo far ſhut up, that theſe ſtreams, or perſpirable matter, not having a free paſſage through them, are hindered from going off in the uſual manner; the conſequence of which is, their recoiling on the blood, vitiating its quality, overfilling the veſſels, and affecting the head, glands or kernels of the neck and throat, the lungs, and other principal parts.

To enumerate the various cauſes of colds would be endleſs; the moſt uſual are, riding horſes till they are hot, and ſuffering them to ſtand in that condition where the air is cold and piercing; removing a horſe from a hot ſtable to a cold one, and too ſuddenly changing his cloathing; hence it is, that horſes often catch ſuch ſevere colds, after they come out of dealers hands; and by not being carefully rubbed down, when they come in hot, off journeys.

The ſigns of a horſe's catching cold, are a cough, heavineſs and dullneſs, which affect him more or leſs in proportion to the ſeverity of it: the eyes are ſometimes moiſt and watery, the kernels about the ears and under the jaws ſwell, the noſe gleets, and he rattles in his breathing; and when the cold is violent, the horſe will be feveriſh, his flanks work, and he will both loath his hot meat and refuſe his water. When theſe laſt ſymptoms are attended with a ſlimy mouth, ears, and feet cold, and a great inward ſoreneſs, there is danger of a bad fever.

But when the horſe coughs ſtrong, ſnorts after it, is but little off his ſtomach, pricks up his ears, and moves briſkly in his ſtall, dungs and ſtales freely, his ſkin feels kindly, and his coat does not ſtare, he is in no danger, and there will be no occaſion for medicines of any kind; but you ſhould bleed him about two quarts, keep him warm, and give him feeds of ſcalded ban, with as much warm water as he will drink, in order to dilute his blood.

If the diſorder ſhould increaſe, the horſe feel hot, and refuſe his meat, bleed him, if ſtrong, two quarts more; and if you are not ſatisfied, without giving medicines, avoid, as you would poiſon, a farrier's drench; (which is generally compoſed of ſome hot, mauſeous powders, given in a quantity of ale; which too often encreaſes the fever, by overheating the blood, and palls the horſe's ſtomach by its loathſomneſs:) and inſtead of it, infuſe two ounces of anniſeeds, with a dram of ſaffron, in a pint and a half of boiling water; pour off the clear, and diſſolve in it four ounces of honey; to which may be added four ſpoonfuls of ſallad oil: this drink may be given every night; or one of the following balls, provided there is no fever; in which caſe, it always will be more eligible to give two or three ounces of nitre or ſalt prunella every day in his feeds, or water, till it is removed; but ſhould the horſe be inclined to coſtiveneſs, remember that his body ſhould be kept open by emollient glyſters, or cream of tartar diſſolved in his water, to the quantity of three or four ounces a-day.

Pectoral Horſe-ball.

TAKE of the freſh powders of anniſeed, elicampane, carraway, liquorice, turmerick, and flour of brimſtone, each three ounces; juice of liquorice four ounces, diſſolved in a ſufficient quantity of mountain; ſaffron powdered half an ounce, ſallad oil and honey half a pound, oil of anniſeed one ounce: mix together with wheat flour enough to make them into a paſte.

Or, the following from Dr BRACKEN.

TAKE anniſeed, carraway ſeed, and greater cardamoms, finely powdered, of each one ounce, flour of brimſtone two ounces, turmerick in fine powder one ounce and a half, ſaffron two grams, Spaniſh juice diſſolved in water two ounces, oil of anniſeed half an ounce, liquorice powder one ounce and a half, wheat-flower a ſufficient quantity to make into a ſtiff paſte, by beating all the ingredients well in a mortar.

Theſe balls conſiſt of warm opening ingredients; and, given in ſmall quantities, about the ſize of a pullet's egg, will encourage a free perſpiration; but in caſe of a fever, ſhould be cautiouſly continued. They are much more efficacious, and in all caſes ſuperior to the farrier's drenches, if diſſolved in a pint of warm ale.

This ſimple method, with good nurſing and hot maſhes, warm water and cloathing, eſpecially about the head and throat, which promotes the running at the noſtrils, will anſwer the moſt ſudden colds; and when the horſe feeds heartily, and ſnorts after coughing, moderate exerciſe every day will haſten his recovery.

To a horſe loaded with fleſh, a rowel may ſometimes be neceſſary, as may alſo a gentle purge or two, to ſome, when the diſtemper is gone off.

Of FEVERS *in general*.

The ſymptoms of a fever are great reſtleſſneſs, the horſe ranging from one end of his rack to the other; his flanks beat; his eyes are red and inflamed; his tongue parched and dry; his breath is hot, and ſmells ſtrong;

he loſes his appetite, and nibbles his hay, but does not chew it, and is frequently ſmelling to the ground; the whole body is hotter than ordinary, (though not parched, as in ſome inflammatory diſorders;) he dungs often, little at a time, uſually hard, and in ſmall bits; he ſometimes ſtales with difficulty, and his urine is high-coloured; his flanks beat; and he ſeems to thirſt, but drinks little at a time, and often; his pulſe beats full and hard, to fifty ſtrokes and upwards in a minute.

The firſt intention of cure is bleeding, to the quantity of two or three quarts, if the horſe is ſtrong and in good condition; then give him a pint of the following drink, four times a-day; or an ounce of nitre, mixed up into a ball with honey, may be given thrice a-day, inſtead of the drink, and waſhed down with three or four horns of any ſmall liquor.

> Take of baum, ſage and chamomile flowers, each a handful, liquorice root ſliced half an ounce, ſalt prunel or nitre three ounces; infuſe in two quarts of boiling water; when cold, ſtrain off, and ſqueeze into it the juice of two or three lemons, and ſweeten with honey.

As the chief ingredient to be depended on in this drink is the nitre; it may perhaps be as well given in water alone; but as a horſe's ſtomach is ſoon palled, and he requires palatable medicines, the other ingredients may in that reſpect have their uſe. Soleyſel for this purpoſe adviſes two ounces of ſalt of tartar, and one of ſal armoniac to be diſſolved in two quarts of water, and mixed with a pail of common water, adding a handful of bran or barley-flour to qualify the unpleaſant taſte: this may be given every day, and is a uſeful medicine.

His diet ſhould be ſcalded bran, given in ſmall quantities; which, if he refuſes, let him have dry bran ſprinkled with water: put a handful of picked hay into the rack, which a horſe will often eat, when he will touch nothing elſe; his water need not be much warmed, but ſhould be given often, and in ſmall quantities: his cloathing ſhould be moderate; too much heat and weight on a horſe being improper in a fever; which ſcarce ever goes off in critical ſweats (as thoſe in the human body terminate) but by ſtrong perſpiration.

If in a day or two he begins to eat his bran, and pick a little hay; this method with good nurſing will anſwer: but if he refuſes to feed, more blood ſhould be taken away, and the drinks continued; to which may be added two or three drams of ſaffron, avoiding at this time all hotter medicines: the following glyſter ſhould be given, which may be repeated every day, eſpecially if his dung is knotty or dry.

> Take two handfuls of marſhmallows, and one of chamomile flowers; fennel ſeed an hounce; boil in three quarts of water to two; ſtrain off, and add four ounces of treacle, and a pint of linſeed oil, or any common oil.

Two quarts of water gruel, fat broth, or pot-liquor, with the treacle and oil, will anſwer this purpoſe; to which may be added a handful of ſalt. Theſe ſort of glyſters are properer than thoſe with purging ingredients.

The following opening drink is very effectual in theſe fevers, and may be given every other day, when the glyſters ſhould be omitted; but the nitre-balls or drink may be continued, except on thoſe days theſe are taken.

> Take of cream of tartar and Glauber's ſalts, each four ounces; diſſolve in barley water, or any other liquor: an ounce or two of lenitive electuary may be added, or a dram or two of powder of jallap, to quicken the operation in ſome horſes.

Four ounces of Glauber's ſalts, or cream of tartar, with the ſame quantity of lenitive electuary, may be given for the ſame purpoſe, if the former ſhould not open the body ſufficiently.

In four or five days the horſe generally begins to pick his hay, and has a ſeeming reliſh to food; though his flanks will heave pretty much for a fortnight: yet the temper of his body and return of appetite ſhew, that nothing more is requiſite to complete his recovery, than walking him abroad in the air, and allowing plenty of clean litter to reſt him in the ſtable.

This method of treating a fever is ſimple, according to the laws of nature; and is confirmed by long experience, to be infinitely preferable to the hot method.

The intention here is to leſſen the quantity of blood; promote the ſecretion of urine and perſpiration, and cool and dilute the fluids in general.

There is another ſort of fever that horſes are ſubject to, of a more complicate and irregular nature than the former; which if not properly treated, often proves fatal.

The ſigns are a ſlow fever with languiſhing, and great depreſſions; the horſe is ſometimes inwardly hot, and outwardly cold; at other times hot all over, but not to any extreme; his eyes look moiſt and languid; he has a continual moiſture in his mouth, which is the reaſon he ſeldom cares to drink, and when he does it is but little at a time. He feeds but little, and leaves off as ſoon as he has eat a mouthful or two; he moves his jaws in a feeble, looſe manner, with an unpleaſant grating of his teeth; his body is commonly open; his dung ſoft and moiſt, but ſeldom greaſy; his ſtaling is often irregular, ſometimes little, at other times profuſe, ſeldom high-coloured, but rather pale, with little or no ſediment

When a horſe's appetite declines daily, till he refuſes all meat, it is a bad ſign. When the fever doth not diminiſh, or keep at a ſtand, but increaſes, the caſe is then dangerous. But when it ſenſibly abates, and his mouth grows drier, the grating of his teeth ceaſes, his appetite mends, and he takes to lay down (which perhaps he has not done for a fortnight) theſe are promiſing ſigns. A horſe in theſe fevers always runs at the noſe, but not the kindly white diſcharge, as in the breaking of a cold, but of a reddiſh or greeniſh duſky colour, and of a conſiſtence like glue, and ſticks like turpentine to the hair on the inſide of the noſtrils: If this turns to a gleet of clear thin water, the horſe's hide keeps open, and he mends in his appetite; theſe are certain ſigns of recovery.

The various and irregular ſymptoms that attend this ſlow fever, require great ſkill to direct the cure, and more knowledge of the ſymptoms of horſes diſeaſes, than the generality of gentlemen are acquainted with. The experienced farrier ſhould therefore be conſulted and attended to, in regard to the ſymptoms; but very ſeldom as to the application of the remedy, which is generally above their comprehenſion; though it may be readily ſelected, by duly attending to the obſervations here inculcated.

Firſt then, a moderate quantity of blood, not exceeding three pints, may be taken away, and repeated in proportion to his ſtrength, fullneſs, inward ſoreneſs, cough, or any tendency to inflammation. After this, the fever-drink, (p. 457. col. 1. parag. 3.) may be given, with the addition of an ounce of ſnake-root, and three drams of ſaffron and camphor diſſolved firſt in a little ſpirit of wine; the quantity of the nitre may be leſſened, and theſe increaſed, as the ſymptoms indicate.

The diet ſhould be regular; no oats given, but ſcalded, or raw bran ſprinkled; the beſt flavoured hay ſhould be given by handfuls, and often by hand, as the horſe ſometimes cannot lift up his head to the rack.

As drinking is ſo abſolutely neceſſary to dilute the blood, if the horſe refuſes to drink freely of warm water or gruel, he muſt be indulged with having the chill only taken off, by ſtanding in the ſtable; nor will any inconvenience enſue, but oftener an advantage; for the nauſeous warmth of water, forced on horſes for a time, palls their ſtomachs, and takes away their appetites, which the cold water generally reſtores.

Should the fever after this treatment increaſe, the horſe feed little, ſtale often, his urine being thin and pale, and his dung ſometimes looſe, and at other times hard: ſhould the moiſture in his mouth continue, his ſkin being ſometimes dry, and at others moiſt, with his coat looking ſtarting, and ſurfeited: upon theſe irregular ſymptoms, which denote great danger, give the following balls, or drink; for in theſe caſes there is no time to be loſt.

TAKE of contrayerva-root, myrrh, and ſnake-root powdered, each two drams, ſaffron one dram, mithridate or Venice treacle half an ounce; make into a ball with honey, which ſhould be given twice or thrice a-day, with two or three horns of an infuſion of ſnake-root, ſweetened with honey; to a pint and a half of which may be added half a pint of treacle water or vinegar, which latter is a medicine of excellent uſe in all kinds of inflammatory and putrid diſorders, either external or internal.

Should theſe balls not prove ſucceſsful, add to each a dram of camphor, and where it can be afforded, to a horſe of value, the ſame quantity of caſtor. Or the following drink may be ſubſtituted in their ſtead for ſome days.

TAKE of contrayerva and ſnake-root of each two ounces, liquorice-root ſliced one ounce, ſaffron two drams; infuſe in two quarts of boiling water cloſe covered for two hours; ſtrain off, and add half a pint of diſtilled vinegar, four ounces of ſpirit of wine, wherein half an ounce of camphor is diſſolved, and two ounces of mithridate or Venice treacle; give a pint of this drink every four, ſix, or eight hours.

Should the horſe be coſtive, recourſe muſt be had to glyſters, or the opening drink: ſhould he purge, take care not to ſuppreſs it, if moderate; but if, by continuance, the horſe grows feeble, add diaſcordium to his drinks, inſtead of the mithridate; if it increaſes, give more potent remedies.

Let it be remembered, that camphor is a very powerful and effectual medicine in theſe kinds of putrid fevers; being both active and attenuating, and particularly calculated to promote the ſecretions of urine and perſpiration.

Regard ſhould alſo be had to his ſtaling; which, if in too great quantities, ſo as manifeſtly to depreſs his ſpirits, ſhould be controuled by proper reſtringents, or by preparing his drinks with lime-water. If, on the contrary, it happens that he is too remiſs this way, and ſtales ſo little as to occaſion a fullneſs, and ſwelling of the body and legs, recourſe may be had to the following drink:

TAKE of ſalt-prunella, or nitre, one ounce; juniper-berries, and Venice turpentine, of each half an ounce; make into a ball with oil of amber.

Give him two or three of theſe balls, at proper intervals, with a decoction of marſh-mallows, ſweetened with honey.

But if, notwithſtanding the method we have laid down, a greeniſh or reddiſh gleet is diſcharged from his noſtrils, with a frequent ſneezing; if he continues to loſe his fleſh, and becomes hide-bound; if he altogether forſakes his meat, and daily grows weaker; if he ſwells about the joints, and his eyes look fixed and dead; if the kernels under his jaws ſwell, and feel looſe; if his tail is raiſed and quivers; if his breath ſmells ſtrong, and a purging enſues with a diſcharge of fœtid dark-coloured matter, his caſe may then be looked on as deſperate, and all future attempts to ſave him will be fruitleſs.

The ſigns of a horſe's recovery are known by his hide keeping open, and his ſkin feeling kindly; his ears and feet will be of a moderate warmth, and his eyes briſk and lively; his noſe grows clean and dry; his apetite mends, he lays down well, and both ſtales and dungs regularly.

Be careful not to overfeed him on his recovery; let his diet be light, feeds ſmall, and increaſed by degrees as he gets ſtrength; for by overfeeding, horſes have frequent relapſes, or great ſurfeits, which are always difficult of cure.

If this fever ſhould be brought to intermit, or prove of the intermitting kind, immediately after the fit is over, give an ounce of Jeſuit's bark, and repeat it every ſix hours, till the horſe has taken four or ſix ounces; ſhould eruptions or ſwellings appear, they ought to be encouraged, for they are good ſymptoms at the decline of a fever, denote a termination of the diſtemper, and that no further medicines are wanted.

The true reaſons perhaps why ſo many horſes miſcarry in fevers, are, that their maſters, or doctors, will not wait with patience, and let nature have fair play: that they generally neglect bleeding ſufficiently at firſt; and are conſtantly forcing down ſugar ſops, or other food in a horn, as if a horſe muſt be ſtarved in a few days, if he did not eat: then they ply him twice or thrice a-day with hot medicines and ſpirituous drinks, which (excepting a very few caſes) muſt be extremely pernicious to a horſe, whoſe diet is naturally ſimple, and whoſe ſtomach and blood, unaccuſtomed to ſuch heating medicines, muſt be greatly injured, and without doubt are often inflamed by ſuch treatment.

Dilute the blood with plenty of water, or white drink; let his diet be warm bran maſhes, and his hay ſprinkled. Should the fever riſe, which will be known by the ſymptoms above deſcribed, give him an ounce of nitre thrice a-day in his water, or made up in a ball with honey. Let his body be kept cool and open, with the opening drink, given twice or thrice a-week; or an ounce of ſalt of tartar may be given every day, diſſolved in his water, for that purpoſe, omitting then the nitre. After a week's treatment in this manner, the cordial ball may be given once or twice a-day, with an infuſion of liquorice-root ſweetened with honey; to which may be added, when the phlegm is tough, or cough dry and huſky, a quarter of a pint of linſeed or ſallad oil, and the ſame quantity of oxymel ſquills.

The following cooling purge is very proper to give at the decline of the diſtemper, and may be repeated three or four times.

Take two ounces of ſenna; anniſeed and fennel bruiſed, each half an ounce; ſalt of tartar three drams; let them infuſe two hours in a pint of boiling water; ſtrain off, and diſſolve in it three ounces of Glauber's ſalt, and two of cream of tartar; give for a doſe in the morning.

This purge generally works before night very gently; and in fevers, and all inflammatory diſorders, is infinitely preferable to any other phyſic.

Before we cloſe this chapter on fevers, it may be no improper hint to the curious, to take notice that a horſe's pulſe ſhould more particularly be attended to than is cuſtomary, as a proper eſtimate may thereby be made both of the degree and violence of the fever preſent, by obſerving the rapidity of the blood's motion, and the force that the heart and arteries labour with to propel it round. The nigheſt calculation that has been made of the quickneſs of the pulſe in a healthy horſe, is, that it beats about forty ſtrokes in a minute; ſo that in proportion to the increaſe above this number, the fever is riſing, and if farther increaſed to above fifty, the fever is very high.

How often the pulſe beats in a minute may eaſily be diſcovered by meaſuring the time with a ſtop-watch, or minute ſand-glaſs, while your hand is laid on the horſe's near ſide, or your fingers on any artery; thoſe which run up on each ſide the neck, are generally to be ſeen beating as well as felt a little above the cheſt; and one withinſide each leg may be traced with the finger.

A due attention to the pulſe is ſo important an article, in order to form a proper judgment in fevers, that it would appear amazing it has ſo much been neglected, if one did not recollect, that the generality of farriers are ſo egregiouſly ignorant, that they have no manner of conception of the blood's circulation, nor in general have they ability enough to diſtinguiſh the difference between an artery and a vein.—With ſuch pretty guardians do we intruſt the healths and lives of the moſt valuable of animals!

Of a PLEURISY, *and* INFLAMMATION *of the* LUNGS, *&c.*

These diſorders have ſcarce been mentioned by any writer in farriery before Mr Gibſon; who, by frequently examining the carcaſes of dead horſes, has found them ſubject to the different kinds of inflammations here deſcribed.

In order to diſtinguiſh theſe diſorders from others, we ſhall deſcribe the ſymptoms in Mr Gibſon's own words.

"A pleuriſy then, which is an inflamation of the pleura; and a peripneumony, which is an inflammation of the lungs; have ſymptoms very much alike; with this difference only, that in a pleuriſy a horſe ſhews great uneaſineſs, and ſhifts about from place to place; the fever, which at firſt is moderate, riſes ſuddenly very high; in the beginning he often ſtrives to lie down, but ſtarts up again immediately, and frequently turns his head towards the affected ſide, which has cauſed many to miſtake a pleuritic diſorder for the gripes, this ſign being common to both, though with this difference: in the gripes a horſe frequently lies down and rolls, and when they are violent he will alſo have convulſive twitches, his eyes being turned up, and his limbs ſtretched out as if he were dying; his ears and feet are ſometimes occaſionally hot, and ſometimes as cold as ice; he falls into profuſe ſweats, and then into cold damps; ſtrives often to ſtale and dung, but with great pain and difficulty; which ſymptoms generally continue, till he has ſome relief: but in a pleuriſy, a horſe's ears and feet are always burning hot, his mouth parched and dry, his pulſe hard and quick: even ſometimes when he is nigh dying, his fever is continued and increaſing; and though in the beginning he makes many motions to lie down, yet afterwards he reins back as far as his collar will permit, and makes not the leaſt offer to change his poſture, but ſtands panting with ſhort ſtops, and a diſpoſition to cough, till he has relief, or drops down.

In an inflammation of the lungs, ſeveral of the ſymptoms are the ſame; only in the beginning he is leſs active, and never offers to lie down during the whole time of his ſickneſs; his fever is ſtrong, breathing difficult, and attended with a ſhort cough; and whereas in a plueriſy a horſe's mouth is generally parched and dry; in an inflammation of the lungs, when a horſe's mouth is open, a ropy ſlime will run out in abundance; he gleets alſo at the noſe a reddiſh or yellowiſh water, which ſticks like glue to the inſide of his noſtrils.

In a pleuriſy, a horſe heaves and works violently at his flanks, with great reſtleſſneſs, and for the moſt part his belly is tucked up; but in an inflammation of the lungs, he always ſhews fullneſs, and the working of his flanks is regular, except after drinking and ſhifting his poſture; and his ears and feet are for the moſt part cold, and often in damp ſweets.

The cure of both theſe diſorders is the ſame. In the beginning a ſtrong horſe may loſe three quarts of blood, the next day two quarts more; and if ſymptoms do not abate, the bleedings muſt be repeated, a quart at a time; for it is ſpeedy, large, and quick-repeated bleedings that are in theſe caſes chiefly to be depended on. But if a horſe has had any previous weakneſs, or is old, you muſt bleed him in leſs quantities, and oftener. Mr Gibſon recommends rowels on each ſide the breaſt, and one on the belly; and a bliſtering ointment to be rubbed all over his briſket upon the foremoſt ribs.

The diet and medicines ſhould be both cooling, attenuating, relaxing, and diluting; and the horſe ſhould have warm maſhes, and plenty of water or gruel. The following balls may be given thrice a-day.

Take of ſpermaceti and nitre, of each one ounce; oil of anniſeed, thirty drops; honey enough to make a ball.

A pint of barley-water, in which figs and liquorice-root have been boiled, ſhould be given after each ball; to which the juice of lemons may be added; and if the lungs are greatly oppreſſed with a dry ſhort cough, two or three horns full of the decoction may be given three or four times a-day, with four ſpoonfuls of honey and linſeed oil. A ſtrong decoction of the rattle-ſnake-root is alſo much recommended in pleuritic diſorders, and may be given to the quantity of two quarts a-day, ſweetened with honey. It remarkably attenuates the blood, and diſperſes the inflammation, and in ſome parts is deemed a ſpecific for this complaint.

An emollient glyſter ſhould be injected once a-day, to which may be added two ounces of nitre or cream of tartar.

In two or three days he will probably run at the noſe, and begin to feed; but ſhould he not, and continue hot and ſhort-breathed, you muſt bleed him again, and give the following glyſter.

Take ſenna and marſhmallows, of each two ounces; fennel and bay-berries, each one ounce; boil in five pints of clear water, to two quarts; pour off the clear, and add four ounces of purging ſalts, two or three of ſyrup of buckthorn, and half a pint of linſeed, or any common oil.

If by theſe means he grows cooler, and his pain moderates, repeat the glyſter the next day, unleſs it worked too much; then intermit a day; and when he comes to eat ſcalded bran and picked hay, leave off the balls, and continue only the decoction, with now and then a glyſter.

But let it be obſerved, that a horſe ſeldom gets the better of theſe diſorders, unleſs he has relief in a few days; for if the inflammation is not checked in that time, it uſually terminates in a gangrene, or collection of matter, which, for want of expectoration, ſoon ſuffocates him.

But as pleuritic diſorders are apt to leave a taint on the lungs, great care ſhould be taken of the horſe's exerciſe and feeding, which ſhould be light and open for two or three weeks.

There is alſo an external pleuriſy, or inflammation of the muſcles between the ribs, which, when not properly treated, proves the foundation of that diſorder called the *cheſt founder*; for if the inflammation is not diſperſed in time, and the viſcid blood and juices ſo attenuated by internal medicines, that a free circulation is obtained; ſuch a ſtiffneſs and inactivity will remain on theſe parts, as will not eaſily be removed, and which is generally known by the name of cheſt-founder.

The ſigns of this inflammation, or external pleuriſy, are a ſtiffneſs of the body, ſhoulders, and fore-legs; attended ſometimes with a ſhort dry cough, and a ſhrinking when handled in thoſe parts.

Bleeding, ſoft pectorals, attenuants, and gentle purges are the internal remedies; and externally, the parts affected may be bathed with equal parts of ſpirit of ſal armoniac, and ointment of marſhmallows, or oil of chamomile.

Theſe outward inflammations frequently fall into the inſide of the fore-leg, and ſometimes near the ſhoulder; forming abſceſſes, which terminate the diſorder.

The membrane which ſeparates the lungs, and more particularly the diaphragm or midriff, is often alſo inflamed; which is ſcarce to be diſtinguiſhed from the pleuriſy, only in this, that when the midriff is greatly inflamed, the horſe will ſometimes be jaw-ſet, and his mouth ſo much cloſed that nothing can be got in; but the method of cure is the ſame.

Of a COUGH, *and* ASTHMA.

The conſequence often of the preceding diſorders injudiciouſly treated, are ſettled habitual coughs; which frequently degenerate into aſthmas, and broken-wind.

Nothing has more perplexed practitioners than the cure of ſettled coughs; the cauſe of which, perhaps, has been their want of attention to the different ſymptoms which diſtinguiſh one cough from another; for without ſtrict obſervance thereof, it is impoſſible to find out the true method of cure.

Thus, if a horſe's cough is of long ſtanding, attended with loſs of appetite, waſting of fleſh, and weakneſs, it denotes a conſumption; and that the lungs are full of knotty, hard ſubſtances, called tubercles, which have often been diſcovered on diſſection.

The following ſigns denote when the cough proceeds from phlegm, and ſlimy matter, that ſtop up the veſſels of the lungs.

The horſe's flanks have a ſudden quick motion; he breathes thick, but not with his noſtrils open, like a horſe in a fever, or that is broken-winded; his cough is ſometimes dry and huſky, ſometimes moiſt, before which he wheezes, rattles in the throat, and ſometimes throws out of his noſe and mouth great gobs of white phlegm, eſpecially after drinking, or when he begins or ends his exerciſe, which diſcharge commonly gives great relief. Some ſuch horſes wheeze and rattle to ſuch a degree, and are ſo thick-winded, that they can ſcarce move on, till they have been out ſome time in the air; though then they will perform beyond expectation.

The above aſthmatic caſe proves often very obſtinate; but, if it happens to a young horſe, and the cough is not of long ſtanding, it is greatly relieved, if not totally cured, by the following method.

If the horſe is full of fleſh, bleed him plentifully; if low in fleſh, more ſparingly; which may occaſionally be repeated, on very great oppreſſions and difficulty of breathing, in proportionate quantities.

As mercurial medicines are found remarkably uſeful in theſe caſes, give a mercurial ball (with two drams of calomel) over night, and a common purge next morning: or the following, which is recommended by Mr Gibſon.

Take gum-galbanum, ammoniacum, and aſſa fœtida, of each two drams, fine aloes one ounce, ſaffron one dram, oil of anniſeeds two drams, oil of amber one dram; with honey enough to form into a ball.

They may be repeated at proper intervals, with the uſual cautions. In the intermediate days, and for ſome time after, one of the following balls may be given every morning.

Take cinnabar of antimony, finely levigated, ſix ounces; gum ammoniacum, galbanum, and aſſa fætida, of each two ounces; garlick four ounces; ſaffron half an ounce: make into a paſte for balls, with a proper quantity of honey.

Take of the pectoral or cordial ball one pound, balſam of Peru half an ounce, balſam of ſulphur anniſated one ounce, flowers of Benjamin half an ounce, honey as much as is ſufficient to form them into a paſte; give the ſize of a pigeon's egg every morning.

Exerciſe in a free open air is very ſerviceable, and the diet ſhould be moderate.

The following are the ſymptoms of a dry cough, or aſthma.

The horſe afflicted with this cough eats heartily, hunts and goes through his buſineſs with alacrity, appears well coated, and has all the ſigns of perfect health; yet he coughs at particular times almoſt inceſſantly, without throwing up any thing, except that the violence of the cough will cauſe a little clear water to diſtill from his noſe. Though this cough is not periodical, yet ſome of theſe horſes cough moſt in a morning, after drinking.

This may properly be ſtyled a nervous aſthma in a horſe; as probably it chiefly affects the nerves in the membranous parts of the lungs and midriff; and is a caſe very doubtful at leaſt, if not incurable; but when the horſe is young, the following method may be ſucceſsful.

Take away firſt a moderate quantity of blood; then give him two drams of calomel, mixed up with an ounce of diapente, for two nights; and the next morning a purging ball. Keep him well cloathed and littered, and feed him with ſcalded bran and warm water.

Once in eight or ten days this purge may be repeated, with one mercurial ball only, given over night.

The following balls may then be taken, one every day, about the ſize of a pullet's egg, the horſe faſting two hours afterwards; and ſhould be continued two months, or longer, to be of real ſervice.

Take native cinnabar, or cinnabar of antimony, half a pound; gum guaiacum four ounces; myrrh, and gum armoniac, of each two ounces; Venice ſoap half a pound: the cinnabar muſt be finely levigated, as before obſerved, and the whole mixed up with honey, or oxymel ſquills.

The following alſo will be found a uſeful remedy in obſtinate dry coughs.

Take gum ammoniacum, ſquills, and Venice ſoap, of each four ounces, balſam of ſulphur with anniſeeds one ounce; beat up into a maſs, and give as the former.

Before we cloſe this ſection, it may be neceſſary to obſerve here, that ſome young horſes are ſubject to coughs on cutting their teeth; their eyes alſo are affected from the ſame cauſe. In theſe caſes, always bleed; and if the cough is obſtinate, repeat it, and give warm maſhes; which, in general, are alone ſufficient to remove this complaint.

Of a Broken wind.

This diſorder hitherto ſeems to have been little underſtood; but Mr Gibſon is inclined to think, that the ſource of it is frequently owing to injudicious or haſty feeding young horſes for ſale; by which means the growth of the lungs, and all the contents within the cheſt, are ſo increaſed, and in a few years ſo preternaturally enlarged, that the cavity of the cheſt is not capacious enough for them to expand themſelves in, and perform their functions.

A narrow contracted cheſt with large lungs may ſometimes naturally be the cauſe of this diſorder: and it has been obſerved, that horſes riſing eight years old are as liable to this diſtemper, as, at a certain period of life, men fall into aſthmas, conſumptions, and other chronic diſeaſes.

The reaſon why this diſorder becomes more apparent at this age, may be, that a horſe comes to his full ſtrength and maturity at this time: at ſix he commonly finiſhes his growth in height; after that time he lets down his belly, and ſpreads, and all his parts are grown to their full extent; ſo that the preſſure on the lungs and midriff is now more increaſed.

But how little weight ſoever theſe reaſons may have, repeated diſſections have given ocular proofs of a preternatural largeneſs, not only of the lungs of broken-winded horſes, but of their heart and its bag, and of the membrane which divides the cheſt; as well as of a remarkable thinneſs in the diaphragm, or midriff.

This diſproportion has been obſerved to be ſo great, that the heart and lungs have been almoſt of twice their natural ſize, perfectly ſound, and without any ulceration whatever; or any defect in the wind-pipe, or its glands.

Hence it appears, that this enormous ſize of the lungs, and the ſpace they occupy, by hindering the free action of the midriff, is the chief cauſe of this diſorder; and as the ſubſtance of the lungs was found more fleſhy than uſual, they of courſe muſt loſe a great deal of their ſpring and tone.

Whoever conſiders a broken-wind in this light, muſt own that it may be reckoned among the incurable diſtempers of horſes; and that all the boaſted pretenſions to cure are vain and frivolous, ſince the utmoſt ſkill can amount to no more than now and then palliating the ſymptoms, and mitigating their violence.

We ſhall therefore only lay down ſuch methods as may probably prevent this diſorder, when purſued in time. But if they ſhould not ſucceed, we ſhall offer ſome remedies and rules to mitigate its force, and to make a horſe as uſeful as poſſible under this malady.

It is uſual, before a broken wind appears, for a horſe to have a dry obſtinate cough, without any viſible ſickneſs or loſs of appetite; but, on the contrary, a diſpoſition to foul feeding, eating the litter, and drinking much water.

In order then to prevent, as much as poſſible, this diſorder, bleed him, and give him the mercurial phyſic above preſcribed, which ſhould be repeated two or three times.

The following balls are then to be taken for ſome time, which have been found extremely efficacious in removing obſtinate coughs.

Take aurum moſaicum, finely powdered, eight ounces; myrrh and elicampane, powdered, each four ounces; anniſeeds and bay-berries, each an ounce; ſaffron, half an ounce; make into balls with oxymel ſquills.

The aurum moſaicum is made of equal parts of quickſilver, tin, ſal armoniac, and ſulphur. We give this medicine as ſtrongly recommended by Mr Gibſon; but how far the aurum moſaicum may contribute to its efficacy, may perhaps juſtly be diſputed: as a ſubſtitute in its room, therefore, for this purpoſe, we recommend the ſame quantity of powdered ſquills, or gum ammoniacum, or equal parts of each.

Broken-winded horſes ſhould eat ſparingly of hay, which as well as their corn may be wetted with chamber lye, or fair water; as this will make them leſs craving after water.

The volatile ſalts in the urine may make it preferable to water, and may be the reaſon why garlick is found ſo efficacious in theſe caſes; two or three cloves given at a time in a feed, or three ounces of garlick bruiſed, and boiled in a quart of milk and water, and given every other morning for a fortnight, having been found very ſerviceable; for by warming and ſtimulating the ſolids, and diſſolving the tenacious juices, which choak up the veſſels of the lungs, theſe complaints are greatly relieved.

Careful feeding, and moderate exerciſe has greatly relieved broken-winded horſes.

Horſes ſent to graſs in order to be cured of an obſtinate cough, have often returned completely broken-winded, where the paſture has been rich and ſucculent, ſo that they have had their bellies conſtantly full. As the ill conſequence therefore is obvious, where you have not the conveniency of turning out your horſe for a conſtancy, you may ſoil him for a month or two with young green barley, tares, or any other young herbage.

To purſive thick-winded horſes, Barbadoes and common tar have often been given with ſucceſs, to the quantity of two ſpoonfuls mixed with the yelk of an egg, diſſolved in warm ale, and given faſting two or three times a week, eſpecially thoſe days you hunt or travel.

But in order to make all theſe ſorts of horſes of any real ſervice to you, the grand point is to have a particular regard to their diet, obſerving a juſt œconomy both in that and their exerciſe; giving but a moderate quantity of hay, corn, or water, at a time, and moiſtening the former, to prevent their requiring too much of the latter, and never exerciſing them but with moderation, as has before been obſerved. The following alterative ball may be given once a-fortnight or three weeks; and as it operates very gently, and requires no confinement but thoſe days it is given (when warm meat and water are neceſſary), it may be continued for two or three months.

Take ſuccotrine aloes ſix drams; myrrh, galbanum, and ammoniacum, of each two drams; bay-berries half an ounce: make into a ball with a ſpoonful of oil of amber, and a ſufficient quantity of ſyrup of buckthorn.

Of a CONSUMPTION.

When a conſumption proceeds from a defect in a horſe's lungs, or any principal bowel; the eyes look dull; the ears and feet are moſtly hot; he coughs ſharply by fits; ſneezes much, and frequently groans with it; his flanks have a quick motion; he gleets often at the noſe, and ſometimes throws out a yellowiſh curdled matter; and he has little appetite to hay, but will eat corn, after which he generally grows hot.

As to the cure, one of the principal things is bleeding in ſmall quantities (a pint, or pint and half, from ſome horſes is ſufficient) which ſhould be repeated as often as the breath is more than ordinarily oppreſſed. Pectorals may be given to palliate preſent ſymptoms; but as diſſections have diſcovered both the glands of the lungs and meſentery to be ſwelled, and often indurated, the whole ſtreſs lies on mercurial purges, and the following ponderous alteratives, given intermediately.

Take native cinnabar, or cinnabar of antimony, one pound, powdered very fine, and add the ſame quantity of gum guaiacum and nitre; give the horſe an ounce of this powder twice a-day, wetting his feeds.

The ſpring graſs is often extremely ſerviceable, but the ſalt marſhes are to be preferred, and to be more depended on than medicines; for great alterations are thereby made in the blood and juices, and no ſmall benefit ariſes from open air and proper exerciſe.

Of an APOPLEXY *or* STAGGERS, CONVULSIVE DISORDERS, LETHARGY, EPILEPSY, *and* PALSY.

Farriers generally include all diſtempers of the head under two denominations, *viz. ſtaggers* and *convulſions*; wherein they always ſuppoſe the head primarily affected. But in treating theſe diſorders, we will diſtinguiſh between thoſe that are peculiar to the head, as having their ſource originally thence; and thoſe that are only concomitants of ſome other diſeaſe.

In an apoplexy a horſe drops down ſuddenly, without other ſenſe or motion than a working at his flanks.

The previous ſymptoms are, drowſineſs; watery eyes, ſomewhat full and inflamed; a diſpoſition to reel, feebleneſs, a bad appetite; the head almoſt conſtantly hanging, or reſting on the manger; ſometimes with little or no fever, and ſcarce any alteration in the dung or urine: the horſe is ſometimes diſpoſed to rear up, and apt to fall back when handled about the head; which is often the caſe with young horſes, to which it does not prove ſuddenly mortal; but with proper help they may ſometimes recover. If the apoplexy proceeds from wounds, or blows on the head, or matter on the brain; beſides the above ſymptoms, the horſe will be frantick by fits, eſpecially after his feeds, ſo as to ſtart and fly at every thing. Theſe caſes ſeldom admit of a perfect recovery; and when horſes fall down ſuddenly, and work violently at their flanks, without any ability to riſe after a plentiful bleeding, they ſeldom recover.

All that can be done is to empty the veſſels as ſpeedily as poſſible, by ſtriking the veins in ſeveral parts at once, bleeding to four or five quarts, and to raiſe up the horſe's head and ſhoulders, ſupporting them with plenty of ſtraw. If he ſurvives the fit, cut ſeveral rowels; give him night and morning glyſters prepared with a ſtrong decoction of ſenna and ſalt, or the purging glyſter mentioned in the directions; blow once a-day up his noſtrils a dram of powder of aſarabacca, which will promote a great diſcharge; afterwards two or three aloetic purges ſhould be given; and to ſecure him from a relapſe, by attenuating and thinning his blood, give him an ounce of equal parts of antimony and crocus metallorum for a month; or, which is preferable, the ſame quantity of cinnabar of antimony and gum guaiacum.

If the fit proceeds only from fulneſs of blood, high feeding, and want of ſufficient exerciſe, or a ſizy blood (which is often the caſe with young horſes, who though they reel, ſtagger, and ſometimes ſuddenly fall down, yet are eaſily cured by the above method), an opening diet with ſcalded bran and barley will be neceſſary for ſome time; and the bleeding may be repeated in ſmall quantities.

As to the other diſorders of the head, ſuch as lethargy or ſleeping evil, epilepſy or falling-ſickneſs, vertigo, frenzy, and madneſs, convulſions, and paralytical diſorders, as they are moſt of them to be treated as the apoplexy and epilepſy, by bleeding and evacuations with the alteratives there directed, we ſhall wave treating of them ſeparately, but mention ſome particular rules to diſtinguiſh them, according to the plan we laid down, and then offer ſome general remedies for the ſeveral purpoſes.

In an epilepſy, or falling ſickneſs, the horſe reels and ſtaggers, his eyes are fixed in his head, he has no ſenſe of what he is doing, he ſtales and dungs inſenſibly, he runs round and falls ſuddenly; ſometimes he is immoveable, with his legs ſtretched out as if he was dead, except only a quick motion of his heart and lungs, which cauſes a violent working of his flanks; ſometimes he has involuntary motions, and ſhaking of his limbs, ſo ſtrong, that he has not only beat and ſpurned his litter, but the pavement with it; and with theſe alternate ſymptoms a horſe continued more than three hours, and then he has as ſurpriſingly recovered; at the going off of the fit, he generally foams at the mouth, the foam being white and dry, like what comes from a healthful horſe when he champs on the bit.

But in all kinds of gripes, whether they proceed from diſorders in the guts, or retention of urine, a horſe is often up and down, rolls and tumbles about; and when he goes to lie down, generally makes ſeveral motions with great ſeeming carefulneſs, which ſhews he has a ſenſe of his pain; and if he lays ſtretched out for any time, it is generally but for a ſhort ſpace.

Epilepſies and convulſions may ariſe from blows on the head, too violent exerciſe, and hard ſtraining; and from a fulneſs of blood, or impoveriſhed blood, and ſurfeits; which are ſome of the cauſes that denote the original diſorder.

In lethargic diſorders, the horſe generally reſts his head with his mouth in the manger, and his pole often reclined to one ſide; he will ſhew an inclination to eat, but generally falls aſleep with his food in his mouth, and he frequently ſwallows it whole, without chewing: emollient glyſters are extremely neceſſary in this caſe, with the nervous balls recommended for the ſtaggers and convulſions; ſtrong purges are not requiſite, nor muſt you bleed in too large quantities, unleſs the horſe be young and luſty. In old horſes, rowels and large evacuations are improper; but volatiles of all kinds are of uſe, when they can be afforded: the alterative purge (p. 554. col. 2. par. 2. from the bottom) may be given, and repeated on his amendment.

This diſtemper is to be cured by theſe means, if the horſe is not old and paſt his vigour. It is a good ſign if he has a tolerable appetite, and drinks freely without ſlabbering, and if he lies down, and riſes up carefully, though it be but ſeldom.

But if a lethargic horſe does not lie down; if he is altogether ſtupid and careleſs, and takes no notice of any thing that comes near him; if he dungs and ſtales ſeldom, and even while he ſleeps and dozes, it is a bad ſign: if he runs at the noſe thick white matter, it may relieve him; but if a viſcid gleet, that ſticks to his noſtrils like glue, turn to a profuſe running of ropy, reddiſh and greeniſh matter, it is an infallible ſign of a great decay of nature, and that it will prove deadly.

Young horſes from four to ſix years, are very ſubject to convulſions, from bots in the ſpring; and the large coach-breed, more than the ſaddle. They are ſeized without any previous notice; and if bots and worms are diſcovered in their dung, the cauſe ſeems to be out of doubt; more eſpecially if they have lately come out of a dealer's hands.

When this convulſion proceeds from a diſtemperature of the midriff, or any of the principal bowels, it is to be diſtinguiſhed from bots and vermin by previous ſymptoms; the horſe falls off his ſtomach, and grows gradually weak, feeble, and diſpirited in his work, and turns ſhort-breathed with the leaſt exerciſe.

The lively deſcription of that univerſal cramp or convulſion, called by ſome the ſtag-evil, which ſeizes all the muſcles of the body at once, and locks up the jaws, ſo that it is impoſſible almoſt to force them open, we ſhall give in Mr Gibſon's own words, who ſays: As ſoon as the horſe is ſeized, his head is raiſed with his noſe towards the rack, his ears pricked up, and his tail cocked, looking with eagerneſs as an hungry horſe when hay is put down to him, or like a high-ſpirited horſe when he is put upon his mettle; inſomuch, that thoſe who are ſtrangers to ſuch things, when they ſee a horſe ſtand in this manner, will ſcarce believe any thing of conſequence ails him; but they are ſoon convinced, when they ſee other ſymptoms come on apace, and that his neck grows ſtiff, cramped, and almoſt immoveable; and if a horſe in this condition lives a few days, ſeveral knots will ariſe on the tendinous parts thereof, and all the muſcles both before and behind will be ſo much pulled and cramped, and ſo ſtretched, that he looks as if he was nailed to the pavement, with his legs ſtiff, wide, and ſtradling; his ſkin is drawn ſo tight on all parts of the body, that it is almoſt impoſſible to move it; and if trial be made to make him walk, he is ready to fall at every ſtep, unleſs he be carefully ſupported; his eyes are ſo fixed with the inaction of the muſcles, as give him a deadneſs in his looks; he ſnorts and ſneezes often, pants continually with ſhortneſs of breath; and this ſymptom increaſes continually till he drops down dead; which generally happens in a few days, unleſs ſome ſudden and very effectual turn can be given to the diſtemper.

In all theſe caſes the horſe ſhould firſt be bled plentifully, unleſs he is low in fleſh, old, or lately come off any hard continued duty, then you muſt be more ſparing of his blood; afterwards give the following ball.

Take aſſa fœtida half an ounce, Ruſſia caſtor powdered two drams, valerian root powdered one ounce; make into a ball with honey and oil of amber.

This ball may be given twice a-day at firſt; and then once, waſhed down with a decoction of miſletoe or valerian ſweetened with liquorice or honey: an ounce of aſſa fœtida may be tied up in a piece of ſtrong coarſe linen rag, and put behind his grinders to champ on.

The laxative purges and emollient glyſters ſhould be given intermediately to keep the body open; but when the former balls have been taken a week or ten days, the following may be given once a-day with the valerian decoction.

Take cinnabar of antimony ſix drams, aſſa fœtida half an ounce, ariſtolochia myrrh and bay-berries of each two drams; make into a ball with treacle and oil of amber.

This is the moſt effectual method of treating theſe diſorders; but when they are ſuſpected to ariſe from bots, and worms, which is generally the caſe, mercurial medicines moſt lead the way, thus:

Take mercurius dulcis and philonium of each half an ounce; make into a ball with conſerve of roſes, and give the horſe immediately; half the quantity may be repeated in four or five days.

The following infuſion ſhould then be given, to the quantity of three or four horns, three or four times a-day, till the ſymptoms abate; when the above nervous balls may be continued till they are removed.

Take penny-royal and rue of each two large handfuls, chamomile flowers one handful, aſſa fœtida and caſtor of each half an ounce, ſaffron and liquorice-root ſliced of each two drams; infuſe in two quarts of boiling water; pour off from the ingredients as wanted.

If the caſtor is omitted, add an ounce of aſſa fœtida.

The following ointment may be rubbed into the cheeks, temples, neck, ſhoulders, ſpines of the back and loins, and where-ever there is the greateſt contractions and ſtiffneſs.

Take nerve and marſhmallow ointment of each four ounces, oil of amber two ounces, with a ſufficient quantity of camphorate ſpirit of wine; make a liniment.

When the jaws are ſo locked up that medicines cannot be given by the mouth, it is more eligible to give them by way of glyſter; for forcing open the jaws by violence often puts a horſe into ſuch agonies, that the ſymptoms are thereby increaſed.

In this caſe alſo he muſt be ſupported by nouriſhing glyſters, made of milk-pottage, broths, &c. which muſt be given to the quantity of three or four quarts a-day; glyſters of this kind will be retained, and abſorbed into the blood; and there have been inſtanced of horſes thus ſupported for three weeks together, who muſt otherwiſe have periſhed.

Mr Gibſon mentions ſome extraordinary inſtances of ſucceſs in caſes of this ſort by theſe methods, and repeated frictions, which are extremely ſerviceable in all convulſive diſorders, and often prevent their being jaw ſet; they ſhould be applied with unwearied diligence every two or three hours, where ever any ſtiffneſs or contractions in the muſcles appear; for a horſe in this condition never lies down till they are in ſome meaſure removed.

The uſe of rowels in theſe caſes is generally unſucceſsful, the ſkin being ſo tenſe and tight, that they ſeldom digeſt kindly, and ſometimes mortify; ſo that if they are applied, they ſhould be put under the jaws, and in the breaſt.

The red-hot iron ſo frequently run through the foretop and mane, near the occipital bone, for this purpoſe, has often been found to have deſtroyed the cervical ligament.

In paralytic diſorders, where the uſe of a limb or limbs is taken away, the internals above recommended ſhould be given, in order to warm, invigorate, and attenuate the blood; and the following ſtimulating embrocation ſhould be rubbed into the parts affected.

Take oil of turpentine four ounces, nerve ointment and oil of bays of each two ounces, camphor rubbed fine one ounce, rectified oil of amber three ounces, tincture of cantharides one ounce.

With this liniment the parts affected ſhould be well bathed for a conſiderable time, to make it penetrate; and when the hind parts chiefly are lame, the back and loins ſhould be well rubbed with the ſame. To the nervous medicines above recommended, may be added ſnake-root, contrayerva, muſtard-ſeed, horſe-raddiſh root ſteeped in ſtrong beer, or wine where it can be afforded. Take the following for an example, which may be given to the quantity of three pints a-day alone, or two horns full may be taken after the nervous balls.

Take ſnake-root, contrayerva, and valerian, of each half an ounce; muſtard-ſeed and horſe-raddiſh root ſcraped, of each two ounces; long pepper two drams; infuſe in three pints of ſtrong wine.

When the horſe is recovering from any of the above diſorders, the following alterative purge may be repeated two or three times, as it operates very gently.

Take ſuccotrine aloes one ounce, myrrh half an ounce, aſſa fœtida and gum ammoniacum of each two drams, ſaffron one dram; make into a ball with any ſyrup.

Where a retention of dung is the cauſe of this diſorder, the great gut ſhould firſt be raked thoroughly with a ſmall hand, after which plenty of emollient oily glyſters ſhould be thrown up, and the opening drink given, till the bowels are thoroughly emptied of their impriſoned dung. Their diet ſhould for ſome days be opening, and conſiſt chiefly of ſcalded bran, with flower of brimſtone, ſcalded barley, *&c.*

Of the STRANGLES, *and* VIVES.

THE ſtrangles is a diſtemper to which colts and young horſes are very ſubject; and begins with a ſwelling between the jaw bones, which ſometimes extends to the muſcles of the tongue; and is attended with ſo great heat, pain, and inflammation, that ſometimes, till matter is formed, the horſe ſwallows with the utmoſt difficulty.

The ſymptoms are extraordinary heat and feveriſhneſs, with a painful cough, and a great inclination to drink without being able; ſome horſes loſing their appetite entirely, others eating but little, by reaſon of the pain which chewing and ſwallowing occaſions: when the ſwelling begins on the inſide of the jaw bones, it is much longer en coming to matter than when more to the middle; when it ariſes among the glands, and divides into ſeveral tumours, the cure is generally tedious, as it breaks in different places; and when it forms upwards on the windpipe and gullet, there is ſometimes danger of ſuffocation, unleſs the ſwelling ſoon breaks. But the moſt dangerous kind is, when, beſides the above ſymptoms, the horſe runs at the noſe; this is by ſome called the *baſtard ſtrangles*.

As this diſorder ſeems to be critical, the moſt approved method is to aſſiſt nature in bringing the ſwellings to maturity, by keeping them conſtantly moiſt with ointment of marſhmallows, and covering the head and neck with a warm hood. But as all ſwellings in glandular parts ſuppurate ſlowly, the following poultice may be applied hot twice a-day.

TAKE leaves of marſhmallows ten handfuls, white-lily root half a pound, linſeed and fenugreek-ſeed bruiſed of each four ounces; boil them in two quarts of water till the whole is pulpy, and add four ounces of ointment of marſhmallows, and a ſufficient quantity of hogs-lard, to prevent its growing ſtiff and dry.

In five or ſix days, by theſe means, the matter is generally formed, and makes its way through the ſkin; and if the diſcharge is made freely and with eaſe, the opening need not be inlarged; but ſhould be dreſſed with the following ointment ſpread on tow, ſtill continuing the poultice over it to promote the digeſtion, and prevent any remaining hardneſs.

TAKE roſin and Burgundy pitch of each a pound and a half, honey and common turpentine each eight ounces, yellow wax four ounces, hogs-lard one pound, verdigreaſe finely powdered one ounce; melt the ingredients together, but do not put in the verdigreaſe, till removed from the fire; and it ſhould be ſtirred in by degrees, till the whole is grown ſtiff and cool.

If the fever and inflammation run high, and the ſwelling be ſo ſituated as to endanger ſuffocation, a moderate quantity of blood muſt be taken away, and the remainder diluted with plenty of water-gruel, or warm water, maſhes, *&c.*

The running at the noſe which often attends the ſtrangles is dangerous, eſpecially if it continues after they have ripened and broke, as the horſe will be greatly weakened thereby. To prevent this waſte and decay, give him every day for ſome time an ounce of Jeſuit's bark; or a ſtrong decoction of guaiacum ſhavings, which hath been found extremely beneficial in reſtraining theſe glandular diſcharges when too liberal, and in drying up ulcers of all kinds in horſes.

If a hardneſs remains after the ſores are healed up, they may be anointed with the mercurial ointment; and when the horſe has recovered his ſtrength, purging will be neceſſary.

The vives or ives differ from the ſtrangles only in this; that the ſwellings of the kernels, under the ears of the horſe, (which are the parts at firſt chiefly affected), ſeldom gather, or come to matter, but by degrees perſpire off and diſperſe by warm cloathing, anointing with the marſhmallow ointment, and a moderate bleeding or two. But ſhould the inflammation continue notwithſtanding theſe means, a ſuppuration muſt be promoted by the methods above recommended in the ſtrangles.

When theſe ſwellings appear in an old or full-aged horſe, they are ſigns of great malignity, and often of an inward decay, as well as forerunners of the glanders.

The mercurial ointment above-mentioned, may be prepared thus:

TAKE of crude mercury or quickſilver one ounce, Venice turpentine half an ounce; rub together in a mortar till the globules of the quickſilver are no longer viſible; then add two ounces of hogs-lard.

Of the Diſeaſes of the EYES.

IN order to make the diſorders of the eyes well underſtood, we ſhall conſider them as ariſing from different cauſes; external injuries affecting the globe of the eye; and from internal cauſes affecting the humours within the globe. We ſhall conſider alſo the eye as naturally weak from a bad conformation, which poſſibly may often be hereditary.

In all recent diſorders of the eye from external injuries, ſuch as blows, bites, *&c.* attended with a ſwelling of the lid, and a running from the eye, you muſt firſt ſponge the part often with cold ſpring-water and vinegar; and if much ſwelled, bleed immediately, and apply over it a poultice made of the pulps of roaſted or boiled apples, cleared from their ſeeds and huſks; or of conſerve of roſes and vinegar, with a little bole, and the white of an egg. When the ſwelling is abated, either of the following waſhes will complete the cure.

TAKE white vitriol half an ounce, ſugar of lead two drams; diſſolve in a pint of ſpring-water; to which may occaſionally be added, when the rheum is very great, and inflammation removed, half an ounce of tutty, or compound powder ceruſs.

Let the eye and eyelid be bathed three or four times a-day with a clean ſponge dipped in this waſh; or it may be applied with a feather, leaving a few drops on the eye. When the veins under the eye have been turgid, opening them with a launcet has often been found ſucceſsful.

Mr Gibſon, from his own experience, recommends the following, with which alone he has ſucceeded in moſt common caſes.

Take two drams of roſe-buds, infuſe them in half a pint of boiling water; when cold, pour off the infuſion, and add to it twenty grains of ſugar of lead.

This is to be uſed as the former; but the quantity of ſugar of lead may occaſionally be increaſed.

Sometimes from the violence of the inflammation, ſucceeding blows, and external injuries, the coats of the eye ſhall loſe their tranſparency, thicken, and turn white, or pearl-colour; in the latter caſe, the horſe has ſome glimmering of light; in the former, he is blind while the eye continues in this ſtate.

If the horſe be fleſhy and of a groſs conſtitution, bleeding may be repeated, and a rowel will be neceſſary: let his diet be ſcalded bran or barley; avoiding for ſome days oats, beans, or any thing hard to chew.

The cooling opening drink, (p. 547. col. 1. par. 1.) ſhould be given every other day, which will anſwer better than aloetic purges.

If the eye-lids continue ſwelled and moiſt, and the under ſide of the eye inflamed, an ounce of honey may be added to four ounces of the above waters; or the part may be well bathed with an ounce of honey of roſes, and half a dram of ſugar of lead, diſſolved in three ounces of ſpring-water: to which may be added, when the eye is very watery, a ſpoonful or two of red wine, which will help to thicken the matter and dry it up.

If a film or thick ſlough ſhould remain, it may be taken off, by blowing into the eye equal parts of white vitriol and ſugar-candy finely powdered.

Glaſs finely powdered, mixed up with honey and a little freſh butter, is much recommended by Dr Bracken for this purpoſe; as alſo the following ointment.

Take ointment of tutty one ounce, honey of roſes two drams, white vitriol burnt one ſcruple; this, with a feather, may be ſmeared over the eye twice a-day.

Let it be remembered, that it has long been obſerved in practice, that the eye in its firſt ſtate of inflammation is ſo very tender, that the eye-waters prepared with tutty and other powders aggravate the diſorder; conſequently, during this ſtate, the tinctures of vegetables and ſolutions of ſalts are greatly preferable.

Wounds of the eye may be dreſſed with honey of roſes alone, or with a little ſugar of lead mixed with it, adding thereto, after a few days, an eighth part of tincture of myrrh; all the preceding directions in regard to inflammation being attended to, eſpecially bleeding, rowels, and gentle cooling phyſic.

When the humours of the eye are thickened, and the diſorder is within the globe, ſharp external applications are not only uſeleſs, but extremely detrimental, by the irritation they occaſion, and conſequently ſhould be avoided.

In all caſes of this ſort, whether moon-eyes, which are only cataracts forming, or in confirmed ones attended with a weeping; general evacuations, with internal alteratives, can only take place.

Theſe generally make their appearance, when a horſe is turned five, coming ſix; at which time one eye becomes clouded, the eye lids being ſwelled, and very often ſhut up; and a thin water generally runs from the diſeaſed eye down the cheek, ſo ſharp as ſometimes to excoriate the ſkin; the veins of the temple, under the eye, and along the noſe, are turgid and full: though ſometimes it happens that the eye runs but little.

This diſorder comes and goes till the cataract is ripe; then all pain and running diſappears, and the horſe becomes totally blind, which is generally in about two years. During this time ſome horſes have more frequent returns than others; which continue in ſome a week or more, in others three or four; returning once in two or three months, and they are ſeldom ſo long as five without a relapſe.

There is another kind of moon-blindneſs, which is alſo the forerunner of cataracts, where no humour or weeping attends. The eye is never ſhut up or cloſed here, but will now and then look thick and troubled, at which time the horſe ſees nothing diſtinctly: when the eyes appear ſunk and periſhing, the cataracts are longer coming to maturity; and it is not unuſual in this caſe for one eye to eſcape.

Theſe caſes generally end in blindneſs of one, if not of both eyes; the moſt promiſing ſigns of recovery are when the attacks come more ſeldom, and their continuance grows ſhorter, and that they leave the cornea clear and tranſparent, and the globe plump and full.

The attempts to cure cataracts have hitherto been only palliative and mitigating the ſymptoms; yet early care has ſometimes been ſucceſsful. To this end the horſe ſhould be rowel'd and bled at proper intervals; except where the eyes appear ſunk and periſhing, where it is often pernicious. During the violence of the ſymptoms, obſerve the cooling treatment above recommended, giving him two ounces of nitre every day mixed into a ball with honey, and bathe the parts above the eye with verjuice, or vinegar, wherein roſe-leaves are infuſed; to four ounces of which, half a dram of ſugar of lead may be added. The ſwelling on the lid may afterwards be bathed with a ſponge dipt in equal parts of lime and Hungary water, mixed together: the cooling phyſic, (p. 545 col. 1. par. 4.) ſhould be given every fourth day, till the eye becomes clear, and recovers its uſual brightneſs. The following alſo is very proper phyſic for this purpoſe.

Take lenitive electuary and cream of tartar of each four ounces, Glauber's ſalts three ounces, ſyrup of buckthorn two ounces.

When the weeping is by theſe means removed, the alterative powders (See the ſection, *Of* Alterative Medicines) ſhould be given every day, till two or three pounds are taken, and after an interval of three months, the ſame courſe ſhould be repeated. This method has often been attended with good ſucceſs, where the eyes have been full, and no way periſhed; in that caſe, bathe or foment them with the following, twice a-day.

Take crude ſal armoniac two drams, diſſolve in a pint of lime-water, and add to it four ounces of brandy, or Hungary water.

This will act as a ſtimulus, and may help to thin and rarify the gummy juices, and bring new ſupplies of nouriſhment to the periſhing eyes.

This courſe not ſucceeding, in order more powerfully to open the veſſels of the chryſtalline humour, (which in theſe caſes is always found opake, and, when the cataract is confirmed, entirely loſes its tranſparency,) and hinder as much as poſſible the forming of obſtructions, mercurials are chiefly to be depended on: thus give every other day, for three or four mornings, two drams of calomel, mixed up with conſerve of roſes; and then purge off with the common ball.

During this courſe, particular care ſhould be taken of the horſe: after repeating this, the alterative powders before-mentioned ſhould be given for ſome weeks or months, if you expect any benefit from them; or they may be beat up into a ball with live millepedes, and an ounce and a half given every day: if theſe ſhould not ſucceed, and the horſe is a valuable one, the turbith courſe recommended in the ſection on alteratives, ſeems to be the moſt promiſing method left. But to horſes that are not ſo, an ounce of antimony, ground into an impalpable powder, may be given every day in one of his feeds for three months or longer; or a ſtrong decoction of guaiacum ſhavings may be given for ſome time, to which crude antimony may be given in the following manner.

> TAKE guaiacum ſhavings one pound, crude antimony tied in a rag the ſame quantity; boil in two gallons of forge-water to one, and give a quart a-day, either alone, or mixed with his water.

The haws is a ſwelling and ſpongineſs that grows in the inner corner of the eye, ſo large ſometimes as to cover a part of the eye. The operation here is eaſily performed by cutting part of it away; but the farriers are apt to cut away too much; the wound may be dreſſed with honey of roſes; and if a fungus or ſpongy fleſh ariſes, it ſhould be ſprinkled with burnt alum, or touched with blue vitriol.

Of the GLANDERS.

THE cauſe and ſeat of the glanders has till lately been ſo imperfectly handled, and ſo little underſtood by the writers of this diſtemper, that it is no wonder it ſhould be ranked among the incurables: but a new light having been thrown on this whole affair by the ſtudy of M. La Foſſe, the king of France's farrier, who has been at the pains to trace out, and diſcover, by diſſections, the ſource and cauſe of this diſorder; we hope the method he has propoſed, with ſome further experiments and improvements, will ſoon bring to a certainty of cure (in moſt caſes at leaſt) a diſtemper ſo dangerous to our horſes, and that hitherto has eluded the force of art.

M. de la Foſſe has diſtinguiſhed ſeven different kinds of glanders, four of which are incurable.

The firſt proceeds from ulcerated lungs, the purulent matter of which comes up the trachea, and is diſcharged through the noſtrils, like a whitiſh liquor, ſometimes appearing in lumps and grumes: in this diſorder, though the matter is diſcharged from the noſtrils, yet the malady is ſolely in the lungs.

The ſecond is a waſting humour, which uſually ſeizes horſes at the decline of a diſeaſe, cauſed by too hard labour; this defluxion alſo proceeds from the lungs.

The third is a malignant diſcharge, which attends the ſtrangles ſometimes, and falls upon the lungs, which runs off by the noſtrils.

The fourth is, when an acrimonious humour in the farcy ſeizes theſe parts, where it ſoon makes terrible havock.

The fifth kind we ſhall deſcribe by and by, as ariſing from taking cold.

The ſixth kind is a diſcharge from the ſtrangles, which ſometimes vents itſelf at the noſtrils.

Theſe are the various diſorders which have been obſerved ſometimes to throw matter out from the noſtrils; let us now deſcribe the real glanders.

The matter, then, diſcharged from the noſtrils of a glandered horſe, is either white, yellow, or greeniſh, ſometimes ſtreaked, or tinged with blood: when the diſeaſe is of long ſtanding, and the bones are fouled, the matter turns blackiſh, and becomes very fœtid; and is always attended with a ſwelling of the kernels or glands under the jaws; in every other reſpect the horſe is generally healthy and ſound, till the diſtemper has been of ſome continuance.

It is always a bad ſign, when the matter ſticks to the inſide of the noſtrils, like glue or ſtiff paſte; when the inſide of the noſe is raw, and looks of a livid or lead colour; when the matter becomes bloody, and ſtinks, and when it looks of an aſh-colour. But when only a limpid fluid is firſt diſcharged, and afterwards a whitiſh matter, the gland under the jaw not increaſing, and the diſorder of no long continuance, we may expect a ſpeedy cure; for in this caſe, which ariſes from taking cold, after a horſe has been overheated, the pituitary membrane is but ſlightly inflamed, the lymph in the ſmall veſſels condenſed, and the glands overloaded, but not yet ulcerated.

From theſe ſymptoms, and ſome obſervations made both by Bracken and Gibſon, it is plain they were not abſolute ſtrangers to the ſeat of this diſorder, though they neglected puſhing their inquiries to the fountain-head, and conſequently were at a loſs to know how to apply the remedy to the parts affected.

But our author, after examining by diſſection the carcaſes of glandered horſes, and making a ſtrict ſcrutiny into the ſtate of the viſcera, aſſiſted for that purpoſe by ingenious and expert anatomiſts, for ten years together, affirms this diſeaſe to be altogether local; and that the true ſeat of it is in the pituitary membrane which lines the partition along the inſide of the noſe, the maxillary ſinuſes or cavities of the cheek-bones on each ſide the noſe, and the frontal ſinuſes or cavities above the orbits of the eyes; that the viſcera, as liver, lungs, *&c.* of glandered horſes are in general exceeding ſound; and conſequently that the ſeat of this diſorder is not in thoſe parts, as has been aſſerted by moſt authors; nor indeed is it probable it ſhould: for how could ſuch horſes preſerve their appetite, their good appearance, ſleek and ſhining coats? in a word, all the ſigns of health for many years together (which many glandered horſes are known to enjoy) with ſuch diſtempered bowels.

But on nicely examining the heads of ſuch horſes, he found the cavities above-mentioned more or leſs filled with a viſcous ſlimy matter, the membrane which lines both them and the noſtrils inflamed, thickened, and corroded with ſordid ulcers, which in ſome caſes had eat into the bones.

He obſerves, that when glandered horſes diſcharge matter from both noſtrils, both ſides of the membrane and cavities were affected; but when they ran at one noſtril only, that ſide only was found diſtempered.

It is a curious remark of our author, that the ſublingual glands, or the kernels ſituated under the jaw-bone, which are always ſwelled in this diſtemper, do not diſcharge their lymph into the mouth, as in man, but into the noſtrils; and that he conſtantly found their obſtruction agreed with the diſcharge; if one gland only was affected, then the horſe diſcharged from one noſtril only; but if both were, then the diſcharge was from both.

The ſeat of this diſorder thus diſcovered, our author with great ingenuity has paved the way for cure, by trepanning theſe cavities, and taking out a piece of bone, by which means the parts affected may be waſhed with a proper injection, and in fine the ulcers deterged, healed, and dried up.

But as from the obſervations ſince made by this gentleman, there are different ſpecies of the glanders, ſo the cure of the milder kinds may firſt be attempted by injections and fumigations: thus after taking cold, ſhould a horſe for fifteen or twenty days diſcharge a limpid fluid or whitiſh matter from one or both noſtrils, the glands under the jaw rather growing harder than diminiſhing, we may expect it will degenerate into a true glanders. To prevent which, after firſt bleeding, and treating him as we have directed for a cold, let an emollient injection, prepared with a decoction of linſeed, marſhmallows, elder, chamomile flowers, and honey of roſes, or ſuch like, be thrown up as far as poſſible with a ſtrong ſyringe, and repeated three times a-day: ſhould the running not leſſen or be removed in a fortnight by the uſe of this injection, a reſtringent one may now be prepared with tincture of roſes, lime-water, *&c.* and the noſtrils fumigated with the powders of frankincenſe, maſtich, amber, and cinnabar, burnt on an iron heated for that purpoſe; the fume of which may eaſily be conveyed through a tube into the noſtrils.

This method has been found ſucceſsful when uſed in time; but the methods of cure depend on the ſtubbornneſs of the diſorder; and when inveterate, recourſe muſt be had to the operation above deſcribed.

Of the CHOLIC *or* GRIPES, *and* Pains *in the* Bowels, *from ſudden accidents.*

There ſeems to be no diſtemper ſo little underſtood by the common farrier, as the cholic or gripes in horſes, one general remedy or method ſerving them in all caſes; but as this diſorder may be produced by very different cauſes, the method of cure muſt alſo vary, otherwiſe the intended remedy, injudiciouſly applied, will not only aggravate the complaint, but make it fatal. We ſhall divide this diſorder into three different ſpecies: the flatulent or windy, the bilious or inflammatory, and the dry gripes; each of which we ſhall diſtinguiſh by their different ſymptoms, and then point out the proper remedies.

The flatulent or windy cholic is thus known. The horſe is often lying down, and as ſuddenly riſing again with a ſpring; he ſtrikes his belly with his hinder feet, ſtamps with his fore-feet, and refuſes his meat; when the gripes are violent, he will have convulſive twitches, his eyes be turned up, and his limbs ſtretched out as if dying, his ears and feet being alternately very hot and cold; he falls into profuſe ſweats, and then into cold damps; ſtrives often to ſtale, and turns his head frequently to his flanks; he then falls down, rolls about, and often turns on his back; this laſt ſymptom proceeds from a ſtoppage of urine, that almoſt always attends this ſort of cholic, which may be increaſed by a load of dung preſſing on the neck of the bladder.

Theſe are the general ſymptoms of cholic and gripes from wind, drinking cold water when hot, and when the perſpirable matter is retained, or thrown on the bowels by catching cold; in all which caſes they are violently diſtended. Cribbing horſes are more particularly ſubject to this complaint, by reaſon they are conſtantly ſucking in great quantities of air.

The firſt intention is to empty the ſtrait gut with a ſmall hand dipt in oil, which frequently makes way for the confined wind to diſcharge itſelf; and by eaſing the neck of the bladder, the ſuppreſſion of urine is taken off, and the horſe ſtales and gets eaſe.

The following ball and glyſter ſeldom fail of giving relief in theſe caſes.

TAKE Straſburgh or Venice turpentine, and juniper-berries pounded, of each half an ounce; ſalt-prunella, or ſalt-petre, an ounce; oil of juniper, one dram; ſalt of tartar, two drams; make into a ball with any ſyrup; it may be given whole, and waſhed down with a decoction of juniper-berries, or a horn or two of ale.

If the horſe does not break wind, or ſtale plentifully, he will find no relief; therefore in an hour or two give him another ball, and add to it a dram of ſalt of amber; which may be repeated a third time, if found neceſſary. During the fit the horſe may be walked and trotted gently, but ſhould by no means be haraſſed beyond his ability, or dragged about till he is jaded.

The following glyſter may be given, between the balls, or alone, and repeated occaſionally.

TAKE chamomile flowers two handfuls; aniſe, coriander, and fennel ſeeds, of each an ounce; long pepper half an ounce; boil in three quarts of water to two; and add Daffy's elixir, or gin, half a pint; oil of amber half an ounce, and oil of chamomile eight ounces.

The ſigns of a horſe's recovery, are his lying quiet, without ſtarting, or tumbling, and his gathering up his legs, and ceaſing to laſh out; and if he continues an hour in this quiet poſture, you may conclude all danger over.

The next ſpecies of cholic we ſhall deſcribe, is the bilious or inflammatory; which beſides moſt of the preceding ſymptoms, is attended with a fever, great heat, panting, and dryneſs of the mouth; the horſe alſo generally throws out a little looſe dung, with a hot ſcalding water, which when it appears blackiſh, or of a rediſh colour, and fœtid ſmell, denotes an approaching mortification.

In this caſe the horſe ſhould immediately be bled to the quantity of three quarts; and it ſhould be repeated, if the ſymptoms do not abate in a few hours. The emollient glyſter, with two ounces of nitre diſſolved in it, ſhould be thrown up twice a-day, to cool the inflamed bowels; plenty of gum-arabic water ſhould be taken, and a pint of the following drink given every two or three hours, till ſeveral looſe ſtools are procured; and then it ſhould be given only night and morning till the diſorder is removed.

Take ſenna three ounces, ſalt of tartar half an ounce; infuſe in a quart of boiling water an hour or two; then ſtrain off, and add two ounces of lenitive electuary, and four of Glauber's ſalts.

If this diſorder is not removed by theſe means, but the inflammation and fever increaſe, attended with a diſcharge of the fleſh-coloured water above deſcribed, the event will moſt probably be fatal: and the chief thing to be depended on now, muſt be a ſtrong decoction of Jeſuits bark, given to the quantity of a pint every three hours, with a gill of red port-wine.

A quart of the ſame may be uſed for a glyſter, with two ounces of Venice turpentine, diſſolved with the yolks of two eggs, an ounce of diaſcordium, and a pint of red wine, and given twice a-day: if the horſe recovers, give two or three mild rhubarb purges.

The laſt we ſhall deſcribe is the dry gripes, or the cholic, which ariſes often from coſtiveneſs; it is diſcovered by the horſe's frequent and fruitleſs motion to dung, the blackneſs and hardneſs of the dung, the frequent and quick motion of his tail, the high colour of his urine, and his great reſtleſſneſs and uneaſineſs.

In this caſe the ſtrait gut ſhould be examined and emptied with a ſmall hand oiled properly for that purpoſe; the emollient oily glyſter, (p. 545. col. 2. par. 7.) ſhould be thrown up twice a-day; and the above purging drink given, till the bowels are unloaded, and the ſymptoms removed.

The diet for a horſe in the gripes, ſhould be ſcalded bran, warm water-gruel, or white water, made by diſſolving four ounces of gum-arabic in a quart of water, and mixing it with his other water.

From this hiſtory and diviſion of gripes and cholics, with their different treatment, it appears how abſolutely neceſſary it is they ſhould be well underſtood, in order to be managed ſkilfully: it is plain too, that violent hot medicines ſhould in every ſpecies of this diſorder be guarded againſt, and given with great caution and diſcretion, even in the firſt kind of flatulent cholic, where indeed they can only be wanted; yet too often, when prepared by the farriers with oil of turpentine, geneva, pepper, and brine, *&c.* they even increaſe that diſorder, by ſtimulating the neck of the bladder, too forcibly heating the blood, and inflaming the bowels, till a mortification is brought on them. Theſe are, in general, the conſtant appearances of horſes that die of this diſorder, whoſe bowels being examined for that purpoſe, have been found inflamed, full of red and livid ſpots, ſometimes quite black, criſped with extreme heat, and rotten.

Of the Lax *and* Scouring, *with other Diſorders of the* Stomach *and* Bowels.

It is ſometimes a nice matter to form a proper judgment when to controul or encourage a looſeneſs, but theſe general rules may be a direction: If a healthy full horſe, on taking cold, or upon hard riding, overfeeding, eating unwholeſome food, or with a ſlight fever, ſhould have a moderate purging, by no means think of ſtopping it; but rather encourage it with an open diet, and plenty of warm gruel: but if it continues long, with gripings, the mucus of the bowels coming away, and the horſe loſing his appetite and fleſh, it is then high time to give him proper medicines; if he voids great quantities of ſlime and greaſy matter, give him the following drench, and repeat it every other day for three times.

Take lenitive electuary and cream of tartar of each four ounces, yellow roſin finely powdered one ounce, and four ounces of ſweet oil; mix with a pint of water gruel.

The following alterative ball alone has been found ſucceſsful for this purpoſe, when given twice a-week, with ſcalded bran and warm gruel.

Take ſuccotrine aloes half an ounce, diapente one ounce; make into a ball with the juice of Spaniſh liquorice diſſolved in water, and a ſpoonful of oil of amber.

To this may be added two drams of myrrh, and a dram of ſaffron, and (where it can be afforded) half an ounce of rhubarb.

When the purging is attended with a fever, rhubarb ſhould firſt be given to the quantity of half an ounce, with an ounce and half of lenitive electuary; at night after the working, give half an ounce or more of diaſcordium in a pint of red wine mulled with cinnamon, and repeat it every day, and the rhubarb ball once in two or three.

But if the diſtemper increaſes, the horſe's flanks and belly look full and diſtended, and he appears griped and in pain, let this glyſter be given, and the quantity of diaſcordium increaſed an ounce in his night-drink.

Take chamomile flowers one handful, red roſes half a handful, pomegranate and balauſtines of each an ounce; boil in two quarts of water to one; ſtrain off, and diſſolve in it two or three ounces of diaſcordium, and one of mithridate; to which may be added a pint of port wine: repeat it once a-day.

If the flux continues violent, give an ounce of rock-alum, with an ounce and a half of bole, twice a-day; or, diſſolve double this quantity with two ounce of diaſcordium, and the cordial ball, in two quarts of hartſhorn drink; to which may be added a pint of port; and give the horſe, three or four times a-day, a pint of this drink. For this purpoſe alſo a ſtrong decoction of oak-bark may be given, with either of the above remedies, and to the ſame quantity; even by itſelf, it will be found on trial no inconſiderable remedy.

When the diſcharge is attended with an acrid mucus or ſlime, the griping and pains are very ſevere, the common lining of the bowels being waſhed away; in this caſe the following glyſter ſhould frequently be injected warm.

Take of tripe-liquor or thin ſtarch two quarts, oil of olives half a pint, the yelk of ſix eggs well broke, and two or three ounces of courſe ſugar.

Some horſes having naturally weak ſtomachs and bowels, throw out their aliment undigeſted; their dung is habitually ſoft, and of a pale colour; they feed poorly, and get no fleſh: to remedy this complaint, give the following purge two or three times; and then the infuſion to the quantity of a pint every morning.

Take ſuccotrine aloes ſix drams, rhubarb powdered three drams, myrrh and ſaffron each a dram; make into a ball with ſyrup of ginger.

Infuſion.—Take zedoary, gentian, winters-bark, and orange-peel, of each two ounces; pomegranate-bark and balauſtine, of each an ounce; chamomile-flowers and centaury, each a handful; cinnamon and cloves, each an ounce: infuſe in a gallon of port or ſtrong beer.

The bloody flux is a diſtemper horſes are not very ſubject to; however, as it ſometimes does occcur, whenever blood is diſcharged, attended with gripings, and great pain in the bowels, if the flux is not ſpeedily reſtrained, the horſe probably may be ſoon loſt: we recommend therefore the following glyſter and drink for that purpoſe.

Take oak bark four ounces, tormentil-root two ounces, burnt hartſhorn three ounces; boil in three quarts of forge-water to two; ſtrain off, and add two ounces of diaſcordium, four ounces of ſtarch, and half a dram of opium.

A glyſter may alſo be prepared with the ſame quantity of fat broth, ſtarch and opium, in order to plaiſter over the coats of the bowels, and abate their violent irritations. Alſo,

Take ſoft chalk two ounces, mithridate or diaſcordium one ounce, powder of Indian-root half a dram, liquid laudanum fifty or ſixty drops; diſſolve in a pint of hartſhorn drink, and add to it four ounces of cinnamon-water or red wine: give it twice a-day.

Gum arabic diſſolved in hartſhorn drink, or in common water, ſhould be the horſe's uſual drink.

When horſes are apt to be coſtive, from whatever cauſe it ariſes, gentle openers ſhould be given; ſuch as cream of tartar, Glauber's ſalts, and lenitive electuary; four ounces of any two of theſe diſſolved in warm ale, whey, or water, given every other morning for two or three times, will anſwer this purpoſe; eſpecially if aſſiſted by an oily emollient glyſter, prepared with a handful of ſalt. Scalded bran or barely, with an ounce of fenugreek and linſeed, occaſionally given, will prevent this complaint: but where it is conſtitutional, and proceeds from the power and force of digeſtion in the ſtomach and guts, as ſometimes happens, and the horſe is otherwiſe in perfect health, no inconvenience will ariſe from it; and it is obſerved that ſuch horſes are able to endure great fatigue and labour.

Of Worms *and* Bots.

Authors have deſcribed three different ſorts of worms that affect horſes, *viz. Bots*, which young horſes are often troubled with in the ſpring; the *Rotundi*, or thoſe reſembling earth-worms; and the *Aſcarides*, or thoſe about the ſize of the largeſt ſewing needle, with flat heads.

The bots which breed in the ſtomachs of horſes, and are ſometimes the cauſe of convulſions, appear to be very large maggots, compoſed of circular rings, with little ſharp prickly feet along the ſides of their bellies (like the feet of hog-lice), which by their ſharpneſs (like the points of the fineſt needles) ſeem to be of uſe to faſten them to the part where they breed and draw their nouriſhment, and to prevent their being looſened from ſuch adheſion before they come to maturity. The eggs from whence theſe bots are produced, are diſperſed into cluſters all round the lower orifice of the ſtomach, and are laid under the inner coat or thin membrane of the ſtomach; ſo that when the animals come to form and life, they burſt through this inner coat with their breech and tail ſtraight outwards, and their trunks ſo fixed into the muſcular or fleſhy coat of the ſtomach, that it ſometimes requires a good pull to diſengage them; from the blood of this laſt coat they draw their nouriſhment, which they ſuck like ſo many leeches, every one ulcerating and purſing up the part where it fixes like a honey-comb; and they often make ſuch quick havock, as to deſtroy the horſe.

The ſymptoms of worms are various. The bots that many horſes are troubled with in the beginning of the ſummer, are always ſeen ſticking on the ſtrait gut, and are often thruſt out with the dung, with a yellowiſh coloured matter like melted ſulphur; they are noways dangerous there, but are apt to make a horſe reſtleſs and uneaſy, and rub his breech againſt the poſts. The ſeaſon of their coming is uſually in the months of May and June, after which they are ſeldom to be ſeen, and rarely continue in any one horſe above a fortnight or three weeks. Thoſe that take their lodgment in the ſtomach, are extremely dangerous by cauſing convulſions; and are ſeldom diſcovered by any previous ſigns before they come to life, when they throw a horſe into violent agonies. The other kinds are more troubleſome than dangerous; but are known by the following ſigns: The horſe looks lean and jaded, his hair ſtares as if he was ſurfeited, and nothing he eats makes him thrive; he often ſtrikes his hind-feet againſt his belly, is ſometimes griped, but without the violent ſymptoms that attend a cholic or ſtrangury; for he never rolls and tumbles, but only ſhews uneaſineſs, and generally lays himſelf down quietly on his belly for a little while, and then gets up and falls a feeding; but the ſureſt ſign is when he voids them with his dung.

For the cure of bots in the ſtomach, we have already taken notice that calomel ſhould firſt be given in large quantities, and repeated at proper intervals, (ſee p. 554. col. 1.) Æthiops mineral, or ſome of the under-mentioned forms, may be given afterwards.

But bots in the ſtrait gut may be cured by giving the horſe a ſpoonful of ſavin, cut very ſmall, once or twice a-day in his oats or bran, moiſtened; and three or four cloves of garlick may be added to advantage. Give alſo an aloetic purge between whiles; the following ſtands recommended.

Take fine ſuccotrine aloes, ten drams; freſh jallap, one dram; ariſtochia, or birthwort, and myrrh powdered, of each two drams; oil of ſavin and amber, of each one dram; ſyrup of buckthorn enough to form into a ball.

But as the ſource of worms in general proceeds from a vitiated appetite and a weak digeſtion, recourſe muſt firſt be had to mercurials, and afterwards to ſuch things as are proper to ſtrengthen the ſtomach, promote digeſtion, and, by deſtroying the ſuppoſed ova, prevent the regeneration of theſe animals. Thus, two drams of calomel may be given with half an ounce of diapente, and mixed up with conſerve of wormwood, over night; and the next morning the above purge: theſe may be repeated ſix or eight days. Or the following mercurial purge may be given, which will be leſs troubleſome, and no leſs efficacious.

TAKE crude quickſilver two drams, Venice turpentine half an ounce; rub the quickſilver till no gliſtening appears; then add an ounce of aloes, a dram of grated ginger, thirty drops of oil of ſavin, and a ſufficient quantity of ſyrup of buckthorn to make a ball.

One of theſe balls may be given every ſix days, with the uſual precautions in regard to mercurial phyſic; and theſe powders intermediately.

TAKE powdered tin and Æthiops mineral of each half an ounce: give every night in a maſh, or among his corn.

The various preparations of antimony and mercury muſt be given ſeveral weeks together, in order to get entire riddance of theſe vermin. The Æthiops mineral may be given to the quantity of half an ounce a-day; the the mercurius alkaliſatus to two drams a day, incorporated with a bit of cordial ball. The cinnabar powders, as directed in the farcy, are no leſs effectual: and when worms are bred from high feeding, or unwholeſome food; rue, garlick, tanſy, ſavin, box, and many other ſimples, may be given ſucceſsfully; being for that purpoſe mixed with their food; as alſo cut tobacco, from half an ounce to an ounce a-day.

Of the YELLOWS, *or* JAUNDICE.

HORSES are frequently ſubject to this diſtemper; which is known by a duſky yellowneſs of the eyes; the inſide of the mouth and lips, the tongue and bars of the roof of the mouth, looking alſo yellow. The horſe is dull, and refuſes all manner of food; the fever is ſlow, yet both that and the yellowneſs increaſe together. The dung is often hard and dry, of a pale yellow, or light pale green. His urine is commonly of a dark dirty brown colour; and when it has ſettled ſome time on the pavement, it looks red like blood. He ſtales with ſome pain and difficulty; and if the diſtemper is not checked ſoon, grows delirous and frantic. The off-ſide of the belly is ſometimes hard and diſtended; and in old horſes, when the liver has been long diſeaſed, the cure is not practicable, and ends fatally with a waſting diarrhœa: but when the diſtemper is recent, and in young horſes, there is no fear of a recovery, if the following directions are obſerved.

Firſt of all bleed plentifully; and give the laxative glyſter (p. 547. col. 1. par. 2. from the bottom) as horſes are apt to be very coſtive in this diſtemper; and the next day give him this purge.

TAKE of Indian rhubarb powdered one ounce and a half, ſaffron two drams, ſuccotrine aloes ſix drams, ſyrup of buckthorn a ſufficient quantity.

If the rhubarb ſhould be found too expenſive, omit it, and add the ſame quantity of cream of tartar, and half an ounce of Caſtile ſoap, with four drams more of aloes. This may be repeated two or three times, giving intermediately the following balls and drink.

TAKE of Æthiop's mineral half an ounce, millepedes the ſame quantity, Caſtile ſoap one ounce; make into a ball, and give one every day, and waſh it down with a pint of this decoction.

TAKE madder-root and turmerick of each four ounces, burdock root ſliced half a pound, Monk's rhubarb four ounces, liquorice ſliced two ounces; boil in a gallon of forge-water to three quarts; ſtrain off, and ſweeten with honey.

Balls of Caſtile ſoap and turmerick may be given alſo for this purpoſe, to the quantity of three or four ounces a day, and will in moſt recent caſes ſucceed.

By theſe means the diſtemper generally abates in a week, which may be diſcovered by an alteration in the horſe's eyes and mouth; but the medicines muſt be continued till the yellowneſs is intirely removed. Should the diſtemper prove obſtinate, and not ſubmit to this treatment, you muſt try more potent remedies, *viz.* mercurial phyſic, repeated two or three times at proper intervals; and then the following balls.

TAKE ſalt of tartar two ounces, cinnabar of antimony four ounces, live millepedes and filings of ſteel of each three ounces, ſaffron half an ounce, Caſtile or Venice ſoap half a pound: make into balls, the ſize of a pullet's egg, with honey; and give one, night and morning, with a pint of the above drink.

It will be proper, on his recovery, to give two or three mild purges; and if a fat full horſe, to put in a rowel.

Of the Diſorders of the KIDNEYS *and* BLADDER.

THE ſigns of the kidneys being hurt or affected are, a weakneſs of the back and loins, difficulty of ſtaling, faintneſs, loſs of appetite, and deadneſs in the eyes; the urine is thick, foul, and ſometimes bloody, eſpecially after a violent ſtrain. A horſe diſeaſed in his kidneys can ſeldom *back*, that is, move ſtrait backwards without pain, which is viſible as often as he is put to the trial: the ſame thing is obſervable indeed in horſes, whoſe backs have been wrung and wrenched; but with this difference, that in the latter there is ſeldom any defect or alteration in the urine, except that it is higher coloured.

Bleeding is the prime remedy, and that plentifully, in order to prevent inflammation; and the more ſo, if a fever attends a difficulty in ſtaling, for then we may ſuſpect the kidneys already inflamed. A rowel in the belly has been found uſeful; and the following balls may be given twice or thrice a-day, with a pint of marſhmallow decoction, in which half an ounce of gum arabic is diſſolved, with an ounce of honey.

TAKE lucatellus-balſam one ounce, ſpermaceti ſix drams, ſal prunella half an ounce; mix into a ball with honey: if the urine is bloody, add half an ounce of Japan earth.

Should the fever continue, bleed largely, give emollient glyſters, and the cooling opening drink, (p. 547. col. 1. par. 3.) till it abates.

If the urine paſſes with difficulty and pain, notwithſtanding theſe means, give this ball, and repeat it twice or thrice a-day till the horſe ſtales freer and without pain, his urine become of a right conſiſtence, and free from any purulent ſettlement.

Take balſam of copivi or Straſburgh turpentine, and Venice ſoap, of each one ounce, nitre ſix drams, myrrh powdered two drams; make into a ball with honey, and waſh it down with the marſhmallow decoction.

As a ſuppreſſion of urine ariſes ſometimes from an inflammation of the kidney; ſo at others, from a paralytic diſorder, diſabling them in their office of ſeparating the urine from the blood: in this latter caſe, the bladder is uſually empty, ſo that a horſe will make no motion to ſtale; and if he continues a few days in this condition, his body will ſwell to a great degree, breaking out in blotches all over, and death will ſoon cloſe the ſcene.

If it ariſes from inflammation, bleed largely, and treat the horſe as above recommended; but if not, give ſtimulating glyſters, and ſtrong diuretics, ſuch as the following balls, once in four hours: for if a horſe ſtales not in thirty hours, his danger muſt be great.

Take juniper-berries powdered one ounce, ſal prunella ſix drams, ætherial oil of turpentine half an ounce, camphor one dram, oil of juniper two drams; make into a ball with honey, and give after it three or four horns of the marſhmallow decoction and honey.

Or,

Take ſquills powdered two or three drams, nitre half an ounce or ſix drams; make into a ball with honey.

If the complaint is not removed by theſe means, rub the horſe's reins well with two parts of oil of turpentine, and one of oil of amber; and apply a poultice of garlick, horſe raddiſh, muſtard-ſeed, camphor, and green ſoap, ſpread on thick cloth, over them. Give the horſe alſo two drams of calomel over night, and a moderate purge the next morning. Theſe perhaps are the chief and beſt remedies that can be given in this generally fatal diſorder.

When the ſtrangury in a horſe does not ariſe from wind, or dung preſſing on the neck of the bladder (as was obſerved in the Section on Cholicks) the cauſe is from inflammation, or too long a retention of the urine. Such horſes make frequent motions to ſtale, ſtand wide and ſtraddling, are full, and have their flanks diſtended. In this caſe bleed largely; give the following drink, and repeat it every two hours, for two or three times, till the horſe is relieved.

Take Venice turpentine, broke with the yolk of an egg, one ounce, nitre or ſal prunella ſix drams, half a pint of ſweet oil, and a pint of white wine.

If this drink ſhould not have the deſired effect, the diuretic ball above mentioned may be given in the ſame manner, omitting the myrrh.

Give the horſe plenty of the marſhmallow decoction, in a quart of which diſſolve an ounce of nitre and gum arabic, and two of honey.

Horſes ſubject to a *diabetes*, or profuſe ſtaling, if old, or of a weak conſtitution, are ſeldom cured; they ſoon loſe their fleſh and appetite, grow feeble, their coat ſtaring, and they die rotten. Of a young horſe there are more hopes; but he muſt not be indulged with too much water, or moiſt food. Give him the following:

Take jeſuit's bark four ounces, biſtort and tormentil-root of each two ounces; boil in two gallons of lime-water to the conſumption of half, and give a pint three times a-day.

As this diſorder generally proceeds from too violent exerciſe, over-ſtraining, *&c* repeated bleedings in ſmall quantities are abſolutely neceſſary, till the mouths of the veſſels cloſe up.

Of Molten-grease.

By molten-greaſe is meant a fat or oily diſcharge with the dung, and ariſes from a colliquation, or melting down of the fat of a horſe's body by violent exerciſe in very hot weather. It is always attended with a fever, heat, reſtleſſneſs, ſtarting and tremblings, great inward ſickneſs, ſhortneſs of breath, and ſometimes with the ſymptoms of a pleuriſy. His dung will be extremely greaſy, and he will fall into a ſcouring; his blood will have a thick ſkin or fat over it when cold, of a white or yellow hue, but chiefly the latter; the congealed part or ſediment is commonly a mixture of ſize and greaſe, which makes it ſo extremely ſlippery, that it will not adhere to the fingers, and the ſmall portion of ſerum feels alſo ſlippery and clammy. The horſe ſoon loſes his fleſh and fat, which probably is diſſolved and abſorbed into blood; and thoſe that ſurvive this ſhock, commonly grow hide-bound for a time, their legs ſwelling both before and behind, and continue in this ſtate till the blood and juices are rectified; and if this is not done effectually, the farcy, or ſome obſtinate ſurfeit, generally follows, very difficult to remove.

In the firſt place bleed plentifully, and repeat it for two or three days ſucceſſively in ſmaller quantities; two or three rowels ſhould alſo be immediately put in, and the cooling emollient glyſters (p. 547. col. 1. par. 2. from the bottom) daily thrown up to abate the fever, and drain off the greaſy matter from the inteſtines. By the mouth give plenty of warm water or gruel, with cream of tartar or nitre, to dilute and attenuate the blood, which in this caſe is greatly diſpoſed to run into grumes, and endanger a total ſtagnation.

When the fever is quite gone off, and the horſe has recovered his appetite, gentle aloetic purges ſhould be given once a-week, for a month or ſix weeks, in order to bring down the ſwelled legs. To this end give the following, which, reapeated for ſome time, will entirely remove this diſorder.

Take of ſuccotrine aloes ſix drams, of gum guaiacum powdered half an ounce, of diaphoretic antimony and powder of myrrh of each two drams; make into a ball with ſyrup of buckthorn.

Theſe will ſeldom take a horſe from his buſineſs above two or three days in a week; neither will he loſe his fleſh or appetite with them, but on the contrary mend in both; which cannot be obtained by any other method of purging, and gives this greatly the preference in many caſes.

Of Surfeits, Mange, *and* Hide-bound.

Surfeits ariſe from various cauſes; but are commonly the effects of ſome diſeaſes not attended to, or that have been ill cured.

A horſe is ſaid to be ſurfeited, when his coat ſtares, and looks ruſty and dirty, though proper means has not been wanting to keep him clean. The ſkin is full of ſcales and dander, that lies thick and meally among the hair, and is conſtantly ſupplied with a freſh ſucceſſion of the ſame, for want of due tranſpiration. Some horſes have hurdles of various ſizes like peas or tares; ſome have dry fixed ſcabs all over their limbs and bodies; others a moiſture, attended with heat and inflammation; the humours being ſo ſharp, and violently itching, that the horſes rub ſo inceſſantly, as to make themſelves raw. Some have no eruptions at all, but an unwholeſome look, and are dull, ſluggiſh and lazy; ſome appear only lean and hide-bound: others have flying pains and lameneſs, reſembling a rheumatiſm; ſo that in the ſurfeits of horſes, we have almoſt all the different ſpecies of the ſcurvy and other chronical diſtempers.

The following method is uſually attended with ſucceſs in the dry ſpecies. Firſt take away about three or four pounds of blood, and then give the following mild purge, which will work as an alterative, and ſhould be repeated once a-week, or ten days, for ſome time.

Take ſuccotrine aloes ſix drams or one ounce, gum guaiacum half an ounce, diaphoretic antimony and powder of myrrh of each two drams; make into a ball with ſyrup of buckthorn.

In the intermediate days, an ounce of the following powder ſhould be given, morning and evening, in his feeds.

Take native cinnabar, or cinnabar of antimony, finely powdered, half a pound; crude antimony, in fine powder, four ounces; gum guaiacum, alſo in powder, four ounces: make into ſixteen doſes for eight days.

This medicine muſt be repeated till the horſe coats well, and all the ſymptoms of ſurfeit diſappear.

The wet ſurfeit, which is no more than a moiſt running ſcurvy, appears on different parts of the body of a horſe, attended ſometimes with great heat and inflammation; the neck oftentimes ſwells ſo in one night's time, that great quantities of a hot briny humour iſſues forth; which, if not allayed, will be apt to collect on the poll or withers, and produce the poll-evil or fiſtula. This diſeaſe alſo frequently attacks the limbs, where it proves obſtinate and hard to cure: and in ſome horſes ſhews itſelf ſpring and fall.

In this caſe bleed plentifully, avoid externally all repellers, and give cooling phyſic twice a-week; as, four ounces of lenitive electuary, with the ſame quantity of cream of tartar; or the latter, with four ounces of Glauber's ſalts, quicked, if thought proper, with two or three drams of powder of jallap, diſſolved in water-gruel, and given in a morning faſting.

After three or four of theſe purges, two ounces of nitre made into a ball with honey may be given every morning for a fortnight; and if attended with ſucceſs, repeated for a fortnight longer.

The powders above-mentioned may be alſo given with the horſe's corn; or a ſtrong decoction of guaiacum ſhavings or logwood may be given alone to the quantity of two quarts a-day. Theſe, and indeed all alterative medicines, muſt be continued for a long time, where the diſorder proves obſtinate.

The diet ſhould be cool and opening, as ſcalded bran or barley; and if the horſe is hide-bound, an ounce of fenugreek-ſeeds ſhould be given in his feeds for a month or longer; and, as this diſorder often proceeds from worms, give the mercurial phyſic too, and afterwards the cinnabar powders, as above directed; but as in general, it is not an original diſeaſe, but a ſymptom only of many, in the cure regard muſt be had to the firſt cauſe: thus, as it is an attendant on ſurfeits, fevers, worms, *&c.* the removal of this complaint muſt be variouſly effected.

In a mangy horſe the ſkin is generally tawny, thick, and full of wrinkles, eſpecially about the mane, the loins and tail; and the little hair that remains in thoſe parts ſtands almoſt always ſtrait out or briſtly: the ears are commonly naked and without hair, the eye and eyebrows the ſame; and when it affects the limbs, it gives them the ſame aſpect; yet the ſkin is not raw, nor peels off, as in the hot inflamed ſurfeit.

Where this diſtemper is caught by infection, if taken in time it is very eaſily cured: and we would recommend a ſulphur ointment as moſt effectual for that purpoſe, rubbed in every day. To purify and cleanſe the blood, give antimony and ſulphur for ſome weeks after. There are a great variety of external remedies for this purpoſe, ſuch as train-oil and gun-powder, tobacco ſteeped in chamber-lye, *&c.* Solleyſell recommends the following.

Take burnt alum and borax in fine powder of each two ounces, white vitriol and verdegreaſe powdered of each four ounces; put them into a clean pot, with two pounds of honey, ſtirring till they are incorporated; when cold, add two ounces of ſtrong aqua-fortis.

But when this diſorder is contracted by low feeding, and poverty of blood, the diet muſt be mended, and the horſe properly indulged with hay and corn. The following ointments are effectually uſed for this diſorder, rubbed into the parts affected every day.

Take powdered brimſtone, train-oil, and tar, of each equal quantities; to which may be added ginger, or white hellebore.

Or,

Take ſulphur vivum half a pound, crude ſal armoniac one ounce, hogs lard or oil a ſufficient quantity to form into an ointment.

Theſe are both very powerful remedies for this diſorder, and can ſcarce fail of ſucceſs.

Of the FARCIN *or* FARCY.

THE true farcy is properly a diſtemper of the blood-veſſels, which generally follows the tract of the veins, and, when inveterate, thickens their coats and integuments, ſo that they become like ſo many chords. We ſhall not deſcribe the different ſorts of farcies, ſeeing they are only degrees of one and the ſame diſtemper; but proceed to paint the diſtemper by its ſymptoms, which are pretty manifeſt to the eye.

At firſt, one or more ſmall ſwellings, or round buds like grapes or berries, ſpring out over the veins, and are often exquiſitely painful to the touch; in the beginning they are hard, but ſoon turn into ſoft bliſters, which when broke diſcharge an oily or bloody ichor, and turn into very foul and ill-diſpoſed ulcers. In ſome horſes it appears on the head only; in ſome on the external jugular; in others on the plate vein, and runs downwards on the inſide of the fore-arm towards the knee, and very often upwards towards the briſket: in ſome the farcy ſhews itſelf on the hind-parts, about the paſterns, and along the large veins on the inſide of the thigh, riſing upwards into the groin, and towards the ſheath; and ſometimes the farcy makes its appearance on the flanks, and ſpreads by degrees towards the lower belly, where it often becomes very troubleſome.

When the farcy appears on the head only, it is eaſily cured; eſpecially when it is ſeated in the cheeks and forehead, the blood-veſſels being here ſmall: but it is more difficult when it affects the lips, the noſtrils, the eyes, the kernels under the jaws, and other ſoft and looſe parts, eſpecially if the neck-vein becomes chorded. When it begins on the outſide of the ſhoulder or hips, the cure is ſeldom difficult: but when the farcy ariſes on the plate-vein, and that vein ſwells much, and turns corded, and the glands or kernels under the arm-pit are affected, it is hard to cure; but more ſo when the crural veins withinſide of the thigh are corded, and beſet with buds, which affects the kernels of the groin and the cavernous body of the yard. When the farcy begins on the paſterns or lower limbs, it often becomes very uncertain, unleſs a timely ſtop is put to it; for the ſwelling in thoſe dependant parts grows ſo exceſſively large in ſome conſtitutions. and the limbs ſo much disfigured thereby with foul ſores and callous ulcerations, that ſuch a horſe is ſeldom fit for any thing afterwards but the meaneſt drudgery: but it is always a promiſing ſign, wherever the farcy happens to be ſituate, if it ſpreads no further. It is uſual to affect only one ſide at a time; but when it paſſes over to the other, it ſhews great malignancy: when it ariſes on the ſpines, it is then for the moſt part dangerous, and is always more ſo to horſes that are fat and full of blood, than to thoſe that are in a more moderate caſe. When the farcy is epidemical, as ſometimes happens, it riſes on ſeveral parts of the body at once, forms naſty foul ulcers, and makes a profuſe running of greeniſh bloody matter from both noſtrils; and ſoon ends in a miſerable rot.

When the farcy makes its firſt appearance on the head, it riſes on the cheeks and temples, and looks like a net-work, or ſmall creeping twigs full of berries. Sometimes it inflames the eye, and ſometimes little bliſters or buds run along the ſide of the noſe. It ariſes often on the outſide of the ſhoulder, running along the ſmall veins with heat and inflammation; and ſometimes a few ſmall buds appear near the withers, and on the outſide of the hip. In all theſe appearances, the diſeaſe being ſuperficial, and affecting only the ſmaller veſſels, is eaſily conquered by the following method, when taken in time; for the ſimpleſt farcy, if neglected, may degenerate into the worſt ſort.

This diſtemper, then, being of an inflammatory nature, and in a particular manner affecting the blood veſſels, muſt neceſſarily require large bleeding, particularly where the horſe happens to be fat and full of blood. This always checks the beginning of a farcy, but is of ſmall ſervice afterwards; and if a horſe is low in fleſh, the loſs of too much blood ſometimes proves injurious. After bleeding, let the horſe have four ounces of cream of tartar and lenitive electuary; which may be given every other day for a week, to cool the blood, and open the body; and then give nitre three ounces a-day for three weeks or a month, and anoint the buds and ſwellings with the following ointment twice a-day.

TAKE ointment of elder four ounces, oil of turpentine two ounces, ſugar of lead half an ounce, white vitriol powdered two drams; mix together in a gallypot.

The buds ſometimes by this method are diſperſed, leaving only little bald ſpots, which the hair ſoon covers again. When they break and run, if the matter be thick and well digeſted, they will ſoon be well: but in order to confirm the cure, and to diſperſe ſome little lumps which often remain for ſome time on the ſkin without hair, give the liver of antimony for a month; two ounces a-day for a fortnight, and then one ounce a-day for the other fortnight: by following this method, a farcy which affects only the ſmall veſſels, may be ſtopped in a week or ten days, and ſoon after totally eradicated.

When the farcin affects the larger blood-veſſels, the cure is more difficult; but let it always be attempted early: therefore on the plate, thigh, or neck veins appearing chorded, bleed immediately on the oppoſite ſide, and apply the following to the chorded vein.

TAKE oil of turpentine in a pint bottle ſix ounces, oil of vitriol three ounces; drop the oil of vitriol into the oil of turpentine by little at a time, otherwiſe the bottle will burſt; when it has done ſmoaking, drop in more oil of vitriol, and ſo on till all is mixed.

This mixture is one of the beſt univerſals in a beginning farcy; but where it is ſeated in looſe fleſhy parts, as flanks or belly, equal parts of the oil of vitriol and turpentine are neceſſary.

Rub the parts firſt with a woollen cloth; and then apply ſome of the mixture over the buds, and where-ever there is any ſwelling, twice a day. Give the cooling phyſic every other day, and then three ounces of nitre every day for ſome time.

When the farcy begins on the flanks, or towards the lower belly, it often takes its riſe from a ſingle puncture of a ſharp ſpur. The pain and ſmarting is one ſure ſign to diſtinguiſh the farcy from common accidents; the ſtaring of the hair, which ſtands up like a tuft all round the buds or bliſters, and the matter that iſſues from the buds, which is always purulent and of a clammy greaſy conſiſtence, are other certain ſigns. After bathing with the mixture above mentioned till the ulcers are ſmooth and healing, ſhould the ſwelling not ſubſide, to prevent the ſpreading of the buds, and to diſperſe them, bathe with either of theſe mixtures as far as the centre of the belly; and at the ſame time give a courſe of antimonials, as will preſently be preſcribed.

Take ſpirits of wine four ounces, oil of vitriol and turpentine, of each two ounces, white-wine vinegar, or verjuice, ſix ounces.

Or the following:

Take ſpirits of wine rectified four ounces, camphor half an ounce, vinegar or verjuice ſix ounces, white vitriol, diſſolved in four ounces of ſpring water, one ounce; mix together.

In the lower limbs the farcy lies ſometimes concealed for a great while, and makes ſo ſlow a progreſs, that it is often miſtaken for greaſe, or for a blow or kick, and goes by the general appellation of a humour ſettled there. In order to diſtinguiſh the one from the other, we ſhall obſerve that a kick, or bruiſe, is generally attended with a ſudden ſwelling, or a contuſed wound, which for the moſt part digeſts eaſily: the greaſe is alſo a ſmooth ſwelling that breaks out above the bending of the paſterns backwards; but the farcy begins on the paſtern joint uſually with one bud, and runs upwards like a knotty crab-tree.

Very ſimple means have ſometimes ſtopped it, before it has begun to ſpread; a poultice with bran and verjuice bound round the part, and renewed once a-day, will often alone ſucceed; and if proud fleſh ſhould ariſe, touch it with oil of vitriol, or aqua fortis, an hour before you apply the poultice; for when the diſtemper is local, as we ſuppoſe it here, it is to be conquered by outward applications.

When the diſtemper grows inveterate, and reſiſts the above method, and the veſſels continue chorded, Gibſon recommends the following mixture.

Take linſeed oil half a pint; oil of turpentine and ſalt-petre, of each three ounces; tincture of euphorbium and hellebore, of each two drams; the ſoldiers ointment two ounces; or oil of bays, or oil of origanum, half an ounce; double aqua fortis half an ounce: after the ebullition is over, add two ounces of Barbadoes tar.

Rub this into the chorded veins, and where-ever there is a ſwelling, once in two or three days; but if the orifices are choaked up with proud fleſh, or the ſkin ſo much thickened over the ulcers as to confine the matter, in either caſe it is neceſſary to make an open paſſage with a ſmall hot iron, and deſtroy the proud fleſh, after which it may be kept down by touching with oil of vitiol, aqua fortis, or butter of antimony. A ſalve may alſo be prepared with quickſilver and aqua fortis, rubbing any quantity of the former with enough of the latter, to the conſiſtence of a liniment; ſmear the ulcers with this whenever they appear foul, and you will find it preferable to moſt other eating medicines.

Our farriers, after opening the buds, put in uſually a ſmall quantity of corroſive ſublimate or arſenic, which they call coring out the farcy; this may anſwer where the buds are few, and not ſituated near large blood-veſſels, joints, or tendons: others uſe Roman vitriol, or ſublimate and vitriol, in equal quantities: but let it be remembered, that many a horſe has been poiſoned by theſe medicines ignorantly uſed, and in too large quantities.

The following balls are proper in every ſtate of the farcy; and when the diſtemper has been in its infancy, before the ſkin was much defaced, has often cured it in a week or two, by giving them only once or twice a-day: but in an old farcy they ſhould be given for two or three months together.

Take of native cinnabar, or cinnabar of antimony, eight ounces; long bithwort and gum guaiacum powdered, of each four ounces: make into a paſte with honey, and form into balls of the ſize of a large walnut, and roll them into liquorice powder.

The tediouſneſs of this courſe has encouraged the giving of mercurials; and indeed where they are directed with ſkill, they muſt be attended with ſucceſs: the ſtronger preparations, as the red and white precipitates, and turbith, being combined with ſharp ſaline parts, may be hazardous and injurious; but the latter given in ſmall quantities have been found very ſucceſsful in ſuch kind of inveterate diſorders. Mr Gibſon ſays, he has given it to a dram at a doze, where the limbs have been greatly ſwelled; that in forty-eight hours the ſores were all dried up, and the limbs reduced; but that it made the horſe ſo violently ſick for ſeveral days, and ſcoured him to ſuch a degree, that it could not be repeated.

One would have thought that the ſucceſs attending this medicine ſo ſuddenly, might have encouraged Gibſon to have made further trials in ſmaller quantities; which had he done, it is more than probable he would not have been diſappointed: for the grand ſecret in giving mercurials as alteratives, is the introducing them into the blood, without operating on the ſtomach and bowels; and to do this effectually, they muſt be given in ſmall quantities, and ſo bridled as to controul their force on the firſt paſſages; taken in this manner, they will mix gradually with the blood and juices, and operate both effectually and ſafely.

Dr Bracken recommends the knots and chords to be rubbed with the mercurial ointment before they break, in order to diſperſe them; and after breaking, to dreſs the ſores with equal parts of Venice turpentine and quickſilver: if by theſe means the mouth ſhould become ſore, treat as above.—This method ſeems to be effectual with proper care.

The following is alſo recommended by the ſame gentleman:

Take butter of antimony and bezoar mineral, of each one ounce; beat up with half a pound of cordial ball, and give the bigneſs of a walnut, or three quarters of an ounce, every day for two or three weeks, faſting two or three hours after it.

We ſhall here take notice of what is called the water-farcy, which has no reſemblance to a true farcy, either in its cauſe, ſymptoms, or effects, but has only obtained this name through cuſtom and ignorance.

This water farcy then is of two kinds; one the product of a feveriſh diſpoſition, terminating on the ſkin, as often happens in epidemical colds; the other is dropſical, where the water is not confined to the belly and limbs, but ſhews itſelf in ſeveral parts of the body by ſoft ſwellings yielding to the preſſure of the finger. This laſt kind uſually proceeds from foul feeding, or from the latter graſs and fog, that often comes up in great plenty with continued cold rains, and breeds a ſluggiſh viſcid blood. In the former caſe, we have ſeen the limbs and whole body enormouſly ſwelled, and very hard, the belly and ſheath greatly diſtended; which were as ſurpriſingly reduced in four and twenty hours, by ſlight ſcarifications within ſide the leg and thigh, with a ſharp penknife, and three or four ſtrokes on the ſkin of the belly on each ſide the ſheath; from theſe ſcarifications there was a conſtant and ſurpriſing large dripping of water, which ſoon relieved the horſe; when a few purges compleated his recovery.

In the other ſpecies of dropſy the curative intentions are to diſcharge the water, recover the craſis or ſtrength of the blood, and brace up the relaxed fibres throughout the whole body. To this end, purge once a-week or ten days; and give intermediately either of the following.

Take black hellebore freſh gathered, two pounds; waſh, bruiſe, and boil in ſix quarts of water, to four; and then ſtrain out the liquor, and put two quarts of white-wine on the remaining hellebore, and let it infuſe warm forty-eight hours; then ſtrain off, mix both together, and give the horſe a pint night and morning.

Take nitre two ounces, ſquills powdered three drams or half an ounce, camphor one dram, honey enough to form into a ball, to be given once a-day alone, or waſhed down with a horn or two of the above drink.

Before we cloſe this ſection, it is proper to lay down the ſymptoms of an incurable farcy, that the owners of ſuch horſes may ſave themſelves unneceſſary expence and trouble in their endeavours to obtain a cure.

When a farcy, by improper applications, or by neglect, has ſpread and increaſed, or after long continuance reſiſted the medicines above recommended; if freſh buds are continually ſprouting forth, while the old ones remain foul and ill conditioned; if they riſe on the ſpines of the back and loins; if the horſe grows hide-bound, and runs at the noſe; if abſceſſes are formed in the fleſhy parts between the interſtices of the large muſcles; if his eyes look dead and lifeleſs; if he forſakes his food, and ſcours often, and his excrements appear thin and of a blackiſh colour; if the plate or thigh vein continues large and chorded after firing, and other proper applications: theſe ſymptoms denote the diſtemper to have penetrated internally, and that it will degenerate into an incurable conſumption: it is moſt probable alſo, that the whole maſs of fluids are tainted, and become irremediable by art.

Of Alterative Medicines.

By alteratives, or altering medicines, are to be underſtood ſuch as, having no immediate ſenſible operation, gradually gain upon the conſtitution, by changing the humours or juices from a ſtate of diſtemperature to health. This intention in ſome caſes may perhaps be effected by correcting the acrimony of the juices, and accelerating the blood's motion; and in others by attenuating, or breaking its particles, and dividing thoſe coheſions which obſtruct the capillaries or finer veſſels; and ſo promote the due ſecretions of the various fluids. It is certain, that many have but an indifferent opinion of a medicine that does not operate externally, and gratify their ſenſes with a quantity of imagined humours ejected from the body: but let ſuch people remember, that there are good humours as well as bad, which are thrown off together; that no evacuating medicine has a power of ſelecting, or ſeparating the bad from the good; and conſequently that they are thrown out only in a proportionate quantity. Theſe few hints may be ſufficient to convince the judicious reader of the great advantages ariſing from alteratives, and the preference due to them in moſt caſes over purgatives; unleſs it could be proved, as already mentioned, that the latter could cull out and ſeparate from the blood the bad humours ſolely, leaving the good behind; but this ſelective power has long been juſtly exploded as ridiculous and uncertain, ſince it is plain, that all kinds of purging medicines differ only in degree of ſtrength, and operate no otherwiſe upon different humours than as they ſtimulate more or leſs.

We ſhall therefore take this opportunity of recommending ſome alterative medicines, which are not ſo generally known as they ought to be; and that too on the ſureſt grounds, a proper experience of their good effects in repeated trials. The firſt then is nitre or purified ſaltpetre, which has long been in great eſteem, and perhaps is more to be depended on in all inflammatory fevers than any other medicine whatever: but beſides this extenſive power of allaying inflammatory diſorders, it is now offered as a remedy, taken in proper quantities, as an alterative for ſurfeits, molten-greaſe, hide-bound, greaſe-heels, *&c.* And as it has been known to ſucceed even in the cure of the farcy, what other diſtempers in horſes, ariſing from vitiated fluids, may it not be tried on, with a ſtrong probability of ſucceſs? This great advantage will ariſe from the uſe of this medicine over moſt others, that, as its operation is chiefly by urine, it requires no confinement or cloathing; but the horſe may be worked moderately throughout the whole courſe. This medicine has been found equally efficacious (by many trials made in one of our hoſpitals) in correcting the acrimony of the juices, and diſpoſing the moſt obſtinate and inveterate ſores to heal up; and hence probably it came recommended as an alterative to our horſes.

The quantity of nitre given at a time ſhould be from two to three ounces a-day; let it be finely powdered, and then mix with it by little at a time as much honey as will form it into a ball; give it every morning faſting for a month; or it may be given at firſt for a fortnight only, intermitting a fortnight, and then repeat it. If it be obſerved that the horſe ſhews an uneaſineſs at the ſtomach after taking it, a horn or two of any liquor ſhould be given after it, or it may be diſſolved at firſt in his water, or mixed with his corn; though the ball, where it agrees, is the eaſieſt method of giving.

When horſes take drinks with great reluctance, powders muſt be given in their feeds; thus crude antimony, or liver of antimony finely powdered, may be given to the quantity of half an ounce, night and morning; but in all ſurfeits, gum guaiacum mixed with antimony is found more efficacious. Thus,

TAKE of crude antimony finely powdered, or, where it can be afforded, cinnabar of antimony, and gum guaiacum, of each a pound: mix together with an oily peſtle to prevent the gum's caking: divide the whole into thirty-two dozes, *viz.* an ounce each doze; let one be given every day in the evening feed.

Or,

TAKE of cinnabar of antimony, gum guaiacum, and Caſtile or Venice ſoap, of each half a pound, ſalt of tartar four ounces; beat them up into a maſs, and give an ounce every day. To theſe may be added very advantageouſly, an ounce and an half of camphor.

Æthiops mineral given to the quantity of half an ounce a-day, is a very good ſweetener and corrector of the blood and juices; but it has been obſerved, after having been taken a week or ten days, to make ſome horſes ſlabber, and unable to chew their hay and oats; and the ſame ſymptoms have aroſe, where only two drams of crude mercury has been given, and continued about the ſame ſpace of time.

Diet Drinks.—1. A decoction of logwood, prepared like that of guaiacum, is alſo ſucceſsfully given in ſurfeits.

2. Lime-water, prepared with ſhavings of ſaſſapharas and liquorice, is a good diet-drink, to ſweeten and correct a horſe's blood; and may be given with the nitre balls for that purpoſe.

3. Tar-water alſo, as has before been hinted, may in many caſes be well worth trial: but let it be remembered, that all medicines of this kind ſhould be continued a conſiderable time in obſtinate caſes.

Of ROWELLING.

THERE ſeems to be no remedy ſo much made uſe of, and ſo little underſtood by farriers in general, as rowels; for which reaſon we ſhall endeavour to ſet the whole affair in a clearer light, than hitherto it has appeared in.

We ſhall begin then by deſcribing rowelling, which is an artificial vent made between the ſkin and fleſh, in order to unload and empty the veſſels in general, and thereby relieve particular parts, when too much oppreſſed by a fulneſs or redundancy.

The general and abſurd reaſoning of farriers on the effects and uſe of rowelling, in ſome meaſure makes this ſection the more neceſſary, as it is too notorious how impertinently they talk on this ſubject: for in ſhort, with them, a rowel is to draw off all the bad and corrupt humours from the blood by a ſort of magic.

It is neceſſary to obſerve, that the matter generally diſcharged by a rowel, is nothing more than an ouzing from the extremities of the veſſels divided in the making of it; in fact then, it is blood, which loſes its colour, by being ſhed out of the veſſels, the warmth of the part, and its confinement.

If this is granted, it will evidently appear, that the good effects enſuing this operation, muſt be owing to a gradual depletion or emptying of the veſſels in general; by which means the ſurcharge or load on a particular part, is taken off and removed, and impurities or bad juices (generally called humours) run off with the good in proportion to their quantity in the blood.

Thus, to lean hide-bound horſes, and thoſe of a dry hot conſtitution, the diſcharge, by depriving the conſtitution of ſo much blood and fluids, is daily exhauſting the ſtrength of the animal; and may be productive of bad conſequences, by defrauding the conſtitution of a neceſſary fluid.

But in diſorders from fulneſs, attended with acrimony, or ſharpneſs of the juices, and with defluxions on the eyes, lungs, or any part of conſequence; the gradual diſcharge, brought on by theſe means, will contribute to leſſen the fulneſs on the parts affected, and give the veſſels an opportunity of recovering their tone, while evacuating and alterative medicines are doing their office.

It may be neceſſary, however, to obſerve, that there is a wonderful communication between the veſſels of the cellular membrane under the ſkin, which remarkably appears, by inflating thoſe of ſheep, calves, *&c.* by the butchers; hence probably it is that ſome diſorders of this integument, are ſo apparently relieved by iſſues, or rowels, without our having any recourſe to that general depletion of the veſſels, we have juſt obſerved, to account for it; and hence alſo may be deduced their utility, ſometimes in draining off any extravaſated fluids, which may lodge between the interſtices of the muſcles, after violent ſtrains of the ſhoulder; alſo in diſcharging ſuch vitious or ſharp fluids as are thrown on the membranes, and occaſion thoſe flying pains and lameneſſes, which we find are often removed by this local remedy.

Of STRAINS *in* VARIOUS PARTS.

IT is neceſſary to obſerve, that in all ſtrains, the muſcular or tendinous fibres are overſtretched; and ſometimes ruptured, or broke. To form therefore a true idea of theſe diſorders, let us firſt conſider every muſcle and tendon as compoſed of ſpringy elaſtic fibres, which have a proper power of their own to contract and extend themſelves; or, to make their action more familiar, let us compare them to a piece of catgut, that we may the better judge with what propriety oily medicines are directed for their cure. Thus then, it by a violent extenſion of this catgut, you had ſo overſtretched it as to deſtroy its ſpringineſs or elaſticity, and was inclined to recover its loſt tone; would you for that purpoſe think of ſoaking it in oil? And is not the method of treating ſtrains, or overſtretched

ſtretched muſcles and tendons, full as prepoſterous, when you bathe or ſoak them in oily medicines, at a time that they want reſtringents to brace them up? Yet cuſtom has ſo eſtabliſhed this practice, and fallacious experience ſeemingly ſo confirmed it, that it would be a difficult taſk to convince the illiterate and prejudiced of the abſurdity, who, by atributting effects to wrong cauſes, are led into this error, and the oils uſurp the reputation that is due only to reſt and quiet: they ſeem, however, to be aware of the ill conſequences, by their adding the hot oils, as ſpike, turpentine, and origanum; which, though they in ſome meaſure guard againſt the too ſuppling quality of the other oils, yet the treatment is ſtill too relaxing to be of real ſervice.

And indeed, in all *violent* ſtrains of either tendons or muſcles, whatever opinion we may entertain of bathing and anointing with favourite noſtrums, which often ſucceed in ſlight caſes, where perhaps bandage alone would have done; yet it is the latter, with proper reſting the relaxed fibres, till they have thoroughly recovered their tone, that are the chief things to be depended on; and frequently ſome months are neceſſary for effecting the cure.

All violent ſtrains of the ligaments, which connect the bones together, eſpecially thoſe of the thigh, require time, and turning out to graſs, to a perfect recovery. External applications can avail but little here, the parts affected lying too deep, and ſo ſurrounded with muſcles that medicine cannot penetrate to them. The ſooner, in theſe caſes, a horſe is turned out to graſs, the better; as the gentle motion in the field will prevent the ligaments and joint oil from thickening, and of courſe the joint itſelf from growing ſtiff.

When a horſe's ſhoulder is overſtrained, he does not put out that leg as the other; but to prevent pain, ſets the ſound foot hardily on the ground to ſave the other; even though he be turned ſhort on the lame ſide, which motion tries him the moſt of any. When trotted in hand, inſtead of putting his leg forward in a right line, he forms a circle with the lame leg; and when he ſtands in the ſtable, that leg is advanced before the other.

In order to cure this lameneſs, firſt bleed him, and let the whole ſhoulder be well bathed three times a day with hot verjuice or vinegar, in which may be diſſolved a piece of ſoap; but if the lameneſs continues without ſwelling, or inflammation, after reſting two or three days, let the muſcles be well rubbed for a conſiderable time, to make them penetrate, with good opodeldoch, or either of the following mixtures:

TAKE camphorated ſpirit of wine, two ounces; oil of turpentine, one ounce; this proportion will prevent the hair coming off.

Or,

TAKE the beſt vinegar, half a pint; ſpirit of vitriol, and camphorated ſpirit of wine, of each two ounces.

When the ſhoulder is very much ſwelled, it ſhould be fomented with woollen cloths (large enough to cover the whole) wrung out of hot verjuice and ſpirit of wine; or a fomentation prepared with a ſtrong decoction of wormwood, bay-leaves, and roſemary, to a quart of which may be added half a pint of ſpirit of wine.

A rowel in the point of the ſhoulder in this caſe often does great ſervice; eſpecially if the ſtrain has been very violent, and the ſwelling very large: but as to boring up the ſhoulder with a hot iron, and afterwards inflating it, is both a cruel and abſurd treatment; and the pegging up the ſound foot, or ſetting on a patten-ſhoe, to bring the lame ſhoulder on a ſtretch, is a moſt prepoſterous practice, and directly calculated to render a horſe incurably lame; for it can only be neceſſary in caſes the very oppoſite to this, where the muſcles have been long contracted, and we want to ſtretch them out.

Where poultices can be applied, they are at firſt undoubtedly very effectual, after bathing with hot vinegar or verjuice, and are to be preferred greatly to cold charges, which, by drying ſo ſoon on the part, keep it ſtiff and uneaſy: let them be prepared with oat-meal, rye-flour, or bran boiled up in vinegar, ſtrong beer or red-wine lees, with lard enough to prevent their growing ſtiff; and when by theſe means the inflammation and ſwelling is brought down, bathe the part twice a-day with either of the above mixtures, opodeldoch, or camphorated ſpirit of wine; and roll the part three or four inches, both above and below, with a ſtrong linen roller, of about two fingers width; which contributes not a little to the recovery, by bracing up the relaxed tendon; and perhaps is more to be depended on than the applications themſelves.

In ſtrains of the *coffin joint*, that have not been diſcovered in time, there will grow ſuch a ſtiffneſs in the joint, that the horſe will only touch the ground with his toe; and the joint cannot be played with the hand; the only method here is repeated bliſtering, and then firing ſuperficially.

Strains of the *back ſinews* are very common, and are eaſily diſcovered by the ſwelling, which extends ſometimes from the back-ſide of the knee down to the heel, but for the moſt part the horſe ſets that leg before the other. The tendon ſhould be well bathed three or four times a-day with hot vinegar; and if much ſwelled, apply the poultices above recommended; and when the ſwelling is down, bathe with the mixtures above, or with camphorated ſpirit of wine and oil of amber, in which is diſſolved as much camphor as the ſpirits will take up, and roll up the tendon with a proper bandage, or laced ſtocking; which laſt, properly fitted to the limb, might be wore to great advantage, not only in theſe ſort of injuries, but in moſt others, where there is a diſpoſition to the greaſe, or other ſwellings of the limbs, from weak and relaxed fibres. Curriers ſhavings wetted with vinegar have been found uſeful for this purpoſe; as has alſo tar and ſpirit of wine: but where the tendons have ſuffered by repeated injuries of this kind, the caſe will demand bliſtering, firing, and proper reſt.

Strains of the *knees* and *paſterns* ariſe frequently from kicks or blows; if they are much ſwelled, apply firſt the poultices; and when the ſwelling is abated, bathe with the above, or the following.

TAKE vinegar, one pint; camphorated ſpirits of wine, four ounces; white vitriol, diſſolved in a little water, two drams.

Or,

TAKE the white of three or four eggs, beat them into a froth with a ſpoon; to which add an ounce of rock allum, finely powdered; ſpirit of turpentine, and wine, of each half an ounce; mix them well together.

As great weakneſs remains in the paſterns after violent ſtrains, the beſt method is to turn the horſe out to graſs till he is perfectly recovered; when this cannot be complied with, the general way is to bliſter and fire.

When a horſe is lame in the *ſtifle*, he generally treads on his toe, and cannot ſet the heel to the ground. Treat him at firſt with the vinegar and cooling reſtringents; but if a large ſwelling, with puffineſs, enſues, foment it well with the diſcutient fomentation till it diſperſes; and then bathe the part with any of the above medicines.

A lameneſs in the *whirl-bone* and hip, is diſcovered by the horſe's dragging his leg after him, and dropping backward on his heel when he trots. If the muſcles of the hip are only injured, this kind of lameneſs is cured eaſily; but when the ligaments of the joint are affected, the cure is often very difficult, tedious, and uncertain. In either caſe, at firſt bathe the parts well with the cooling medicines, four or five times a-day; in the muſcular ſtrain, this method alone may ſucceed; but in the ligamentous, it is reſt and time only can reſtore the injured parts to their proper tone.

Strains in the *hock* are to be treated by ſoaking the parts with coolers and repellers; but when the ligaments are hurt, and they are attended with great weakneſs and pain, uſe the fomentation. If a hardneſs ſhould remain on the outſide, it may be removed by repeated bliſtering; if within, it may be out of the power of any external applications to remove; however, the joint ſhould be fired gently with ſmall razes or lines pretty cloſe together, and then covered with a mercurial plaiſter. To the diſcutient fomentation above mentioned may be added crude ſal armoniac, with a handful of wood-aſhes boiled in it.

The bliſtering ointment for the above purpoſes may be found in the Section of Bone-ſpavin; but the ſublimate ſhould be omitted.

The *firing*, uſed for the ſtrengthening relaxed ſinews or tendons, ſhould act only on the ſkin, which, by contracting and hardening it all round the ſinews, compreſſes them more firmly like a bandage. The bow-men of old ſubmitted to this operation, in order to give ſtrength to the muſcles and tendons of their arms. A proper degree of ſkill is very requiſite to perform it effectually on a horſe; for a due medium ſhould be obſerved, and the inſtrument neither ſo ſlightly applied, as to ſcarify the ſkin only ſuperficially, nor ſo deep as to wound or cauterize the ſinew or its ſheath. The lines ſhould be drawn pretty cloſe together, on each ſide of the joint or ſinew, following the courſe of the hair; no croſs lines ſhould be made, as they but disfigure the horſe afterwards, without any real uſe. The firing inſtrument, or knife, ought to be a little rounded on the edge, gradually thickening to the back, that it may retain the heat for ſome time, but ſhould not be applied till the flaming redneſs is partly gone off. The cauterized parts may be bathed with ſpirit of wine at firſt, and anointed afterwards with bees-wax and oil, which alone is ſufficient to complete the cure.

Of TUMOURS *and* IMPOSTHUMES.

TUMOURS, or ſwellings, ariſe either from external injuries, or internal cauſes.

Swellings, cauſed by external accidents, as blows and bruiſes, ſhould at firſt be treated with reſtringents; thus, let the part be bathed frequently with hot vinegar or verjuice, and, where it will admit of bandage, let a flannel wetted with the ſame be rolled on: if by this method the ſwelling does not ſubſide, apply, eſpecially on the legs, a poultice with red-wine lees, ſtrong-beer grounds, and oatmeal, or with vinegar, oil, and oatmeal; either of theſe may be continued twice a-day, after bathing, till the ſwelling abates; when, in order to diſperſe it entirely, the vinegar ſhould be changed for camphorated ſpirit of wine, to four ounces of which may be added one of ſpirit of ſal armoniac; or it may be bathed with a mixture of two ounces of crude ſal armoniac boiled in a quart of chamber-lye, twice a day, and rags dipped in the ſame may be rolled on.

Fomentation made by boiling worm-wood, bay-leaves, and roſemary, and adding a proper quantity of ſpirits, are often of great ſervice to thin the juices, and fit them for tranſpiration; eſpecially if the injury has affected the joints.

But in bruiſes, where the extravaſated blood will not by theſe means be diſperſed, the ſhorteſt way is to open the ſkin, and let out the grumes.

Critical tumours, or ſwellings, which terminate fevers, ſhould by no means be diſperſed; except when they fall on the paſtern or coffin-joint, ſo as to endanger them: in this caſe the diſcutient fomentation, (p. 568. col. 1. bottom) ſhould be applied three or four times a-day, and a cloth or flannel frequently wrung out of the ſame ſhould be bound on, in order to keep the joint continually breathing.

But if the ſwelling fixes under the jaws, behind the ears, on the poll, withers, or in the groins and ſheath, *&c.* it ſhould be encouraged and forwarded by ripening poultices where-ever they can be applied; oatmeal boiled ſoft in milk, to which a proper quantity of oil and lard is added, may anſwer this purpoſe; or the poultice recommended in the Section of Strangles: theſe muſt be applied twice a-day, till the matter is perceived to fluctuate under the fingers, when it ought to be let out; for which purpoſe, let the tumour be opened with a knife or ſtrong lancet, the whole length of the ſwelling, if it can be done ſafely; for nothing contributes ſo much to a kind healing, as the matter's having a free diſcharge, and the openings being big enough to dreſs to the bottom.

Pledgets of tow, ſpread with black or yellow baſilicon (or the wound ointment) and dipped in the ſame, melted down with a fifth part of oil of turpentine, ſhould be applied to the bottom of the ſore, and filled up lightly with the ſame, without cramming; it may be thus dreſſed once or twice a-day, if the diſcharge is great, till a proper digeſtion is procured, when it ſhould be changed for pledgets ſpread with the red precipitate ointment, applied in the ſame manner.

Should the ſore not digeſt kindly, but run a thin water and look pale, foment, as often as you dreſs, with the above fomentation; and apply over your dreſſing the ſtrong-beer poultice, and continue this method till the matter grows thick, and the ſore florid.

The following ointments will generally anſwer your expectations in all common caſes, and may be prepared without, as well as with, the verdegreaſe.

TAKE Venice turpentine and bees-wax of each a pound, oil of olives one pound and a half, yellow roſin twelve ounces; when melted together, two or three ounces of verdegreaſe, finely powdered, may be ſtirred in, and kept ſo till cold, to prevent its ſubſiding.

TAKE of yellow baſilicon, or the above ointment, without verdigreaſe, four ounces; red precipitate, finely powdered, half an ounce: mix them together cold with a knife or ſpatula.

This laſt, applied early, will prevent a fungus, or proud fleſh, from ſhooting out; for if you dreſs too long with the above digeſtive, the fungus will riſe faſt, and give ſome trouble to ſuppreſs it; when it will be neceſſary to waſh the ſore as often as you dreſs, with a ſolution of blue vitriol in water, or to ſprinkle it with burnt alum and precipitate. If theſe ſhould not be powerful enough, touch with a cauſtic, or waſh with the ſublimate water, made by diſſolving half an ounce of corroſive ſublimate in a pint of lime-water.

But this trouble may in a great meaſure be prevented, if the ſore is on a part where bandages can be applied with compreſſes of linen cloath: for even when theſe excreſcences regerminate, as it were under the knife, and ſpring up in ſpite of the cauſtics above mentioned, they are to be ſubdued by moderate compreſſion made on the ſprouting fibres, by theſe means.

Authors on farriery have given in general very proper receipts to anſwer every intention of this kind by medicines; but as they have not laid down ſufficient rules for their application in thoſe caſes where they are moſt wanted, the following general directions will not be unacceptable; as the difficulty in healing ſome kinds of ſores ariſes frequently from the unſkilful manner of dreſſing them.

It may be neceſſary then to obſerve here, once for all, that the cures of moſt ſores are affected by the ſimpleſt methods, and that it is often of much more conſequence to know how to dreſs a ſore, than what to dreſs it with; and in this conſiſts indeed the chief art of this branch of ſurgery; for the moſt eminent in that profeſſion have long ſince diſcovered, that variety of ointments and ſalves are unneceſſary in the cure of moſt wounds and ſores, and they have accordingly diſcarded the greateſt part, formerly in repute for that purpoſe; repeated obſervations having taught them, that after the digeſtion, nature is generally diſpoſed to heal up the wound faſt enough herſelf, and that the ſurgeon's chief care is to prevent a luxuriancy, commonly called proud fleſh; which all ointments, wherein lard or oil enters, are but too prone to encourage, as they keep the fibres too lax and ſupple; and which dry lint alone, early applied, as eaſily prevents, by its abſorbing quality, and light compreſſion on the ſprouting fibres.

Thus, if a hollow wound or ſore is crammed with tents, or the dreſſings are applied too hard, the tender ſhoots of fleſh from the bottom are prevented puſhing up; and the ſides of the ſore in time from this diſtenſion may grow horny, and turn fiſtulous; nor has the matter by this method a free diſcharge.

On the other hand, if ſores of any depth are dreſſed ſuperficially, the external parts being more diſpoſed to heal and come together than the internal, they will fall into contact, or heal too ſoon; and the ſore, not filling up properly from the bottom, will break out afreſh.

Hence we may juſtly conceive how little ſtreſs is to be laid on famous ointments, or family ſalves, unſkilfully applied; for unleſs this due medium is obſerved, or obtained in the dreſſing, no hollow ſore can heal up properly.

As ſoon then as a good digeſtion is procured (which is known by the thickneſs and whiteneſs of the matter diſcharged, and the florid red colour at the bottom of the ſore) let the dreſſings be changed for the precipitate medicine; or the ſore may be filled up with dry lint alone, or dipped in lime-water with a little honey and tincture of myrrh, or brandy, about a fifth part of the latter to one of the former; a pledget of lint dipped in this mixture ſhould alſo be applied to the bottom of the ſore, which ſhould be filled up with others to the ſurface or edges, but not crammed in too hard, as before obſerved, nor yet applied too looſely.

By this method, the ſore would incarn, or heal up properly, and ſoft ſpongy fleſh would be prevented, or ſuppreſſed in time; whereas when ointments or ſalves are too long continued, a fungus, or proud fleſh, is thereby ſo encouraged in its growth, that it requires ſome time to deſtroy and eat it down again: a proper compreſs of cloth, and a linen roller, is abſolutely neceſſary both for this purpoſe, and to ſecure on the dreſſings, where ever they can conveniently be applied.

Of WOUNDS *in General.*

IN all freſh wounds made by cutting inſtruments, there is nothing more required than bringing the lips of the wound into contact by ſuture or bandage, provided the part will allow of it; for on wounds of the hips, or other prominent parts, and acroſs ſome of the large muſcles, the ſtitches are apt to burſt on the horſe's lying down and riſing up in the ſtall; in ſuch caſes the lips ſhould not be brought cloſe together: one ſtitch is ſufficient for a wound two inches long; but in large wounds, they ſhould be at an inch or more diſtance; and if the wound is deep in the muſcles, care ſhould be taken to paſs the needles proportionably deep, otherwiſe the wound will not unite properly from the bottom.

Should the wound bleed much from an artery divided, the firſt ſtep ſhould be to ſecure it, by paſſing a crooked needle underneath, and tying it up with a waxed thread: if the artery cannot be got at this way, apply a button of lint or tow to the mouth of the bleeding veſſel, dipped in a ſtrong ſolution of blue vitriol, ſtyptic water, oil of vitriol, or hot oil of turpentine, powdered vitriol, or colcothar, *&c.* and remember always to apply it cloſe to the mouth of the bleeding veſſels, and take care that it is kept there by proper compreſs and bandage, till an eſchar is formed; otherwiſe it will elude your expectations, and frequently alarm you with freſh bleedings.

In a memoir preſented to the Royal Academy of Sciences by M. La Foſſe, he gives an account of the ſucceſs he had met with in ſtopping the bleedings of very conſiderable arteries in horſes, by the application of the powder of puff-balls, the arteries cicatrizing by this means only, without any ſucceeding hæmorrhage. This Lycoperdon, or puff-ball, was made uſe of for this purpoſe in human ſubjects, about 160 years ago, by Felix Wurtz, a famous old ſurgeon in Germany; but he does not ſeem to have a thought of truſting to it in ſuch conſiderable arteries as M. La Foſſe mentions, *viz.* thoſe of the leg and thigh, the bleedings from which divided veſſels he ſtopt in a few minutes by the uſe of this powder only. The agaric of the oak may alſo be uſed for this purpoſe, where it can be retained by a proper bandage.

Theſe applications, as indeed all ſtyptics, ſeem to act by conſtringing the extremity of the veſſel, or choaking it up, till a grume of blood is formed internally, which plugs up the orifice; and has been found to adhere to it ſo, as to conſtitute one body with the veſſel.

We avoid ſetting down any famous receipts for freſh wounds, whether ointments, or Fryar's balſams, being well aſſured, that in a healthy ſound conſtitution, nature furniſhes the beſt balſam, and performs herſelf the cure, which is ſo often attributed to the medicine; when it is otherwiſe, and the blood is deprived of its balſamic ſtate, as will appear from the aſpect of the wound, and its manner of healing, it muſt be rectified by proper internal medicines, before a good foundation for healing can be laid by any external applications whatever.

The lips of the wound then being brought together by the needle or bandage, it needs only to be covered with rags dipped in brandy, or a pledget of tow ſpread with the wound ointment, (ſee p. 570. col. 1. par. 3.) the directions in the preceding ſections being obſerved, and the wounded part kept as much as poſſible from motion.

Punctured wounds from thorns, or any other accidents, ſhould be treated in the ſame manner; applying the beer, or bread and milk poultice over the dreſſing, till ſome ſigns of digeſtion appear; and fomenting the part well every day. This method is alſo very ſucceſsfully uſed to thoſe ſwellings, which often ariſe on the neck from bleeding, the ſores being ſprinkled with precipitate, and burnt alum powdered, to fetch out the core, or fungus, which choaks up the orifice. The uſual method is to introduce a piece of vitriol, or ſublimate, which often brings on a plentiful diſcharge, fetches out the core, and makes a cure; but it is often with the loſs of the vein, and it ſometimes leaves a large ſwelling and impoſthumation.

In gun-ſhot wounds, when the ball has not penetrated too deep, it ſhould be extracted, if it can be fetched away without diſturbance, together with any extraneous bodies that might paſs in with it; the wound ſhould be dreſſed with the old digeſtive of Venice or common turpentine, divided with the yolks of eggs, to which may be added ſome honey and tincture of myrrh. The entrance of theſe wounds frequently requires to be enlarged, and a depending orifice ſhould always be procured if poſſible; and if the wound ſhould not digeſt kindly, apply the beer poultice, and foment with the diſcutient fomentation, p. 569. col. 2. par. 3.

In ſcalds, or burns from gun-powder, or any other cauſe, when the ſkin remains entire, bathe the part well, and keep it ſoaked with rags dipped in ſpirit of wine camphorated: ſalt bound thick on the part has been found very effectual for this purpoſe: and indeed all ſaline and ſpirituous applications excel others, while the ſkin is yet unbroke; but when the ſkin is ſeparated, anoint the part, and keep it conſtantly ſupple with linſeed or ſallad oil, and a plaiſter ſpread with bees-wax and oil; if the ſkin is ſo ſcorched, that ſloughs muſt be digeſted out, dreſs with the wound-ointment and oil of turpentine, and finiſh the cure with any drying ointment. Should the horſe be feveriſh from the pain, bleed him, give cooling glyſters, and treat him as we have directed in ſimple fevers.

Of Ulcers *in General.*

We ſhall not here enter into a deſcription of each particular ſpecies of ulcers, but only lay down ſome directions for their general treatment; by which means we ſhall avoid the uſual proxility of authors on this ſubject, and yet give ſo general an idea of the nature of ulcers, as we hope will be ſufficiently inſtructive both of the application and of the proper remedy to each.

It may be neceſſary to obſerve, that we may often in vain purſue the beſt methods of cure by external applications, unleſs we have recourſe to proper internal remedies; for as all ulcers, difficult to heal, proceed from a particular indiſpoſition of the blood and juices, before the former can be brought into any order, the latter muſt be corrected by alteratives and ſweetening medicines.

The firſt intention in the cure of ulcers is bringing them to digeſt, or diſcharge a thick matter; which will, in general, be effected by the green ointment, or that with precipitate; but ſhould the ſore not digeſt kindly by theſe means, but diſcharge a gleety thin matter, and look pale, you muſt then have recourſe to warmer dreſſings, ſuch as balſam, or oil of turpentine, melted down with your common digeſtive, and the ſtrong beer poultice over them; it is proper alſo in theſe kind of ſores where the circulation is languid, and the natural heat abated, to warm the part, and quicken the motion of the blood, by fomenting it well at the time of dreſſing; which method will thicken the matter, and rouſe the native heat of the part, and then the former dreſſings may be re-applied.

If the lips of the ulcer grow hard or callous, they muſt be pared down with a knife, and afterwards rubbed with the cauſtic.

Where ſoft fungous fleſh begins to riſe, it ſhould carefully be ſuppreſſed in time, otherwiſe the cure will go on but ſlowly; if it has already ſprouted above the ſurface, pare it down with a knife, and rub the remainder with a bit of cauſtic; and, to prevent its riſing again, ſprinkle the ſore with equal parts of burnt alum, and red precipitate; or waſh with the ſublimate water, and dreſs with dry lint even to the ſurface, and then roll over a compreſs of linen as tight as can be borne; for a proper degree of

preſſure,

Should the ſore not digeſt kindly, but run a thin water and look pale, foment, as often as you dreſs, with the above fomentation; and apply over your dreſſing the ſtrong-beer poultice, and continue this method till the matter grows thick, and the ſore florid.

The following ointments will generally anſwer your expectations in all common caſes, and may be prepared without, as well as with, the verdegreaſe.

Take Venice turpentine and bees-wax of each a pound, oil of olives one pound and a half, yellow roſin twelve ounces; when melted together, two or three ounces of verdegreaſe, finely powdered, may be ſtirred in, and kept ſo till cold, to prevent its ſubſiding.

Take of yellow baſilicon, or the above ointment, without verdigreaſe, four ounces; red precipitate, finely powdered, half an ounce: mix them together cold with a knife or ſpatula.

This laſt, applied early, will prevent a fungus, or proud fleſh, from ſhooting out; for if you dreſs too long with the above digeſtive, the fungus will riſe faſt, and give ſome trouble to ſuppreſs it; when it will be neceſſary to waſh the ſore as often as you dreſs, with a ſolution of blue vitriol in water, or to ſprinkle it with burnt alum and precipitate. If theſe ſhould not be powerful enough, touch with a cauſtic, or waſh with the ſublimate water, made by diſſolving half an ounce of corroſive ſublimate in a pint of lime-water.

But this trouble may in a great meaſure be prevented, if the ſore is on a part where bandages can be applied with compreſſes of linen cloath: for even when theſe excreſcences regerminate, as it were under the knife, and ſpring up in ſpite of the cauſtics above mentioned, they are to be ſubdued by moderate compreſſion made on the ſprouting fibres, by theſe means.

Authors on farriery have given in general very proper receipts to anſwer every intention of this kind by medicines; but as they have not laid down ſufficient rules for their application in thoſe caſes where they are moſt wanted, the following general directions will not be unacceptable; as the difficulty in healing ſome kinds of ſores ariſes frequently from the unſkilful manner of dreſſing them.

It may be neceſſary then to obſerve here, once for all, that the cures of moſt ſores are affected by the ſimpleſt methods, and that it is often of much more conſequence to know how to dreſs a ſore, than what to dreſs it with; and in this conſiſts indeed the chief art of this branch of ſurgery; for the moſt eminent in that profeſſion have long ſince diſcovered, that variety of ointments and ſalves are unneceſſary in the cure of moſt wounds and ſores, and they have accordingly diſcarded the greateſt part, formerly in repute for that purpoſe; repeated obſervations having taught them, that after the digeſtion, nature is generally diſpoſed to heal up the wound faſt enough herſelf, and that the ſurgeon's chief care is to prevent a luxuriancy, commonly called proud fleſh; which all ointments, wherein lard or oil enters, are but too prone to encourage, as they keep the fibres too lax and ſupple; and which dry lint alone, early applied, as eaſily prevents, by its abſorbing quality, and light compreſſion on the ſprouting fibres.

Thus, if a hollow wound or ſore is crammed with tents, or the dreſſings are applied too hard, the tender ſhoots of fleſh from the bottom are prevented puſhing up; and the ſides of the ſore in time from this diſtenſion may grow horny, and turn fiſtulous; nor has the matter by this method a free diſcharge.

On the other hand, if ſores of any depth are dreſſed ſuperficially, the external parts being more diſpoſed to heal and come together than the internal, they will fall into contact, or heal too ſoon; and the ſore, not filling up properly from the bottom, will break out afreſh.

Hence we may juſtly conceive how little ſtreſs is to be laid on famous ointments, or family ſalves, unſkilfully applied; for unleſs this due medium is obſerved, or obtained in the dreſſing, no hollow ſore can heal up properly.

As ſoon then as a good digeſtion is procured (which is known by the thickneſs and whiteneſs of the matter diſcharged, and the florid red colour at the bottom of the ſore) let the dreſſings be changed for the precipitate medicine; or the ſore may be filled up with dry lint alone, or dipped in lime-water with a little honey and tincture of myrrh, or brandy, about a fifth part of the latter to one of the former; a pledget of lint dipped in this mixture ſhould alſo be applied to the bottom of the ſore, which ſhould be filled up with others to the ſurface or edges, but not crammed in too hard, as before obſerved, nor yet applied too looſely.

By this method, the ſore would incarn, or heal up properly, and ſoft ſpongy fleſh would be prevented, or ſuppreſſed in time; whereas when ointments or ſalves are too long continued, a fungus, or proud fleſh, is thereby ſo encouraged in its growth, that it requires ſome time to deſtroy and eat it down again: a proper compreſs of cloth, and a linen roller, is abſolutely neceſſary both for this purpoſe, and to ſecure on the dreſſings, where ever they can conveniently be applied.

Of Wounds *in General.*

In all freſh wounds made by cutting inſtruments, there is nothing more required than bringing the lips of the wound into contact by ſuture or bandage, provided the part will allow of it; for on wounds of the hips, or other prominent parts, and acroſs ſome of the large muſcles, the ſtitches are apt to burſt on the horſe's lying down and riſing up in the ſtall; in ſuch caſes the lips ſhould not be brought cloſe together: one ſtitch is ſufficient for a wound two inches long; but in large wounds, they ſhould be at an inch or more diſtance; and if the wound is deep in the muſcles, care ſhould be taken to paſs the needles proportionably deep, otherwiſe the wound will not unite properly from the bottom.

Should the wound bleed much from an artery divided, the firſt ſtep ſhould be to ſecure it, by paſſing a crooked needle underneath, and tying it up with a waxed thread: if the artery cannot be got at this way, apply a button of lint or tow to the mouth of the bleeding veſſel, dipped in a ſtrong ſolution of blue vitriol, ſtyptic water, oil of vitriol, or hot oil of turpentine, powdered vitriol, or colcothar, *&c.* and remember always to apply it cloſe to the mouth of the bleeding veſſels, and take care that it is kept there by proper compreſs and bandage, till an eſchar is formed; otherwiſe it will elude your expectations, and frequently alarm you with freſh bleedings.

In a memoir preſented to the Royal Academy of Sciences by M. La Foſſe, he gives an account of the ſucceſs he had met with in ſtopping the bleedings of very conſiderable arteries in horſes, by the application of the powder of puff-balls, the arteries cicatrizing by this means only, without any ſucceeding hæmorrhage. This Lycoperdon, or puff-ball, was made uſe of for this purpoſe in human ſubjects, about 160 years ago, by Felix Wurtz, a famous old ſurgeon in Germany; but he does not ſeem to have a thought of truſting to it in ſuch conſiderable arteries as M. La Foſſe mentions, *viz.* thoſe of the leg and thigh, the bleedings from which divided veſſels he ſtopt in a few minutes by the uſe of this powder only. The agaric of the oak may alſo be uſed for this purpoſe, where it can be retained by a proper bandage.

Theſe applications, as indeed all ſtyptics, ſeem to act by conſtringing the extremity of the veſſel, or choaking it up, till a grume of blood is formed internally, which plugs up the orifice; and has been found to adhere to it ſo, as to conſtitute one body with the veſſel.

We avoid ſetting down any famous receipts for freſh wounds, whether ointments, or Fryar's balſams, being well aſſured, that in a healthy ſound conſtitution, nature furniſhes the beſt balſam, and performs herſelf the cure, which is ſo often attributed to the medicine; when it is otherwiſe, and the blood is deprived of its balſamic ſtate, as will appear from the aſpect of the wound, and its manner of healing, it muſt be rectified by proper internal medicines, before a good foundation for healing can be laid by any external applications whatever.

The lips of the wound then being brought together by the needle or bandage, it needs only to be covered with rags dipped in brandy, or a pledget of tow ſpread with the wound ointment, (ſee p. 570. col. 1. par. 3.) the directions in the preceding ſections being obſerved, and the wounded part kept as much as poſſible from motion.

Punctured wounds from thorns, or any other accidents, ſhould be treated in the ſame manner; applying the beer, or bread and milk poultice over the dreſſing, till ſome ſigns of digeſtion appear; and fomenting the part well every day. This method is alſo very ſucceſsfully uſed to thoſe ſwellings, which often ariſe on the neck from bleeding, the ſores being ſprinkled with precipitate, and burnt alum powdered, to fetch out the core, or fungus, which choaks up the orifice. The uſual method is to introduce a piece of vitriol, or ſublimate, which often brings on a plentiful diſcharge, fetches out the core, and makes a cure; but it is often with the loſs of the vein, and it ſometimes leaves a large ſwelling and impoſthumation.

In gun-ſhot wounds, when the ball has not penetrated too deep, it ſhould be extracted, if it can be fetched away without diſturbance, together with any extraneous bodies that might paſs in with it; the wound ſhould be dreſſed with the old digeſtive of Venice or common turpentine, divided with the yolks of eggs, to which may be added ſome honey and tincture of myrrh. The entrance of theſe wounds frequently requires to be enlarged, and a depending orifice ſhould always be procured if poſſible; and if the wound ſhould not digeſt kindly, apply the beer poultice, and foment with the diſcutient fomentation, p. 569. col. 2. par. 3.

In ſcalds, or burns from gun-powder, or any other cauſe, when the ſkin remains entire, bathe the part well, and keep it ſoaked with rags dipped in ſpirit of wine camphorated: ſalt bound thick on the part has been found very effectual for this purpoſe: and indeed all ſaline and ſpirituous applications excel others, while the ſkin is yet unbroke; but when the ſkin is ſeparated, anoint the part, and keep it conſtantly ſupple with linſeed or ſallad oil, and a plaiſter ſpread with bees-wax and oil; if the ſkin is ſo ſcorched, that ſloughs muſt be digeſted out, dreſs with the wound-ointment and oil of turpentine, and finiſh the cure with any drying ointment. Should the horſe be feveriſh from the pain, bleed him, give cooling glyſters, and treat him as we have directed in ſimple fevers.

Of ULCERS *in General.*

WE ſhall not here enter into a deſcription of each particular ſpecies of ulcers, but only lay down ſome directions for their general treatment; by which means we ſhall avoid the uſual proxility of authors on this ſubject, and yet give ſo general an idea of the nature of ulcers, as we hope will be ſufficiently inſtructive both of the application and of the proper remedy to each.

It may be neceſſary to obſerve, that we may often in vain purſue the beſt methods of cure by external applications, unleſs we have recourſe to proper internal remedies; for as all ulcers, difficult to heal, proceed from a particular indiſpoſition of the blood and juices, before the former can be brought into any order, the latter muſt be corrected by alteratives and ſweetening medicines.

The firſt intention in the cure of ulcers is bringing them to digeſt, or diſcharge a thick matter; which will, in general, be effected by the green ointment, or that with precipitate; but ſhould the ſore not digeſt kindly by theſe means, but diſcharge a gleety thin matter, and look pale, you muſt then have recourſe to warmer dreſſings, ſuch as balſam, or oil of turpentine, melted down with your common digeſtive, and the ſtrong beer poultice over them; it is proper alſo in theſe kind of ſores where the circulation is languid, and the natural heat abated, to warm the part, and quicken the motion of the blood, by fomenting it well at the time of dreſſing; which method will thicken the matter, and rouſe the native heat of the part, and then the former dreſſings may be re-applied.

If the lips of the ulcer grow hard or callous, they muſt be pared down with a knife, and afterwards rubbed with the cauſtic.

Where ſoft fungous fleſh begins to riſe, it ſhould carefully be ſuppreſſed in time, otherwiſe the cure will go on but ſlowly; if it has already ſprouted above the ſurface, pare it down with a knife, and rub the remainder with a bit of cauſtic; and, to prevent its riſing again, ſprinkle the ſore with equal parts of burnt alum, and red precipitate; or waſh with the ſublimate water, and dreſs with dry lint even to the ſurface, and then roll over a compreſs of linen as tight as can be borne; for a proper degree of preſſure, with mild applications, will always oblige theſe ſpongy excreſcences to ſubſide, but without bandage the ſtrongeſt will not ſo well ſucceed.

All ſinuſes, or cavities, ſhould be laid open as ſoon as diſcovered, after bandages have been ineffectually tried; but where the cavity penetrates deep into the muſcles, and a counter opening is impracticable or hazardous; where, by a continuance, the integuments of the muſcles are conſtantly dripping and melting down; in theſe caſes injections may be uſed, and will frequently be attended with ſucceſs. A decoction of colcothar boiled in forge-water; or ſolution of lapis medicamentoſus in lime water, with a fifth part of honey and tincture of myrrh, may be firſt tried, injected, three or four ounces twice a-day; or ſome reſin melted down with oil of turpentine, may be uſed for this purpoſe: if theſe ſhould not ſucceed, the following, which is of a ſharp and cauſtic nature, is recommended on Mr Gibſon's experience.

> Take of Roman vitriol half an ounce; diſſolve in a pint of water, then decant and pour off gently into a large quart-bottle: add half a pint of camphorated ſpirit of wine, the ſame quantity of the beſt vinegar, and two ounces of Ægyptiacum.

This mixture is alſo very ſucceſsfully applied to ulcerated greaſy heels, which it will both cleanſe and dry up.

Theſe ſinuſes, or cavities, frequently degenerate into *fiſtulæ*, that is, grow pipey, having the inſide thickened, and lined, as it were, with a horny callous ſubſtance. In order to their cure, they muſt be laid open, and the hard ſubſtance all cut away; where this is impracticable, ſcarify them well, and truſt to the precipitate medicine made ſtrong, rubbing now and then with cauſtic, butter of antimony, or equal parts of quickſilver and aquafortis.

When a rotten or foul bone is an attendant on an ulcer, the fleſh is generally looſe and flabby, the diſcharge oily, thin, and ſtinking, and the bone diſcovered to be carious, by its feeling rough to the probe paſſed through the fleſh for that purpoſe. In order to a cure, the bone muſt be laid bare, that the rotten part of it be removed; for which purpoſe, deſtroy the looſe fleſh, and dreſs with dry lint; or the doſſils may be preſſed out of tincture of myrrh or euphorbium: the throwing off the ſcale is generally a work of nature, which is effected in more or leſs time, and in proportion to the depth the bone is affected; though burning the foul bone is thought by ſome to haſten its ſeparation.

Where the cure does not properly ſucceed, mercurial phyſic ſhould be given, and repeated at proper intervals: and to correct and mend the blood and juices, the antimonial and alterative powders, with a decoction of guaiacum and lime-waters, are proper for that purpoſe.

Of a BONE-SPAVIN.

Without entering at all into the cauſe of this diſorder, which is a bony excreſcence, or hard ſwelling, growing on the inſide of the hock of a horſe's leg, we ſhall content ourſelves with deſcribing the different kinds thereof, by their ſymptoms; and then enter on their cure.

A ſpavin, that begins on the lower part of the hock, is not ſo dangerous as that which puts out higher, between the two round proceſſes of the leg bone; and a ſpavin near the edge is not ſo bad as that which is more inward toward the middle, as it does not ſo much affect the bending of the hock.

A ſpavin, that comes by a kick or blow, is at firſt no true ſpavin, but a bruiſe on the bone, or membrane which covers it; therefore not of that conſequence, as when it proceeds from a natural cauſe: and thoſe that put out on colts, and young horſes, are not ſo bad as thoſe that happen to horſes in their full ſtrength and maturity; but in very old horſes they are generally incurable.

The uſual method of treating this diſorder is by bliſters and firing, without any regard to the ſituation, or cauſe whence it proceeds. Thus, if a fulneſs on the fore-part of the hock comes upon hard riding, or any other violence, which threatens a ſpavin; in that caſe, ſuch coolers and repellers are proper, as are recommended in ſtrains and bruiſes. Thoſe happening to colts and young horſes are generally ſuperficial, and require only the milder applications; for it is better to wear them down by degrees, than to remove them at once by ſevere means.

Various are the preſcriptions for the bliſtering ointment; but the following, on proper experience, ſtands well recommended by Mr Gibſon.

> Take nerve and marſh-mallow ointment, of each two ounces; quickſilver, one ounce, thoroughly broke with an ounce of Venice turpentine; Spaniſh flies powdered, a dram and a half; ſublimate, one dram; oil of origanum, two drams.

The hair is to be cut as cloſe as poſſible, and then the ointment applied pretty thick over the part; this ſhould be done in the morning, and the horſe kept tied up all day without any litter till night; when he may be untied, in order to lie down; and a pitch or any ſticking plaiſter may be laid over it, and bound on with a broad tape or bandage to keep all cloſe.

After the bliſter has done running, and the ſcabs begin to dry and peel off, it may be applied a ſecond time, in the ſame manner as before; this ſecond application generally taking greater effect than the firſt, and in colts and young horſes makes a perfect cure.

When the ſpavin has been of long ſtanding, it will require to be renewed, perhaps, five or ſix times; but after the ſecond application, a greater diſtance of time muſt be allowed, otherwiſe it might leave a ſcar, or cauſe a baldneſs; to prevent which, once a-fortnight or three weeks is often enough; and it may in this manner be continued ſix or ſeven times, without the leaſt blemiſh, and will generally be attended with ſucceſs.

But the ſpavins that put out on older, or full-aged horſes, are apt to be more obſtinate, as being ſeated more inward; and when they run among the ſinuoſities of the joint, they are for the moſt part incurable, as they then lie out of the reach of applications, and are arrived to a degree of impenetrable hardneſs.

The uſual method in theſe caſes is to fire directly, or to uſe the ſtrongeſt kind of cauſtic bliſters; and ſometimes to fire and lay the bliſter immediately over the part; but this way ſeldom ſucceeds farther than putting a ſtop to the growth of the ſpavin, and is apt to leave both a blemiſh and ſtiffneſs behind; beſides the great riſk run (by applications of theſe fiery and cauſtic medicines to the nervous and tendinous parts about the joints) of exciting violent pain and anguiſh, and deſtroying the limb.

The beſt and ſafeſt way therefore, is to make trial of the bliſtering ointment above, and to continue it according to the directions there laid down, for ſome months, if found neceſſary: the horſes in the intervals working moderately: the hardneſs will thus be diſſolved by degrees, and wear away inſenſibly.

Where the ſpavin lies deep, and runs ſo far into the hollow of the joint, that no application can reach it, neither firing nor medicines can avail, for the reaſons abovementioned; though bold ignorant fellows have ſometimes ſucceeded in caſes of this ſort (by men of judgment deemed incurable) by the application of cauſtic ointments with ſublimate, which act very forcibly, enter deep, and make a large diſcharge, and by that means deſtroy a great part of the ſubſtance, and diſſolve away the remainder: Tho', whoever is at all acquainted with the nature of theſe medicines, muſt know how dangerous in general their operation is on theſe occaſions; and that a proper prepared cautery made like a fleam, under the direction of a ſkilful hand, may be applied with leſs danger of injuring either tendons or ligaments. After the ſubſtance of the ſwelling has been properly penetrated by the inſtrument, it muſt be kept running by the precipitate medicine, or mild bliſtering ointment Where the ſpavin lies not deep in the joint, and the bliſtering method will not ſucceed, the ſwelling may be ſafely fired with a thin iron forced pretty deep into the ſubſtance, and then ſhould be dreſſed, as is above directed.

Of a Curb *and* Ring-bone.

As a ſpavin riſes among the bones on the fore-part of the hock, ſo a curb takes its origin from the junctures of the ſame bones, and riſes on the hind part, forming a pretty large tumour over the back part of the hind-leg, attended with ſtiffneſs, and ſometimes with pain and lameneſs.

A curb proceeds from the ſame cauſes that produce ſpavins; *viz.* hard riding, ſtrains, blows, or kicks. The cure at firſt is generally eaſy enough effected by bliſtering, repeated two or three times, or oftener. If it does not ſubmit to this treatment, but grows exceſſively hard, the quickeſt and ſureſt way is to fire with a thin iron, making a line down the middle from top to bottom, and drawing ſeveral lines in a penniform manner pretty deep; and then to apply a mild bliſtering plaiſter or ointment over it.—This method will entirely remrove it.

There is another ſwelling taken notice of on the outſide of the hock, which is called a *jardon.* This commonly proceeds from blows and kicks of other horſes; but frequently happens to menaged horſes, by ſetting them on their haunches: it is ſeldom attended with much lameneſs, unleſs it has been neglected, or ſome little proceſs of the bone be broke. It ſhould firſt be treated with the coolers and repellers in (p. 574. and 575.); but if any ſwelling continues hard, and inſenſible, the beſt way is to bliſter or fire; but the mild bliſters alone generally ſucceed.

The *ring-bone* is a hard ſwelling on the lower part of the paſtern, which generally reaches half-way round the fore-part thereof, and from its reſemblance to a ring has its denomination. It often ariſes from ſtrains, *&c.* and when behind, from putting young horſes too early upon their haunches; for in that attitude a horſe throws his whole weight as much, if not more, upon his paſterns, than on his hocks.

When it appears diſtinctly round the paſtern, and does not run downwards toward the coronet, ſo as to affect the coffin-joint, it is eaſily cured; but if it takes its origin from ſome ſtrain or defect in the joint originally, or if a calloſity is found under the round ligament that covers that joint, the cure is generally dubious, and ſometimes impracticable; as it is apt to turn to a quittor, and in the end to form an ulcer upon the hoof.

The ring-bones that appear on colts and young horſes, will often inſenſibly wear off of themſelves, without the help of any application; but when the ſubſtance remains, there needs no other remedy beſides bliſtering, unleſs when by long continuance it is grown to an obſtinate hardneſs, and then it may require both bliſtering and firing.

To fire a ring-bone ſucceſsfully, let the operation be performed with a thinner inſtrument than the common one, and let the lines or razes be made not above a quarter of an inch diſtant, croſſing them obliquely, ſomewhat like a chain: apply a mild bliſter over all, and, when quite dried up, the rupture-plaiſter; and then turn the horſe to graſs for ſome time.

Of Splents.

These are hard excreſcences that grow on the ſhank-bone, and are of various ſhapes and ſizes. Some horſes are more ſubject to ſplents than others; but young horſes are moſt liable to theſe infirmities, which often wear off and diſappear of themſelves. Few horſes put out ſplents after they are ſeven or eight years old, unleſs they meet with blows or accidents.

A ſplent that ariſes in the middle of the ſhank-bone is no ways dangerous; but thoſe that ariſe on the back part of this bone, when they grow large and preſs againſt the back ſinew, always cauſe lameneſs or ſtiffneſs, by rubbing againſt it: the others, except they are ſituated near the joints, ſeldom occaſion lameneſs.

As to the cure of ſplents, the beſt way is not to meddle with them, unleſs they are ſo large as to diſfigure a horſe, or are ſo ſituated as to endanger his going lame.

Splents in their infancy, and on their firſt appearance, ſhould be well bathed with vinegar, or old verjuice; which, by ſtrengthening the fibres, often put a ſtop to their growth: for the membrane covering the bone, and not the bone itſelf, is here thickened: and in ſome conſtitutions purging, and afterwards diuretic drinks, will be a great means to remove the humidity and moiſture about the limbs, which is what often gives riſe to ſuch excreſcences.

Various are the remedies preſcribed for this diſorder; the uſual way is to rub the ſplent with a round ſtick or the handle of a hammer, till it is almoſt raw, and then touch it with oil of origanum. Others lay on a pitch-plaiſter, with a little ſublimate, or arſenic, to deſtroy the ſubſtance: ſome uſe oil of vitriol; ſome tincture of cantharides: all which methods have at times ſucceeded; only they are apt to leave a ſcar with the loſs of hair. Thoſe applications that are of a more cauſtic nature, often do more hurt than good, eſpecially when the ſplent is grown very hard, as they produce a rottenneſs, which keeps running ſeveral months before the ulcer can be healed, and then leaves an ugly ſcar.

Mild bliſters often repeated, as recommended in the ſection upon the *Bone-Spavin*, ſhould firſt be tried as the moſt eligible method, and will generally ſucceed, even beyond expectation: but if they fail, and the ſplent be near the knee or joints, you muſt fire and bliſter in the ſame manner as for the bone-ſpavin.

Splents on the back part of the ſhank-bone are difficult to cure, by reaſon of the back ſinews covering them: the beſt way is to bore the ſplent in ſeveral places with an iron not very hot; and then to fire in the common way, not making the lines too deep, but very cloſe together.

Of the POLL-EVIL.

THE poll-evil is an abſceſs near the poll of a horſe, formed in the ſinuſes between the poll-bone, and the uppermoſt vertebræ of the neck.

If it proceeds from blows, bruiſes, or any external violence, at firſt bathe the ſwelling often with hot vinegar; and if the hair be fretted off with an ouzing through the ſkin, make uſe of two parts of vinegar, and one of ſpirit of wine; but if there be an itching, with heat and inflammation, the ſafeſt way is to bleed, and apply poultices with bread, milk, and elder-flowers: this method, with the aſſiſtance of phyſick, will frequently diſperſe the ſwelling, and prevent this evil.

But when the tumour is critical, and has all the ſigns of matter, the beſt method then is to forward it by applying the ripening poultices already taken notice of, till it comes to maturity, and burſts of itſelf; or if opened with a knife, great care ſhould be taken to avoid the tendinous ligament that runs along the neck under the mane: when matter is on both ſides, the opening muſt be made on each ſide, and the ligament remain undivided.

If the matter flows in great quantities, reſembles melted glue, and is of an oily conſiſtence, it will require a ſecond inciſion, eſpecially if any cavities are diſcovered by the finger or probe; theſe ſhould be opened by the knife, the orifices made depending, and the wound dreſſed with the common digeſtive of turpentine, honey, and tincture of myrrh, and, after digeſtion, with the precipitate ointment; or waſh the ſore with the following, made hot, and fill up the cavity with tow ſoaked in it.

> TAKE vinegar or ſpirit of wine half a pint, white vitriol diſſolved in ſpring-water half an ounce, tincture of myrrh four ounces.

This may be made ſharper by adding more vitriol; but if the fleſh is very luxuriant, it ſhould firſt be pared down with a knife before the application; with this waſh alone Mr Gibſon has cured this diſorder without any other formality of dreſſing, waſhing with it twice a-day, and laying over the part a quantity of tow ſoaked in vinegar and the white of eggs beat together.

But the moſt compendious method of cure, is found by obſervation to be by *ſcalding*, as the farriers term it; and is thus proſecuted when the ſore is foul, of a bad diſpoſition, and attended with a profuſion of matter.

> TAKE corroſive ſublimate, verdegreaſe in fine powder, and Roman vitriol, of each two drams; green copperas half an ounce, honey or Ægyptiacum two ounces, oil of turpentine and train oil of each eight ounces, rectified ſpirit of wine four ounces; mix together in a bottle.

The manner of ſcalding is firſt to clean the abſceſs well with a piece of ſponge dipped in vinegar; then put a ſufficient quantity of the mixture into a ladle with a ſpout, and when it is made ſcalding hot, pour it into the abſceſs, and cloſe the lips together with one or more ſtitches. This is to remain in ſeveral days; and if good matter appears, and not in an over great quantity, it will do well without any other dreſſing, but bathing with ſpirit of wine; if the matter flows in great abundance, and of a thin conſiſtence, it muſt be ſcalded again, and repeated till the matter leſſens and thickens.

Of a FISTULA, *and* BRUISES *on the* WITHERS; WARBLES *on the Back, and* SIT-FASTS.

BRUISES on the withers frequently impoſthumate, and for want of care turn fiſtulous. They ariſe often from pinches of the ſaddle, and ſhould be treated with repellers: for this purpoſe bathe the tumour well with hot vinegar three or four times a day; if that does not ſucceed alone, an ounce of oil of vitriol may be put to a quart of vinegar, or half an ounce of white vitriol diſſolved in a little water, and added to the ſame quantity. Theſe are generally very effectual repellers for this purpoſe in horſes, and will frequently prevent impoſthumation: when the ſwelling is attended with heat, ſmarting, and little hot watery pimples, the following mixture will then be more proper to bathe with.

> TAKE two ounces of crude ſal ammoniac, boiled in a quart of lime-water; where that cannot be had, a handful of pearl or wood-aſhes may be boiled in common water: pour off the decoction when ſettled, and mix with it half a pint of ſpirit of wine: anoint the part afterwards with linſeed oil, or elder ointment, to ſoften and ſmooth the ſkin.

But when the ſwellings are critical, the conſequence of a fever ſettled on this part, you muſt avoid the repelling method, and aſſiſt in bringing the ſwelling to matter, by means of ſuppurating poultices: experienced farriers adviſe, never to open theſe tumours till they break of themſelves; for if they are opened before they are ripe, the whole ſore will be ſpongy, and diſcharge a bloody ichor, which ſoon degenerates into a ſordid ulcer. But take care to enlarge the openings and pare away the lips, that your dreſſings may be applied eaſily; and avoid the ligament which runs along the neck to the withers: if a gathering forms on the oppoſite ſide, open it in the ſame manner, but take care they incline downwards, for the ſake of depending orifices, and letting the matter flow off eaſily. For the method of dreſſing, we muſt refer to the preceding Section; and if the bones ſhould be found foul, they muſt be dreſſed with tincture of myrrh till they ſcale off: if the fungus is very troubleſome, and the diſcharge oily, yellow and viſcid, pledgets ſoaked in the following, made hot, have been found very effectual, bathing the ſwelling round with ſpirit of wine and vinegar.

Take half an ounce of blue vitriol diſſolved in a pint of water; oil of turpentine, and rectified ſpirit of wine, of each four ounces; white-wine vinegar, ſix ounces; oil of vitriol and Ægyptiacum, of each two ounces.

When the cavities are truly fiſtulous, the calloſities muſt be cut out, where it can be done, with a knife; and the remainder deſtroyed by corroſives, *viz.* precipitate, burnt alum, and white vitriol, as we have already obſerved in the Section on Ulcers.

Warbles are ſmall hard tumours under the ſaddle-part of the horſe's back, occaſioned by the heat of the ſaddle in travelling, or its uneaſy ſituation. A hot greaſy diſh-clout at firſt frequently applied, will ſometimes remove them. Camphorated ſpirits of wine are alſo very effectual for this purpoſe to diſperſe them, to which a little ſpirit of ſal armoniac may be added. The repellers above-mentioned are ſucceſsfully applied in theſe caſes; and if you are obliged to work the horſe, take care your ſaddle is nicely chambered.

A *ſit-faſt* proceeds generally from a warble, and is the horſe's hide turned horny, which, if it cannot be diſſolved and ſoftened by rubbing with the mercurial ointment, muſt be cut out, and treated then as a freſh wound.

Of Wind-galls, Blood *and* Bog Spavins.

A Wind-gall is a flatulent ſwelling, which yields to the preſſure of the finger, and recovers its ſhape on the removal thereof: the tumour is viſible to the eye, and often ſeated on both ſides of the back ſinew, above the fetlocks, on the fore-legs, but moſt frequently on the hind-legs; though they are met with in various parts of the body, where-ever membranes can be ſo ſeparated, that a quantity of air and ſeroſities may be included within their duplicatures.

When they appear near the joints and tendons, they are generally cauſed by ſtrains, or bruiſes on the ſinews, or the ſheath that covers them; which, by being overſtretched, have ſome of their fibres ruptured; whence probably may ouze out that fluid which is commonly found with the included air: though where theſe ſwellings ſhew themſelves in the interſtices of large muſcles, which appear blown up like bladders, air alone is the chief fluid; and theſe may ſafely be opened, and treated as a common wound.

On the firſt appearance of wind-galls, their cure ſhould be attempted by reſtringents and bandage; for which purpoſe, let the ſwelling be bathed twice a-day with vinegar, or verjuice alone; or let the part be fomented with a decoction of oak-bark, pomegranate, and alum boiled in verjuice, binding over it, with a roller, a woollen cloth ſoaked in the ſame. Some, for this purpoſe, uſe red-wine lees, others curriers ſhavings wetted with the ſame, or vinegar, bracing the part up with a firm bandage.

If this method, after a proper trial, ſhould not be found to ſucceed, authors have adviſed the ſwelling to be pierced with an awl, or opened with a knife: but mild bliſtering has in general the preference given to theſe methods; the including fluids being thereby drawn off, the impacted air diſperſed, and the tumour gradually diminiſhed.

A *blood-ſpavin* is a ſwelling and dilatation of the vein that runs along the inſide of the hock, forming a little ſoft ſwelling in the hollow part, and is often attended with a weakneſs and lameneſs of the hock.

The cure ſhould be firſt attempted with the reſtringents and bandage above recommended, which will contribute greatly to ſtrengthen all weakneſſes of the joints, and frequently will remove this diſorder, if early applied: but if by theſe means the vein is not reduced to its uſual dimenſions, the ſkin ſhould be opened, and the vein tied with a crooked needle and wax-thread paſſed underneath it, both above and below the ſwelling, and the turgid part ſuffered to digeſt away with the ligatures: for this purpoſe, the wound may be daily dreſſed with turpentine, honey, and ſpirit of wine, incorporated together.

A *bog-ſpavin* is an encyſted tumour on the inſide the hough; or, according to Dr Bracken, a collection of browniſh gelatinous matter, contained in a bag, or cyſt, which he thinks to be the lubricating matter of the joint altered, the common membrane that incloſes it forming the cyſt. This caſe he has taken the pains to illuſtrate in a young colt of his own, where he ſays, When the ſpavin was preſſed hard on the inſide the hough, there was a ſmall tumour on the outſide, which convinced him the fluid was within-ſide the joint: he accordingly cut into it, diſcharged a large quantity of this gelatinous matter, dreſſed the ſore with doſſils dipped in oil of turpentine, putting into it, once in three or four days, a powder made of calcined vitriol, alum, and bole: by this method of dreſſing, the bag ſloughed off, and came away, and the cure was ſucceſsfully compleated without any viſible ſcar.

This diſorder, according to the above deſcription, will ſcarcely ſubmit to any other method, except firing, when the cyſt ought to be penetrated to make it effectual; but in all obſtinate caſes that have reſiſted the above methods, both the cure of this and of the ſwellings called wind-galls ſhould be attempted in this manner. If, through the pain attending the operation or dreſſings, the joint ſhould ſwell and inflame, foment it twice a-day, and apply a poultice over the dreſſings till it is reduced.

Of Mallenders *and* Sallenders.

Mallenders are cracks in the bend of the horſe's knee, that diſcharge a ſharp indigeſted matter; they are often the occaſion of lameneſs, ſtiffneſs, and the horſe's tumbling.

Sallenders are the ſame diſtemper, ſituate on the bending of the hough, and occaſion a lameneſs behind.

They are both cured by waſhing the parts with a lather of ſoap warmed, or old chamber-lye; and then apply over the cracks a ſtrong mercurial ointment ſpread on tow, with which they ſhould be dreſſed, night and morning, till all the ſcabs fall off: if this ſhould not ſucceed, anoint them night and morning with a little of the following, and apply the above ointment over it.

Take hogs lard, two ounces; ſublimate mercury, two drams.

Or,

Take hogs lard, two ounces; oil of vitriol, two drams.

Take the next from Gibſon, which is to be depended on:

Æthiops mineral, half an ounce; white vitriol, one dram; ſoft green ſoap, ſix ounces.

Anoint with this often; but firſt clip away the hair, and clear the ſcabs. On their drying up, it may be proper to give a gentle purge or two; or the nitre balls may be taken advantageouſly, for a fortnight or three weeks.

Of LAMPAS, BARBS, *and* WOLVES TEETH.

The *lampas* is an excreſcence in the roof of the horſe's mouth, which is ſometimes ſo luxuriant, that it grows above the teeth, and hinders his feeding. The cure is in lightly cauteriſing the fleſh with a hot iron, taking care that it does not penetrate too deep, ſo as to ſcale off the thin bone that lies under the upper bars; the part may be anointed with burnt alum and honey, which is proper for moſt ſores in the mouth.

This operation is by ſome thought to be entirely unneceſſary; it being a general obſervation with them, that all young horſes have their mouths more or leſs full of what are called lampas; and that ſometimes they riſe higher than the fore-teeth; but they further obſerve, in proportion as a horſe grows older, the roof flattens of itſelf, and the teeth then appear to riſe. We are obliged to the ingenious M. La Foſſe for this remark, and hope it will be the means of aboliſhing this cruel and unneceſſary operation.

Barbs are ſmall excreſcences under the tongue, which may be diſcovered by drawing it aſide, and are cured by cutting cloſe off, and waſhing with brandy or ſalt and water.

A horſe is ſaid to have *wolves-teeth*, when the teeth grow in ſuch a manner, that their points prick, or wound either the tongue, or gums, in eating. Old horſes are moſt liable to this infirmity, and whoſe upper overſhoot the under teeth in a great degree.

To remedy this evil, you may either chop off the ſuperfluous parts of the teeth with a chizzel and mallet, or file them down, which is the better way, till you have ſufficiently waſted them.

Of the GREASE.

In order to treat this diſorder with ſome propriety; we ſhall conſider it as ariſing from two different cauſes; a fault or relaxation in the veſſels, or a bad diſpoſition in the blood and juices. We muſt here obſerve, that the blood and juices (or humours, for there are always ſome in the beſt ſtate of blood) are brought to the extreme parts by the arteries, and returned by the veins; in which latter, the blood is to riſe in perpendicular columns, to return the circulating fluids from the extremities: hence ſwellings in the legs of horſes may eaſily be accounted for, from a partial ſtagnation of the blood and juices in the finer veſſels, where the circulation is moſt languid; and eſpecially when there is want of due exerciſe, and a proper muſcular compreſſion on the veſſels, to puſh forward the returning blood, and propel the inert and half ſtagnating fluids through their veſſels; in ſhort, the blood in ſuch caſes cannot ſo readily aſcend as deſcend, or a greater quantity is brought by the arteries than can be returned by the veins.

The greaſe then, conſidered in this light, muſt be treated as a local complaint, where the parts affected are alone concerned, the blood and juices being yet untainted, and in good condition; or as a diſorder where they are both complicated: but when it is an attendant on ſome other diſtemper, as the farcy, yellows, dropſy, *&c.* ſuch diſeaſes muſt firſt be cured before the greaſe can be removed. In the former caſe, moderate exerciſe, proper dreſſing, cleanlineſs, and external application, will anſwer the purpoſe; in the latter, internals muſt be called in to our aſſiſtance, with proper evacuations.

When a horſe's heels are firſt obſerved to ſwell in the ſtable, and ſubſide or go down on exerciſe; let care be taken to waſh them very clean every time he comes in, with ſoap-ſuds, chamber-lye, or vinegar and water, which, with proper rubbing, will frequently prevent, or remove this complaint: or let them be well bathed twice a-day with old verjuice, or the following mixture, which will brace up the relaxed veſſels; and if rags dipped in the ſame are rolled on, with a proper bandage, for a few days, it is moſt likely the ſwellings will ſoon be removed by this method only, as the bandage will ſupport the veſſels, till they have recovered their tone. To anſwer this end alſo, a laced ſtocking made of ſtrong canvas or coarſe cloth, neatly fitted to the part, would be found extremely ſerviceable, and might eaſily be contrived by an ingenious mechanic.

Take rectified ſpirit of wine, four ounces; diſſolve in it half an ounce of camphor; to which add wine-vinegar, or old verjuice, ſix ounces; white vitriol, diſſolved in a gill of water, one ounce; mix together, and ſhake the phial when uſed.

But if cracks or ſcratches are obſerved, which ouze and run, let the hair be clipped away, as well to prevent a lodgment (which becomes ſtinking and offenſive by its ſtay) as to give room for waſhing out dirt or gravel, which, if ſuffered to remain there, would greatly aggravate the diſorder.

When this is the caſe, or the heels are full of hard ſcabs, it is neceſſary to begin the cure with poultices, made either of boiled turnips and lard, with a handful of linſeed powdered; or oatmeal and rye-flour, with a little common turpentine and hogs lard, boiled up with ſtrong-beer grounds or red-wine lees. The digeſtive ointment being applied to the ſores for two or three days, with either of theſe poultices over it, will, by ſoftening them, promote a diſcharge, unload the veſſels, and take down the ſwelling; when they may be dried up with the following:

Take white vitriol and burnt alum, of each two ounces; Ægyptiacum, one ounce; lime-water, a quart or three pints: waſh the ſores with a ſponge dipped in this, three times a-day, and apply the common white ointment ſpread on tow; to an ounce of which may be added two drams of ſugar of lead.

This method is generally very ſucceſsful, when the diſtemper is only local, and requires no internal medicines; but if the horſe be full and groſs, his legs greatly gorged, ſo that the hair ſtares up, and is what ſome term pen-feathered, and has a large ſtinking diſcharge from deep foul ſores, you may expect to meet with great trouble, as theſe diſorders are very obſtinate to remove, being often occaſioned by a poor dropſical ſtate of blood, or a general bad diſpoſition in the blood and juices.

The cure in this caſe, if the horſe is full and fleſhy, muſt be begun by bleeding, rowels, and repeated purging; after which, diuretic medicines are frequently given with ſucceſs. Thus,

Take four ounces of yellow roſin, one of ſal prunellæ; grind them together with an oiled peſtle, add a dram of oil of amber, and give a quart of forge-water every morning, faſting two hours before and after taking, and ride moderately.

As this drink is found very diſagreeable to ſome horſes, I would recommend the nitre-balls in its ſtead, given to the quantity of two ounces a-day, for a month or ſix weeks, mixed up with honey, or in his feeds: take the following alſo for that purpoſe.

Yellow roſin, four ounces; ſalt of tartar, and ſal prunellæ, of each two ounces; Venice ſoap, half a pound; oil of juniper, half an ounce; make into balls of two ounce weight, and give one every morning.

The legs, in this caſe, ſhould be bathed or fomented, in order to breathe out the ſtagnant juices, or to thin them, ſo that they may be able to circulate freely in the common current. For this purpoſe, foment twice a-day with the diſcutient fomentation, p. 569. col. 2. par. 3. in which a handful or two of wood-aſhes has been boiled; apply then the above poultices, or the following, till the ſwelling has ſubſided, when the ſores may be dreſſed with the green ointment till they are properly digeſted, and then dried up with the water and ointment above recommended.

Take honey, one pound; turpentine, ſix ounces; incorporate with a ſpoon; and add of the meal of fenugreek and linſeed, each four ounces; boil in three quarts of red-wine lees to the conſiſtence of a poultice; to which add, when taken from the fire, two ounces of camphor in powder; ſpread it on thick cloths, and apply warm to the legs, ſecuring it on with a ſtrong roller.

If the ſores are very foul, dreſs them with two parts of the wound-ointment, and one of Ægyptiacum; and apply the following, ſpread on thick cloths, and rolled on.

Take of black ſoap, one pound; honey, half a pound; burnt alum, four ounces; verdigreaſe powdered, two ounces; wheat-flour, a ſufficient quantity.

If the diuretic balls ſhould not ſucceed, they muſt be changed for the antimonial and mercurial alteratives, already mentioned: but turning a horſe out in a field, where he has a hovel or ſhed to run to at pleaſure, would greatly contribute to quicken the cure, and indeed would in general effect it alone; but if this cannot be complied with, let him be turned out in the day-time.

If the horſe is not turned out, a large and convenient ſtall is abſolutely neceſſary, with good dreſſing and care.

The laſt thing we ſhall recommend, is a method to oblige a horſe to lie down in the ſtable. This undoubtedly is of the utmoſt conſequence, as it will not a little contribute to the removal and cure of this diſorder; for by only changing the poſition of his legs, a freer circulation would be obtained, and the ſwelling taken down: whereas in general it is greatly aggravated by the obſtinacy of the horſe, who refuſes to lie down at all (probably from the pain it gives him to bend his legs for that purpoſe) by which means the ſtiffneſs and ſwelling increaſes, till the over-gorged and diſtended veſſels are obliged to give way, and by burſting, diſcharge the fluids, which ſhould circulate through them.

Of SCRATCHES, CROWN-SCABS, RAT-TAILS, *and* CAPELLETS.

Scratches in the heels have ſo much affinity with the greaſe, and are ſo often concomitants of that diſtemper, that the method of treating them may be ſelected chiefly from the preceding ſection; which at firſt ſhould be by the linſeed and turnip poultice, with a little common turpentine to ſoften them, and relax the veſſels; the green ointment may then be applied for a few days to promote a diſcharge, when they may be dried up with the ointments and waſhes recommended in the above ſection. It is beſt afterwards to keep the heels ſupple, and ſoftened with currier's dubbing, which is made of oil and tallow. This will keep the hide from cracking, and be as good a preſervative as it is to leather; and by uſing it often before exerciſe, will prevent the ſcratches, if care is taken to waſh the heels with warm water, when the horſe comes in. When they prove obſtinate, and the ſores are deep, uſe the following; but if any cavities or hollow places are formed, they ſhould firſt be laid open; for no foundation can be laid for healing, till you can dreſs to the bottom.

Take Venice turpentine, four ounces; quickſilver, one ounce; incorporate well together by rubbing ſome time, and then add honey and ſheeps ſuet, of each two ounces.

Anoint with this once or twice a-day; and if the horſe is full or fleſhy, you muſt bleed and purge; and if the blood is in a bad ſtate, the alteratives muſt be given to rectify it.

The *crown-ſcab* is an humour that breaks out round the coronet, which is very ſharp and itching, and attended with a ſcurfineſs: ſharp waters prepared with vitriol are generally uſed for the cure; but the ſafeſt way is firſt to mix marſhmallow and yellow baſilicon, or the wound ointment, equal parts, and to ſpread them on tow, and lay all round the coronet. A doze or two of phyſic may be very proper, with the diuretic medicines, (par. 4. 5. 6. of the preced. col. and the alteratives above recommended

commended, in rebelliouscaſes. *Vid.* the Section on ALTERATIVES.

Rat-tails are excreſcences, which creep from the paſtern to the middle of the ſhanks, and are ſo called from the reſemblance they bear to the tail of a rat. Some are moiſt, others dry; the former may be treated with the drying ointment and waſhes, p. 577. col. 1. par. 1. the latter with the mercurial ointment, p. 555. col. 2. par. 6. If the hardneſs does not ſubmit to the laſt medicine, it ſhould be pared off with a knife, and dreſſed with turpentine, tar and honey, to which verdigreaſe or white vitriol may occaſionally be added; but before the uſe of the knife, you may apply this ointment.

TAKE black ſoap, four ounces; quick-lime, two ounces; vinegar enough to make an ointment.

There are particular ſwellings which horſes are ſubject to, of a wenny nature, which grow on the heel of the hock, and on the point of the elbow, and are called by the French and Italians capellets: they ariſe often from bruiſes and other accidents; and when this is the caſe, ſhould be treated with vinegar and other repellers; but when they grow gradually on both heels, or elbows, we may then ſuſpect the blood and juices in fault that ſome of the veſſels are broke, and juices extravaſated; in this caſe, the ſuppuration ſhould be promoted, by rubbing the part with marſhmallow ointment, and when matter is formed, the ſkin ſhould be opened with a lancet, in ſome dependent part towards one ſide, to avoid a ſcar: the dreſſings may be turpentine, honey, and tincture of myrrh. The relaxed ſkin may be bathed with equal parts of ſpirit of wine and vinegar, to which an eighth part of oil of vitriol may be added. The contents of theſe tumours are various, ſometimes watery, at others ſuety, or like thick paſte; which, if care be not taken to digeſt out properly with the cyſt, will frequently collect again; was it not for the disfigurement, the ſhorteſt method would be to extirpate them with a knife, which, if artfully executed, and the ſkin properly preſerved, would leave very little deformity.

Of the Diſeaſes of the FEET.

Of NARROW HEELS, *and* BINDING *of the* HOOF, *&c.*

THOUGH narrow heels in general ariſe from a natural defect, yet they are often rendered incurable by bad ſhoeing; for ſome farriers hollow the quarters ſo deep and thin, that they may be pinched in with the fingers, and think by that method to widen them out by a ſtrong broad webbed ſhoe; but this turns them narrow above, wires their heels, and dries, or rots the frog. The beſt way in all ſuch caſes is not to hollow the foot in ſhoeing, and to pare nothing out but what is rotten or foul; if the foot be hard and dry, or inclined to be rotten, bathe it often with chamber-lye, or boil two pounds of linſeed bruiſed in two quarts of the ſame, to the conſiſtence of a poultice, then add ſix ounces of ſoft green ſoap, and anoint the foot with it every day, rubbing a little of it upon the ſole.

Or,

TAKE bees-wax two ounces; freſh butter or lard, ſix ounce; tar, one ounce; as much linſeed, or neats-foot oil, as will make it the conſiſtence of a ſmooth ointment.

The hoofs, if too dry, may be anointed with the above, or with lard only; ſome for this purpoſe uſe tar, tallow, and honey, but moſt greaſy and unctuous applications will anſwer this intention; the feet alſo, if too dry, may be ſtuffed with bran and lard heated or worked up together in the hand, which is very proper alſo to apply every night, when your horſe is travelling in hot weather on roads that are dry and hard; cow-dung likewiſe is a proper ſtuffing for the feet, but vinegar ſhould cautiouſly be mixed with it; for though it is a known cooler, it is a remarkable reſtringent, which in this caſe would be extremely prejudicial; inſtead of which, a print of freſh butter may be firſt applied to the ſole, and the cow dung laid over it.

There is another diſorder the hoofs are ſubject to, which is their being too ſoft and moiſt; this may be conſtitutional, or proceed from going much in wet and marſhy grounds, ſtanding conſtantly on wet litter, or any infirmity that may bring too great a moiſture into the feet. In this caſe the horſe's hoofs may be bathed every day with warm vinegar, verjuice, copperas-water, and ſuch like reſtringents; to which may be added galls, alum, *&c.* remembring to let the horſe ſtand conſtantly dry.

We ſay a horſe is *hoof-bound*, when the hoof is ſo tight round the inſtep, that it turns the foot ſomewhat into the ſhape of a bell. This is cauſed ſometimes by ſhoeing as above, to widen the heel, and ſometimes by cutting the toes down too much, which gives that ſhape to the foot, and cauſes the horſe to go lame.

To remedy this diſorder, Mr Gibſon recommends the following method: let the foot be drawn down from the coronet almoſt to the toe with a drawing knife, making ſeven or eight lines or razes through the hoof, almoſt to the quick; afterwards keep it charged with pitch roſin, till the lines are wore out in ſhoeing, which will require ſeveral months.

Of SAND CRACKS *and* QUITTORS.

WHAT is called a ſand-crack, is a little cleft on the outſide of the hoof: if it runs in a ſtrait line downwards, and penetrates through the bony part of the hoof, it often proves troubleſome to cure; but if it paſſes through the ligament that unites the hoof with the coronet, it is then apt to breed a quittor, or falſe quarter, which is dangerous.

When the crack only penetrates through the hoof, without touching the ligament, unleſs the hoof be hollow, it may eaſily be cured, by raſping only the edges ſmooth, and applying thick pledgets of baſilicon, and binding them down with a piece of ſoft liſt; if ſome precipitate be added to it, this medicine will be improved thereby, and in general anſwers the end, without any other application But if you perceive any hollowneſs under the hoof, and that the cleft has a tendency to penetrate through the griſtle or ligament, the beſt method, in that caſe, is to fire out of hand with irons that are not made too hot, firſt raſping very thin and wide from both ſides of the cleft: the horſe muſt not carry any weight for ſome time, but be turned out to graſs, or wintered in a good farm-yard.

A quittor is an ulcer formed between the hair and hoof, uſually the inſide quarter of a horſe's foot; it ariſes often from treads and bruiſes, ſometimes from gravel, which, by working its way upwards, lodges about the coronet: if it is only ſuperficial, it may be cured with cleanſing dreſſings, bathing the coronet every day with ſpirit of wine, and dreſſing the ſore with the precipitate medicine.

But if the matter forms itſelf a lodgment under the hoof, there is no way then to come at the ulcer, but by taking off part of the hoof; and if this be done artfully and well, the cure may be affected without danger.

When the matter happens to be lodged near the quarter, the farrier is ſometimes obliged to take off the quarter of the hoof, and the cure is then, for the moſt part, but palliative; for when the quarter grows up, it leaves a pretty large ſeam, which weakens the foot; this is what is called a falſe quarter, and a horſe with this defect ſeldom gets quite ſound.

If the matter, by its confinement, has rotted the coffin-bone, which is of ſo ſoft and ſpongy a nature, that it ſoon becomes ſo, you muſt enlarge the opening, cut away the rotten fleſh, and apply the actual cautery, or hot iron pointed pyramidically, and dreſs the bone with doſſils of lint, dipped in tincture of myrrh, and the wound with the green or precipitate ointment. When the ſore is not enlarged by the knife, which is the beſt, and leſs painful method, pieces of ſublimate are generally applied, which bring out with them cores, or lumps of fleſh; blue vitriol powdered, and mixed with a few drops of the oil, is uſed alſo for this purpoſe, and is ſaid to act as effectually, and with leſs pain and danger; during the operation of theſe medicines, the foot ſhould be kept in ſome ſoft poultice, and care ſhould be taken, during the whole dreſſing, to prevent proud fleſh riſing, which otherwiſe will not only retard the cure, but prevent a firm and ſound healing.

Of Wounds *in the* Feet, *from* Nails, Gravel, *&c.*

Accidents of this ſort are very common, and ſometimes for want of early care, prove of bad conſequence; for the parts, being naturally tender, are very ſuſceptible of inflammation; and when matter is once formed, if a free diſcharge is not procured, the bone, which is ſpungy, ſoon becomes affected, and the whole foot is then in danger.

When any extraneous bodies, ſuch as nails, ſtubs, thorns, *&c.* have paſſed into the horſe's foot, you ſhould endeavour to get them out as ſoon as poſſible; and after waſhing the part with oil of turpentine, dreſs the hole with lint dipped in the ſame, melted down with a little tar; the foot may be ſtopped up with bran and hogs-lard heated together, or put it into the turnip, or any ſoft poultice; this method is generally ſucceſsful, when the nail, *&c.* is entirely removed; but if any piece, or particle, ſhould remain behind, which may be ſuſpected by the degree of pain, and diſcharge of matter; after paring away the ſole as thin as poſſible, introduce a bit of ſponge tent, in order to enlarge the hole, that it may be drawn out by a ſmall pair of forceps, or brought away by digeſtion: if this method ſhould not ſucceed, but the lameneſs continues, with a diſcharge of a thin bloody, or ſtinking matter, you muſt no longer delay opening the wound with a drawing-knife to the bottom, and then dreſs as above directed, or with the turpentine digeſtive, divided with the yolk of an egg, and a little tincture of myrrh; afterwards with the precipitate medicine.

If the lameneſs proceeds from pricking in ſhoeing, the foot ſhould be pared thin on the wound ſide, and after dreſſing with the tar and turpentine, let it be ſtopped with the poultices above mentioned, or with two ounces of common turpentine, melted down with four of lard; ſhould this method not ſucceed, follow the above directions.

If the nail penetrates to the joint of the foot, where matter may be formed and by its long continuance putrify, ſo as to erode the cartilages of the joint, the caſe is incurable.

If the nail has paſſed up to the nut-bone, it is incurable, becauſe this little bone cannot exfoliate, and becauſe the cartilaginous part of it is deſtroyed, as ſoon as injured.

If the nail has not paſſed to the tendon, the horſe will do well, without a neceſſity for drawing the ſole; but if the tendon is wounded, the ſole muſt be carefully drawn, becauſe a ſinovia and gleet is diſcharged.

When gravel is the cauſe, it for the moſt part follows the nail-holes, and if it gets to the quick cannot return, unleſs it is ſcraped out; for the make of the hoof, which is ſpiral like an ear of corn, favours its aſcent, ſo that the gravel continues working upwards towards the coronet, and forms what the farriers call a quittor-bone.

The nature of this diſorder points out the method of cure, which is to be as expeditious and careful as poſſible, in getting out the gravel; if it is found difficult to effect this, let the ſole or hoof be pared thin, and, if neceſſary, the wound enlarged to the bottom, and then dreſſed up as uſual. Should the coffin-bone be affected, you muſt follow the directions laid down in the preceding ſection, remembering always to bathe the hoof with vinegar, or repellers, in order to allay the heat and inflammation, which often happen on ſuch occaſions; and ſhould the pain and anguiſh affect the legs, treat them in the ſame manner, or charge the leg and paſtern with a mixture of wine-lees and vinegar.

Figs are ſpongy ſwellings on the bottom of horſes feet, generally on the ſides of the fruſh. Theſe, or any other kind of excreſcences, ſuch as warts, corns, grapes, *&c.* are beſt removed by the knife; and if any part of them be left behind, or ſhould ſhoot up afreſh, touch them with the cauſtic, or oil of vitriol, and dreſs with Ægyptiacum; to which may be added, when they are very rebellious, a ſmall quantity of ſublimate; when the roots are quite deſtroyed, you may incarn with the precipitate medicines, and dry up the ſore with the following waſh.

Take of white vitriol, alum, and galls in powder, of each two ounces; diſſolve them by boiling a little in two quarts of lime-water, and keep in a bottle for uſe, which ſhould be ſhook when uſed.

Of the Running Thrush, Canker, *and* Loss *of* Hoof.

The *thruſh* or *fruſh* is an impoſthume that ſometimes gathers in the frog; or a ſcabby and ulcerous diſpoſition, which ſometimes cauſes it to fall off: when the diſcharge is natural, the feet ſhould be kept clean, but no drying waſhes made uſe of, it being thought as unſafe to repel ſome of theſe diſcharges, as to cure ſome ſweaty feet.

When an impoſthume, or gathering appears, the ſafeſt way is to pare out the hard part of the frog, or whatever appears rotten; and waſh the bottom of the foot two or three times a-day with old chamber-lye; this is the ſafeſt and beſt way of treating them. But when a horſe has been neglected, and there is is a ſtrong flux to the part, it is apt to degenerate into a canker; to prevent which, uſe the following waſh.

Take ſpirit of wine and vinegar of each two ounces, tincture of myrrh and aloes one ounce, Ægyptiacum half an ounce; mix together.

Bathe the thruſh with this, where-ever there appears a more than ordinary moiſture, and lay over the ulcer a little tow dipped in the ſame. The purges and diuretics recommended in the greaſe, ſhould be given at this time, to prevent the inconveniencies that the drying up theſe diſcharges frequently occaſion.

A *canker* in the foot proceeds, for the moſt part, from thruſhes, when they prove rotten and putrid, though many other cauſes may produce this diſorder. The method uſed by farriers for the cure is generally with hot oils, ſuch as vitriol, aqua-fortis, and butter of antimony, which are very proper to keep down the riſing fleſh, and ſhould be uſed daily, till the fungus is ſuppreſſed, when once in two days will be ſufficient, ſtrewing fine precipitate powder over the new-grown fleſh, till the ſole begins to grow.

There is one great error committed often in this cure, that is, in not having ſufficient regard to the hoof; for it ſhould not only be cut off, where-ever it preſſes on the tender parts, but ſhould be kept ſoft with linſeed oil; and as often as it is dreſſed, bathe the hoof all round the coronet with chamber-lye. Purging is very proper to complete the cure.

The *loſs of the hoof* may be occaſioned by whatever accident may bring an impoſthumation in the feet, whereby the whole hoof becomes looſened, and falls off from the bone. If the coffin-bone remains uninjured, a new hoof may be procured by the following method.

The old hoof ſhould by no means be pulled off, unleſs ſome accident happens that requires its removal; for it ſerves as a defence to the new one, and makes it grow more ſmooth and even; and indeed nature will generally do this office at her own proper time.—On the removal of the hoof, a boot of leather, with a ſtrong ſole, ſhould be laced about the paſtern, bolſtering and ſtopping the foot with ſoft flax, that the tread may be eaſy: dreſs the ſore with the wound ointment, to which ſhould be added the fine powders of myrrh, maſtich, and olibanum. If this medicine ſhould not be ſufficient to prevent a fungus, burnt alum or precipitate may be added to it, and the luxuriant fleſh may be daily waſhed with the ſublimate water.

Of Ruptures, Anticor, Colt-evil *or* Gonorrhoea, *and Diſeaſes of the* Mouth.

In regard to ruptures, though they are generally divided into particular claſſes, we ſhall only obſerve, that by violent efforts of the horſe, or other accidents, the guts or caul may be forced between the muſcles of the belly at the navel, and through the rings of the muſcles into the ſcrotum or cod. The ſwellings are generally about the ſize of a man's fiſt, ſometimes much larger, deſcending to the very hock; they are frequently ſoft, and yield to the preſſure of the hand, when they will return into the cavity of the belly with a rumbling noiſe; and, in moſt, the vacuity may be felt through which they paſſed.

On their firſt appearance, endeavours ſhould be made to return them by the hand; but if the ſwelling ſhould be hard and painful, in order to relieve the ſtricture, and relax the parts, through which the gut or caul has paſſed, let a large quantity of blood be immediately taken away, and the part fomented twice or thrice a-day, applying over it a poultice made with oatmeal, oil and vinegar, which ſhould be continued till the ſwelling grows ſoft and eaſier, or the gut is returned. In the mean time it would be proper to throw up emollient oily glyſters twice a-day, and to let the horſe's chief diet be boiled barley, ſcalded malt, or bran.

Should the ſwelling afterwards return, we apprehend the reſtringent applications, uſually recommended on theſe occaſions, will avail little without a ſuſpenſory bandage; ſo that an ingenious mechanic in that art is chiefly to be relied on for any future aſſiſtance; though it has been obſerved, that with moderate feeding, and gentle exerciſe, ſome horſes have continued to be very uſeful under this complaint.

The *anticor* is a diſorder not very common among our horſes, or thoſe in northern climates; but is particularly taken notice of by the French, Spaniſh, and Italian writers; who deſcribe it a malignant ſwelling in the breaſt, which extends ſometimes to the very ſheath under the belly; it is attended with a fever, great depreſſions, and weakneſs, and a total loſs of appetite.

The cure ſhould firſt be attempted by large and repeated bleedings, to abate the inflammation; emollient glyſters ſhould be injected twice or thrice a-day, with an ounce of ſal prunella in each, and the cooling drink in the Section on Fevers ſhould be given inwardly; the ſwelling ſhould be bathed with the marſhmallow ointment, and a ripening poultice, with onions boiled in it, ſhould be daily applied over it. If by this method, continued four or five days, the inflammation in the throat and gullet is removed, our attention ſhould more particularly turn to encourage the ſwelling at the breaſt, and bring it, if poſſible, to matter: to which end, continue the poultice, and give two ounces of Venice treacle diſſolved in a pint of beer every night; when the ſwelling is grown ſoft, it muſt be opened with the knife, and dreſſed with turpentine digeſtive, the danger now being over.

But ſhould it be found impracticable to bring the ſwelling to matter, and it increaſes upwards, ſo as to endanger ſuffocation; authors have adviſed to pierce the tumour with a hot pointed cautery in five or ſix places, to dreſs with the above digeſtive; and in order to ſtimulate and promote a greater diſcharge, to add to it a ſmall quantity of Spaniſh flies and euphorbium in powder; fomenting at the ſame time, and bathing the circumjacent parts with ointment of marſhmallows. M. Gueriniere, as well as Soleyſell, have adviſed opening the ſkin, when the tumour cannot be brought to matter, in order to introduce a piece of black hellebore-root ſteeped in vinegar, and to confine it there for twenty-four hours; this alſo is intended as a ſtimulant, and is ſaid to anſwer the intention, by occaſioning ſometimes a ſwelling as big as a man's head.

Beſides the diſorders of the mouth, which we have already animadverted on, there are frequently obſerved on the inſide the lips and palate, little ſwellings or bladders called *giggs*: ſlitting them open with a knife, or lancet, and waſhing them afterwards with ſalt and vinegar, is in general their cure; but when they degenerate into what are called cankers, which are known by little white ſpecks, that ſpread and occaſion irregular ulcers, the beſt method then is to touch them daily with a ſmall flat cautery, moderately heated, till the ſpreading is ſtopped, and to rub the ſores three or four times a-day with Ægyptiacum, and tincture of myrrh, ſharpened with oil, or ſpirit of vitriol; when by this dreſſing the ſloughs are ſeparated, they may be waſhed frequently with a ſponge dipped in copperas, or ſublimate water, if they continue to ſpread; or a tincture made by diſſolving half an ounce of burnt alum, and two ounces of honey, in a pint of tincture of roſes. Either of theſe will dry them up, and are very uſeful in moſt diſorders of the mouth.

A relaxation and ſwelling of the palate ſometimes happens to horſes on catching cold. To remedy this diſorder, blow pepper on the part, or anoint it with the ſame mixed up with honey. The tincture above-mentioned may be uſed for this purpoſe, to which may be added half an ounce of ſpirit of ſal armoniac.

The colt-evil is ſuppoſed to ariſe from ſtoned colts having full liberty with mares, before they are able to cover them; whence frequently enſues an excoriation or fretting on the glands, and a ſwelling on the ſheath; this laſt diſorder frequently proceeds too from dirt, or filth lodging there, and is often removed by waſhing the part clean with butter and beer: but when the yard itſelf is ſwelled, foment it twice a-day with marſhmallows boiled in milk, to which may be added a little ſpirit of wine; anoint the excoriation with the white ointment, or waſh it with a ſponge dipped in lime, to a pint of which may be added two drams of ſugar of lead: the yard ſhould be ſuſpended up to the belly; and if the ſwelling ſhould increaſe with the inflammation, bleed, and give the cooling phyſic, anoint with ointment of elder, and apply the bread and milk poultice.

If a ſimple gonorrhœa or ſeminal gleet is obſerved to drip from the yard, (which is often the caſe in high-fed young horſes, where a relaxation of the glands and ſeminal veſſels has been brought on by frequent emiſſions) let the horſe be plunged every day into a river or pond; give him two or three rhubarb purges, at proper diſtances; and intermediately the following balls.

> TAKE of balſam of copivi, or Venice turpentine, olibanum, and maſtich powdered, of each two drams; bole armoniac half an ounce: mix up into a ball with honey, and give it night and morning, till the diſcharge leſſens, and then every night, till it goes off.

Balls prepared with rhubarb and turpentine may alſo be given for this purpoſe; two drams of the former, with half an ounce of the latter.

FAS FAT

FASCES, in Roman antiquity, axes bound up together with rods or ſtaves, and carried before the Roman magiſtrates as a badge of their authority and office.

FASCETS, in the art of making glaſs, are the irons thruſt into the mouths of bottles, in order to convey them into the annealing tower.

FASCIA, in architecture, ſignifies any flat member having a conſiderable breadth and but a ſmall projecture, as the band of an architrave, larmier, *&c.*

FASCIA LATA, in anatomy. See ANATOMY, p. 206.

FASCIÆ, in aſtronomy, certain parts on Jupiter's body reſembling belts or ſwaths. They are more lucid than the reſt of that planet, and are terminated by parallel lines, ſometimes broader and ſometimes narrower.

FASCIALIS, in anatomy. See SARTORIUS.

FASCINATION, a kind of witchcraft or enchantment ſuppoſed to operate by the influence either of the eye or tongue.

FASCINES, in fortification, faggots of ſmall wood, of about a foot diameter and ſix feet long, bound in the middle and at both ends. They are uſed in raiſing batteries, making chandeliers, in filling up the moat to facilitate the paſſage to the wall, in binding the ramparts where the earth is bad, and in making parapets of trenches to ſcreen the men.

FASHION-PIECES, in the ſea-language, are two compaſſing pieces of timber, into which is fixed one on each ſide the tranſom. See TRANSOM.

FAST, or FASTING, in general, denotes the abſtinence from food; but is more particularly uſed for ſuch abſtinence on a religious account.

FASTERMANS, among our Saxon anceſtors, were pledges or bondſmen, who were anſwerable for each other's good behaviour.

FASTI, in Roman antiquity, the calendar wherein were expreſſed the ſeveral days of the year, with their feaſts, games, and other ceremonies.

FAT, in anatomy, an oleaginous or butyraceous matter, ſecreted from the blood, and filling up the cavity of the adipoſe cells. Fat, properly and diſtinctly ſo called, ed, is not ſecreted from glandules, but from the little arteries of the adipoſe membrane. Authors diſtinguiſh it into two kinds, which they expreſs by the words *ſevum* or *adeps*, and *pinguedo*. According to this diſtinction, there is no ſuch thing as ſevum or hard fat in the human body, its fat being all of that ſort expreſſed by pinguedo, or ſoft and oily. That this oleaginous matter has a circulatory motion, or an egreſs into the veins, is very evident from the ſudden conſumption of it in many diſeaſes, and from its vaſt diminution by exerciſe or labour.

Fat, in the ſea-language, ſignifies the ſame with broad. Thus a ſhip is ſaid to have a fat quarter, if the truſſing in or tuck of her quarter be deep.

Fat is uſed alſo for ſeveral utenſils; as, 1. A great wooden veſſel, uſed for the meaſuring of malt, and containing a quarter or eight buſhels. 2. A large brewing veſſel, uſed by bewers to run their wort in. 3. A leaden pan or veſſel for the making of ſalt at Droitwich.

Fat likewiſe denotes an uncertain meaſure of capacity. Thus a fat of iſing-glaſs contains from 3¼ hundred weight to 4 hundred weight; a fat of unbound books, half a maund or four bales; of wire, from 20 to 25 hundred weight; and of yarn, from 220 to 221 bundles.

FATE, denotes an inevitable neceſſity depending upon a ſuperior cauſe. It is alſo uſed to expreſs a certain unavoidable deſignation of things, by which all agents, both neceſſary and involuntary, are ſwayed and directed to their ends.

FATES, in mythology. See Parcæ.

FATHOM, a long meaſure containing ſix feet, uſed chiefly at ſea for meaſuring the length of cables and cordage.

FATUUS ignis, in phyſiology, a meteor otherwiſe called Will-with-a-wiſp. See Will.

FAVIFORM, in general, ſomething reſembling a honeycomb. Surgeons give this appellation to certain ulcers, which emit a ſanies through little holes, eſpecially in the head.

FAVISSÆ, in antiquity, were, according to Feſtus and Gellius, ciſterns to keep water in: but the faviſſæ in the Capitol at Rome were dry ciſterns or ſubterraneous cellars, where they laid up the old ſtatues, broken veſſels, and other things uſed in the temple. Theſe were much the ſame with what, in ſome of the modern churches, are called the archives and treaſury.

FAUNALIA, in Roman antiquity, three annual feſtivals in honour of the god Faunus; the firſt of which was obſerved on the ides of February, the ſecond on the 16th of the calends of March, and the third on the nones of December. The principal ſacrifices on this occaſion were lambs and kids. Faunus was a deity of the Romans only, being wholly unknown to the Greeks.

FAUNS, a kind of rural deities, among the ancient Romans, repreſented with horns on their heads, ſharp-pointed ears, and the reſt of their bodies like goats.

FAWN, among ſportſmen, a buck or doe of the firſt year; or the young one of the buck's breed in its firſt year.

FE, or *St* Fe, the capital of New Mexico: W. long. 109°, N. lat. 36°.

St Fe *de bagota*, the capital of the kingdom of New Granada: W. long. 73°, N. lat. 4°. It is an archbiſhoprick and the ſeat of the governor of the province, *&c.*

St Fe is alſo a town of Spain, in the province of Granada, ſituated on the river Xemil: W. long. 3° 45', N. lat. 37° 20'.

St Fe is alſo the capital of a province of the ſame name, in Terra Firma in South America, ſituated on the river of St Martha, 200 miles ſouth of Carthagena: W. long. 77°, N. lat. 7° 25'.

FEALTY, in law, an oath taken on the admittance of any tenant, to be true to the lord of whom he holds his land.

FEAST, or Festival, in a religious ſenſe, is a day of feaſting and thankſgiving.

Among the ancients, feaſts were inſtituted upon various accounts, but eſpecially in memory of ſome favourable interpoſition of Providence. Thus, the Jews had their feaſt of paſſover, pentecoſt, and tabernacles; the Greeks their cerealia, panathenæa, *&c.* and the Romans their ſaturnalia, ambarvalia, *&c.* See Passover, Cerealia, *&c.*

FEATHER, in phyſiology, a general name for the covering of birds; it being common to all the animals of this claſs to have their whole body, or at leaſt the greateſt part of it, covered with feathers or plumage.

FEBRIFUGE, in medicine, an appellation given to ſuch medicines as mitigate, or remove a fever.

FEBRIS, fever, in medicine. See Fever.

FEBRUARY, in chronology, the ſecond month of the year, reckoning from January, firſt added to the calendar of Romulus by Numa Pompilius.

February derives its name from Februa, a feaſt held by the Romans in this month, in behalf of the manes of the deceaſed; at which ceremony ſacrifices were performed, and the laſt offices were paid to the ſhades of the defunct.

February, in a common year, conſiſts only of twenty-eight days; but in the biſſextile year, it has twenty-nine, on account of the intercallary day, added that year.

FECIALES, or Foeciales, a college of prieſts inſtituted at Rome by Numa, conſiſting of twenty perſons, ſelected out of the beſt families. Their buſineſs was to be arbitrators of all matters relating to war and peace, and to be the guardians of the public faith.

FEE, in Scots law, ſignifies a complete feudal property. See Scots Law, title 10. Hence, where the bare liferent of any feudal ſubject is meant to be conveyed to A, and the abſolute property to B; that meaning is expreſſed thus, to A in liferent, and to B in fee.

FEELERS, in natural hiſtory, a name uſed by ſome for the horns of inſects.

FEELING, one of the five external ſenſes, by which we obtain the ideas of ſolid, hard, ſoft, rough, hot, cold, wet, dry, and other tangible qualities.

FEINT, in fencing, a ſhew of making a thruſt at one part

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Fig. 1. **Felis Leo**
or
Lion

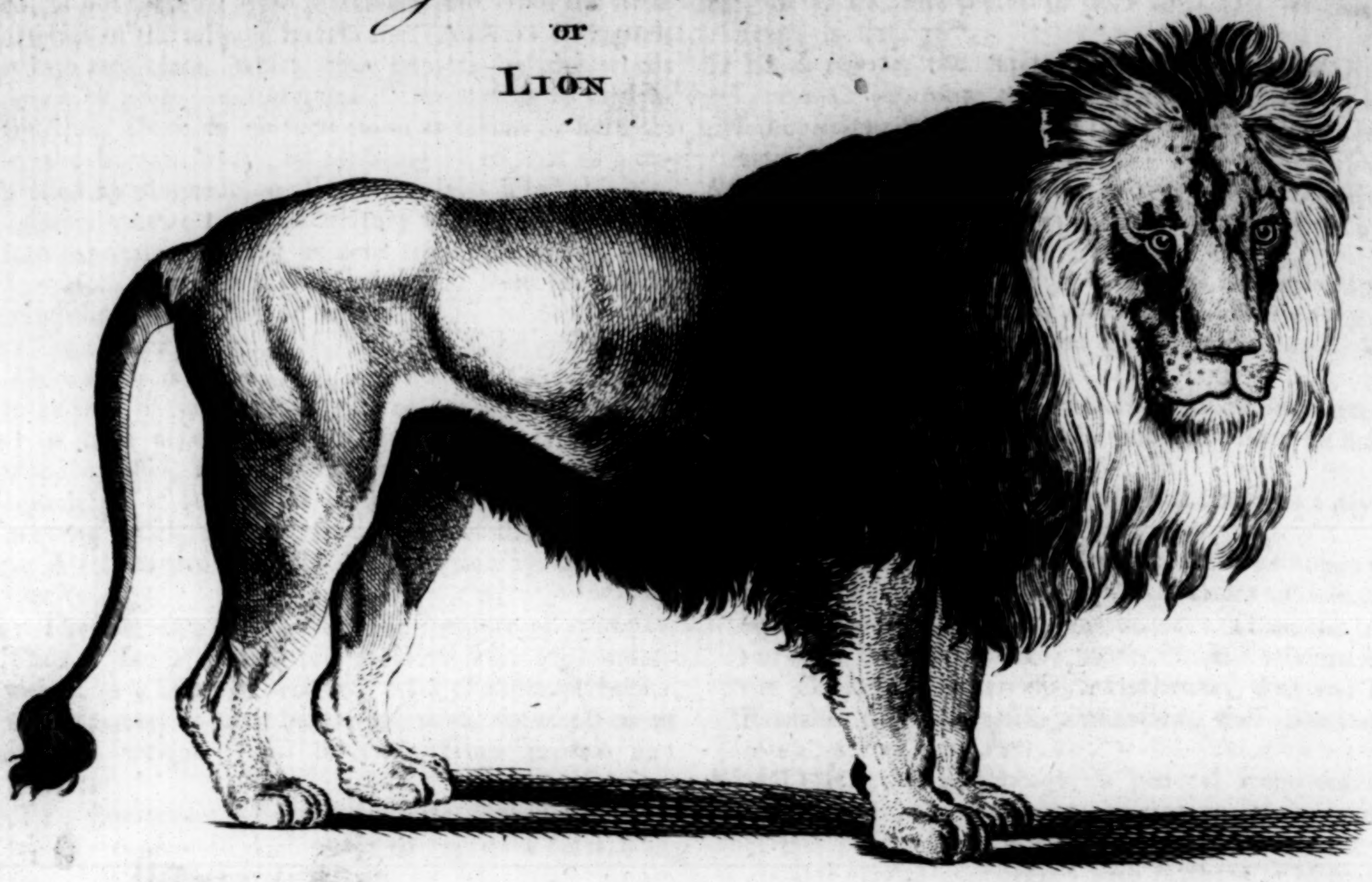
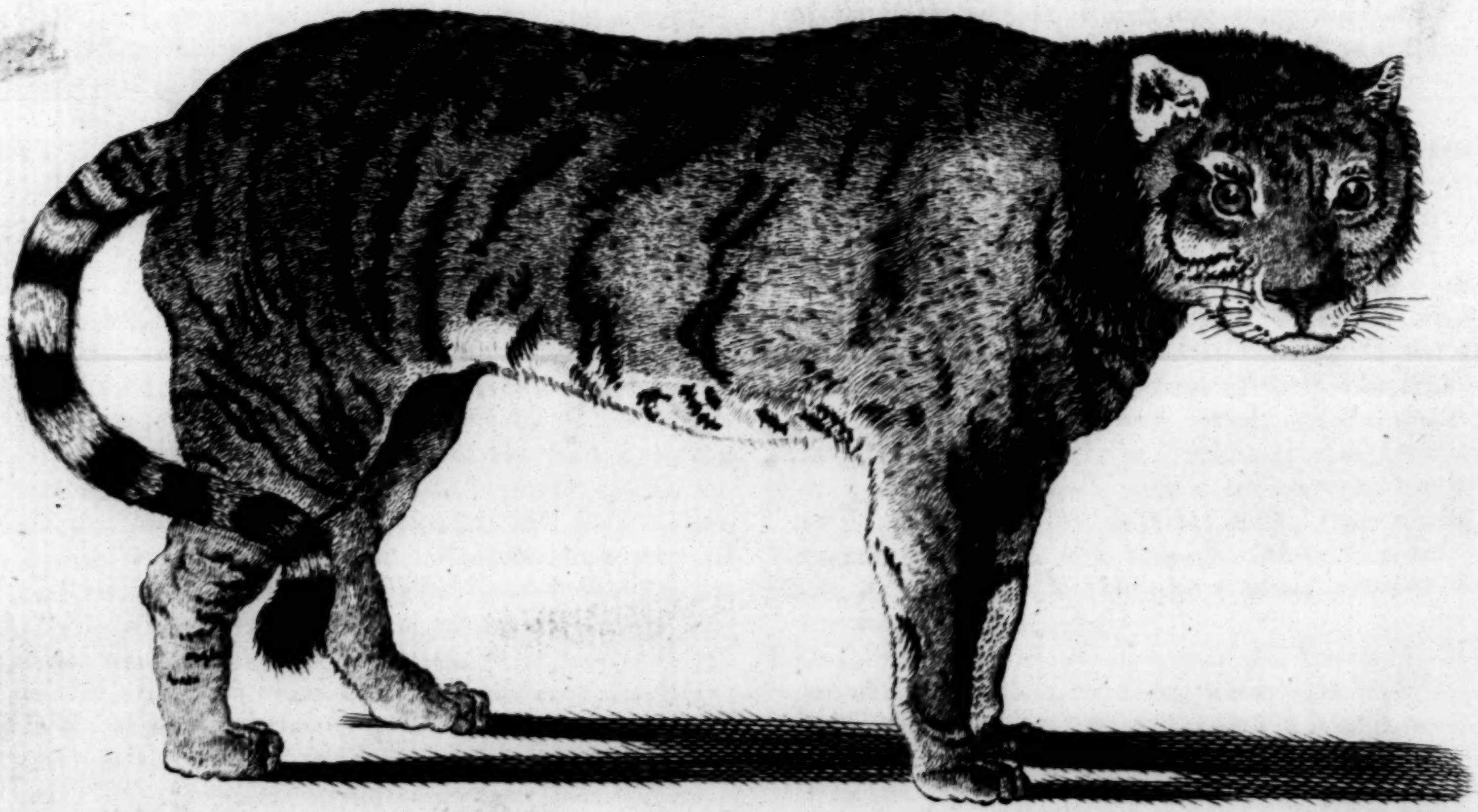


Fig. 2. **Felis Tigris**
or
Tiger



A Bell Sculp.

part, in order to deceive the enemy, that you may really ſtrike him in another.

A ſimple feint is a mere motion of the wriſt, without ſtirring the foot.

FELAPTON, in logic, one of the ſix firſt modes of the third figure of ſyllogiſms; whereof the firſt propoſition is an univerſal negative, the ſecond an univerſal affirmative, and the third a particular negative.

FELIN, a town of Livonia, about an hundred miles north-eaſt of Riga.

FELIS, the Cat, a genus of quadrupeds belonging to the order of feræ, the characters of which are theſe: The fore teeth are equal; the molares or grinders have three points; the tongue is furniſhed with rough ſharp prickles, and pointing backwards; and the claws are ſheathed, and retractile. This genus comprehends ſeven genera, *viz.*

1. The Leo, or Lion. The largeſt lions are from eight to nine feet in length, and from four to eight feet high: thoſe of a ſmaller ſize are generally about 5½ feet long, and about 3½ high. His head is very thick, and his face is beſet on all ſides with long buſhy yellowiſh hair; this ſhaggy hair extends from the top of the head to below the ſhoulders, and hangs down to his knees: the belly and breaſt are likewiſe covered with long hair. The reſt of the body is covered with very ſhort hair, excepting a buſh at the point of the tail. The ears are roundiſh, ſhort, and almoſt entirely concealed under the hair of his front. The ſhaggineſs of the fore-part of his body makes the hinder part have a naked appearance. The tail is long and very ſtrong; the legs are thick and fleſhy; and the feet are ſhort; the length of the claws is about an inch and a quarter, are of a whitiſh colour, very crooked, and can be extended or retracted into the membranous ſheath at pleaſure: Their points are ſeldom blunted, as they are never extended but when he ſeizes his prey.

The female, or lioneſs, has no mane, or long hair about her head or ſhoulders; in her we ſee diſtinctly the whole face, head, ears, neck, ſhoulders, breaſt, *&c.* all theſe parts being in ſome meaſure concealed under the long hair of the male, give the female a very different appearance: beſides, ſhe is conſiderably leſs than the male. The hair of both male and female is of a yellowiſh colour, and whitiſh on the ſides and belly.

In warm countries, quadrupeds in general are larger and ſtronger than in the cold or temperate climates. They are likewiſe more fierce and hardy; all their natural qualities ſeem to correſpond with the ardour of the climate. The lions nouriſhed under the ſcorching ſun of Africa or the Indies, are the moſt ſtrong, fierce, and terrible. Thoſe of mount Atlas, whoſe top is ſometimes covered with ſnow, are neither ſo ſtrong or ſo ferocious as thoſe of Biledulgerid or Zaara, whoſe plains are covered with burning ſand. It is in theſe hot and barren deſarts, that the lion is the dread of travellers, and the ſcourge of the neighbouring provinces. But it is a happy circumſtance, that the ſpecies is not very numerous: they even appear to diminiſh daily. The Romans, ſays Mr Shaw, brought many more lions out of Lybia for their public ſhews, than are now to be found in that country. It is likewiſe remarked, that the lions in Turkey, Perſia, and the Indies are leſs numerous than formerly. As this formidable and courageous animal makes a prey of moſt other animals, and is himſelf a prey to none, this diminution in the number of the ſpecies can be owing to nothing but an increaſe in the number of mankind: for it muſt be acknowledged, that the ſtrength of this king of animals is not a match for the dexterity and addreſs of a Negro or Hottentot, who will often dare to attack him face to face, and with very ſlight weapons.

The ingenuity of mankind augments with their number; that of other animals continues always the ſame. All the noxious animals, as the lion, are reduced to a ſmall number, not only becauſe mankind are become more numerous, but likewiſe becauſe they have become more ingenious, and have invented weapons which nothing can reſiſt. This ſuperiority in the numbers and induſtry of mankind, at the ſame time that it has broke the vigour of the lion, ſeems likewiſe to have enervated his courage. This quality, though natural, is exalted or lowered according to the good or bad ſucceſs with which any animal has been accuſtomed to employ his force. In the vaſt deſarts of Zaara; in thoſe which ſeem to ſeparate two very different races of men, the Negroes and Moors, between Senegal and the boundaries of Mauritania; in thoſe uninhabited regions above the country of the Hottentots; and, in general, in all the meridional parts of Africa and Aſia, where mankind have diſdained to dwell, lions are ſtill as numerous, and as ferocious as ever. Accuſtomed to meaſure their ſtrength by that of all other animals which they encounter, the habit of conquering renders them haughty and intrepid. Having never experienced the ſtrength of man, or the power of his arms, inſtead of diſcovering any ſigns of fear, they diſdain and ſet him at defiance. Wounds irritate, but do not terrify them: they are not even diſconcerted at the ſight of numbers. A ſingle lion of the Deſart has been known to attack a whole caravan; and if, after a violent and obſtinate engagement, he found himſelf weakened, he retreats fighting, always keeping his face to the enemy. On the other hand, the lions which live near the villages or huts of the Indians or Africans, being acquainted with man and the force of his arms, are ſo daſtardly as to fly and leave their prey at the ſight of women or children.

This ſoftening in the temper and diſpoſition of the lion, ſhows that he is capable of culture, and ſuſceptible, at leaſt to a certain degree, of the impreſſions that he receives: accordingly, hiſtory informs us of lions yoked in triumphal chariots, trained to war, or the chace; and that, faithful to their maſters, they never employed their ſtrength or courage but againſt their enemies. It is, however, certain, that a lion taken young and brought up among domeſtic animals, will eaſily be accuſtomed to live and ſport with them; that he is mild and careſſing to his maſter, eſpecially when he is young; and that, if his natural ferocity ſometimes breaks out, it is rarely turned againſt thoſe who have been kind to him. But, as his paſſions are impetuous and vehement, it is not to be expected that the impreſſions of education will at all times be ſufficient to balance them: for this reaſon it is dangerous to let him ſuffer hunger long, or to vex him by ill-timed teazings: bad treatment not only irritates him, but he remembers it long, and meditates revenge. On the other hand, he is exceedingly grateful, and ſeldom forgets benefits received. He has been often obſerved to diſdain weak or inſignificant enemies, to deſpiſe their inſults, and to pardon their offenſive liberties. When led into captivity, he will diſcover ſymptoms of uneaſineſs, without anger or peeviſhneſs: on the contrary, his natural temper ſoftens, he obeys his maſter, careſſes the hand that gives him food, and ſometimes gives life to ſuch animals as are thrown to him alive for prey; by this act of generoſity he ſeems to conſider himſelf as for ever bound to protect them; he lives peacably with them, allows them a part, and ſometimes the whole of his food, and will rather ſubmit to the pangs of hunger than fill his ſtomach with the fruit of his beneficence. We may likewiſe obſerve, that the lion is not a cruel animal; he kills rather from neceſſity than choice, never deſtroying more than he eats, and whenever his appetite is ſatisfied he is mild and peaceable.

The aſpect of the lion does not detract from the noble and generous qualities of his mind. His figure is reſpectable; his looks are determined; his gate is ſtately; and his voice is tremenduous. In a word, the body of the lion appears to be the beſt model of ſtrength joined to agility. The force of his muſcles is expreſſed by his prodigious leaps and bounds, often 20 feet at once; by the briſk motion of his tail, a ſingle ſweep of which is ſufficient to throw a man to the ground; by the eaſe with which he moves the ſkin of his face, and particularly of his forehead; and, laſtly, by the faculty of erecting and agitating the hair of his main when irritated.

Lions are very ardent in their amours: when the female is in ſeaſon, ſhe is often followed by eight or ten males, who roar inceſſantly, and enter into furious engagements, till one of them completely overcomes the reſt, takes peaceable poſſeſſion of the female, and carries her off to ſome ſecret receſs. The lionneſs brings forth her young in the ſpring, and produces but once every year.

All the paſſions of the lion, the ſoft paſſion of love not excepted, are exceſſive; the love of offspring is extreme: the lionneſs is naturally weaker, leſs bold, and more gentle than the lion; but ſhe becomes perfectly rapacious and terrible when ſhe has young. Then ſhe exhibits more courage than the male; ſhe knows no danger; ſhe attacks indifferently men and all other animals, kills them, and carries them to her young ones, whom ſhe thus early inſtructs to ſuck their blood and tear their fleſh. She generally brings forth in the moſt ſecret and inacceſſible places; and, when afraid of a diſcovery, ſhe endeavours to conceal the traces of her feet, by returning frequently on her ſteps, or rather by effacing them with her tail; and, when the danger is great, ſhe carries off her young and conceals them ſome where elſe. But, when an actual attempt is made to deprive her of her young, ſhe becomes perfectly furious, and defends them till ſhe be torn to pieces.

The lion ſeldom goes abroad in the middle of the day; he goes round in the evening and night, in queſt of prey. He is afraid of fire, never approaches the artificial fires made by the ſhepherds for the protection of their flocks; he does not trace other animals by the ſcent, but is obliged to truſt to his eyes. Many hiſtorians have even miſrepreſented him as incapable of finding out his prey; but that he is obliged to the jackal, an animal of exquiſite ſcent, in order to provide for him, and that this animal either accompanies or goes before him for this purpoſe. The jackal is a native of Arabia, Lybia, *&c.* and, like the lion, lives upon prey; perhaps ſometimes he follows the lion, but it is with a view to pick up what he leaves behind, not to provide for him; for, being a ſmall and feeble animal, he ought rather to fly than to ſerve the lion.

The lion, when hungry, will attack any animal that preſents itſelf: but he is ſo very formidable, that all endeavour to avoid his rencountre; this circumſtance often obliges him to conceal himſelf, and lie in wait till ſome animal chances to paſs. He lies ſquat on his belly in a thicket; from which he ſprings with ſuch force and velocity, that he often ſeizes them at the firſt bound. He endures hunger longer than thirſt; he ſeldom paſſes water without drinking, which he does by lapping like a dog. For his ordinary ſubſiſtence, he requires about 15 pounds of raw fleſh each day.

The roaring of the lion is ſo ſtrong and loud, that it reſembles the rumbling of diſtant thunder. His roaring is his ordinary voice: but when he is irritated, his cry is ſhorter, repeated more ſuddenly, and is ſtill more terrible than the roaring: beſides he beats his ſides with his tail, ſtamps with his feet, erects and agitates the hair of his head and main, moves the ſkin of his face, ſhows his angry teeth, and lolls out his tongue.

The gait of the lion is ſtately, grave, and ſlow, though always in an oblique direction. His movements are not equal or meaſured, but conſiſt of leaps and bounds; which prevents him from ſtopping ſuddenly, and makes him often over-leap his mark. When he leaps upon his prey, he makes a bound of 12 or 15 feet, falls above it, ſeizes it with his fore-feet, tears the fleſh with his claws, and then devours it with his teeth.

The lion, however terrible, is hunted by large dogs, well ſupported by men on horſeback: they diſlodge him, and oblige him to retire. But it is neceſſary that both the dogs and horſes be trained before-hand; for almoſt every animal frets and flies as ſoon as he feels the very ſmell of a lion. His ſkin, although hard and firm, does not reſiſt either a ball or a javelin: however, he is ſeldom killed by a ſingle ſtroke; and is more frequently taken by addreſs than force. They put a live animal above a deep pit covered with light ſubſtances, and thus decoy him into the ſnare.

2. The TIGER. The ſize of this animal, according to ſome authors, is larger, and, according to others, ſomewhat leſs than the lion. M. de la Landemagon aſſures us, that he has ſeen a tiger in the Eaſt-Indies 15 feet long, including undoubtedly the length of the

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Fig. 1. Felis Pardus *or* Panther

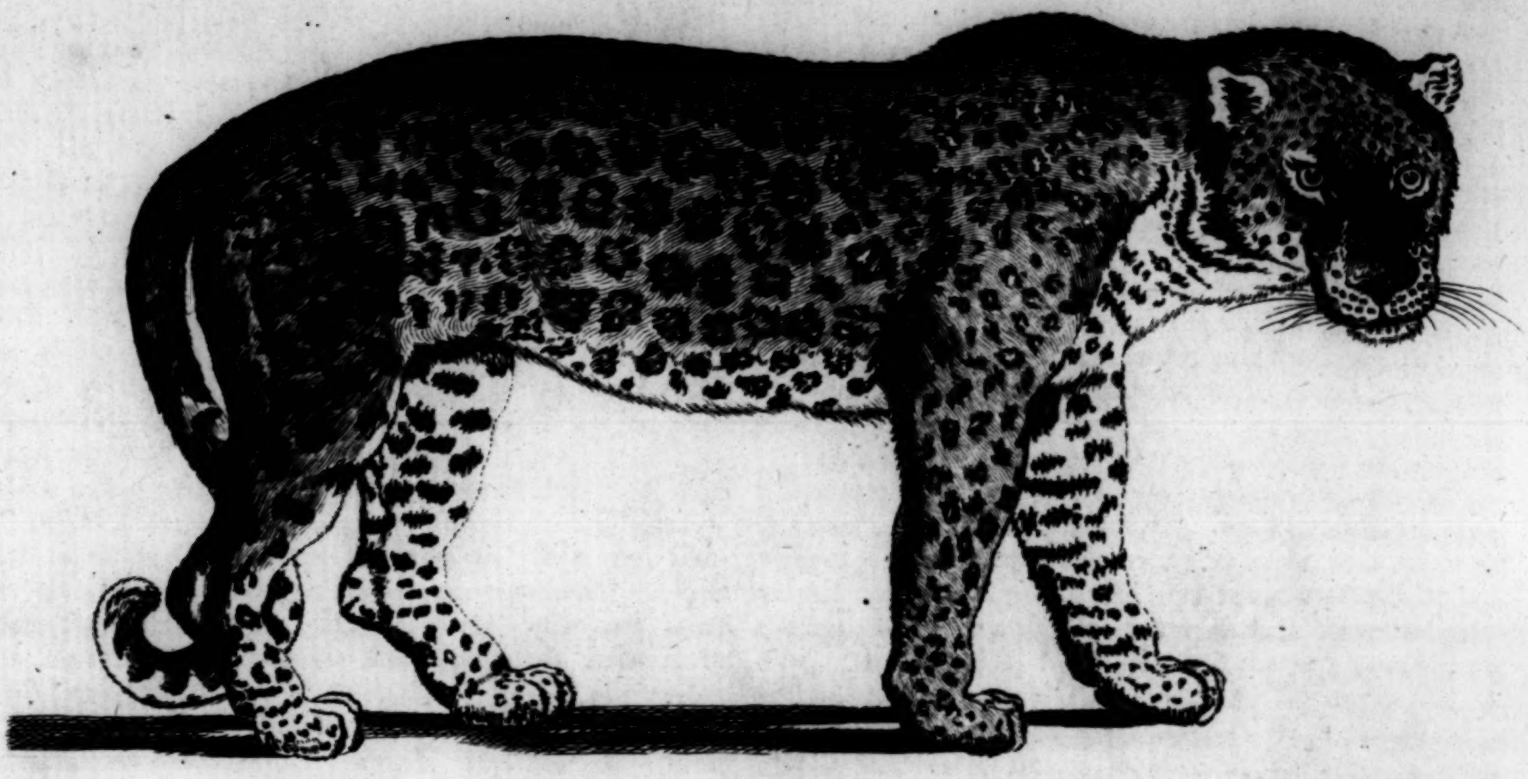
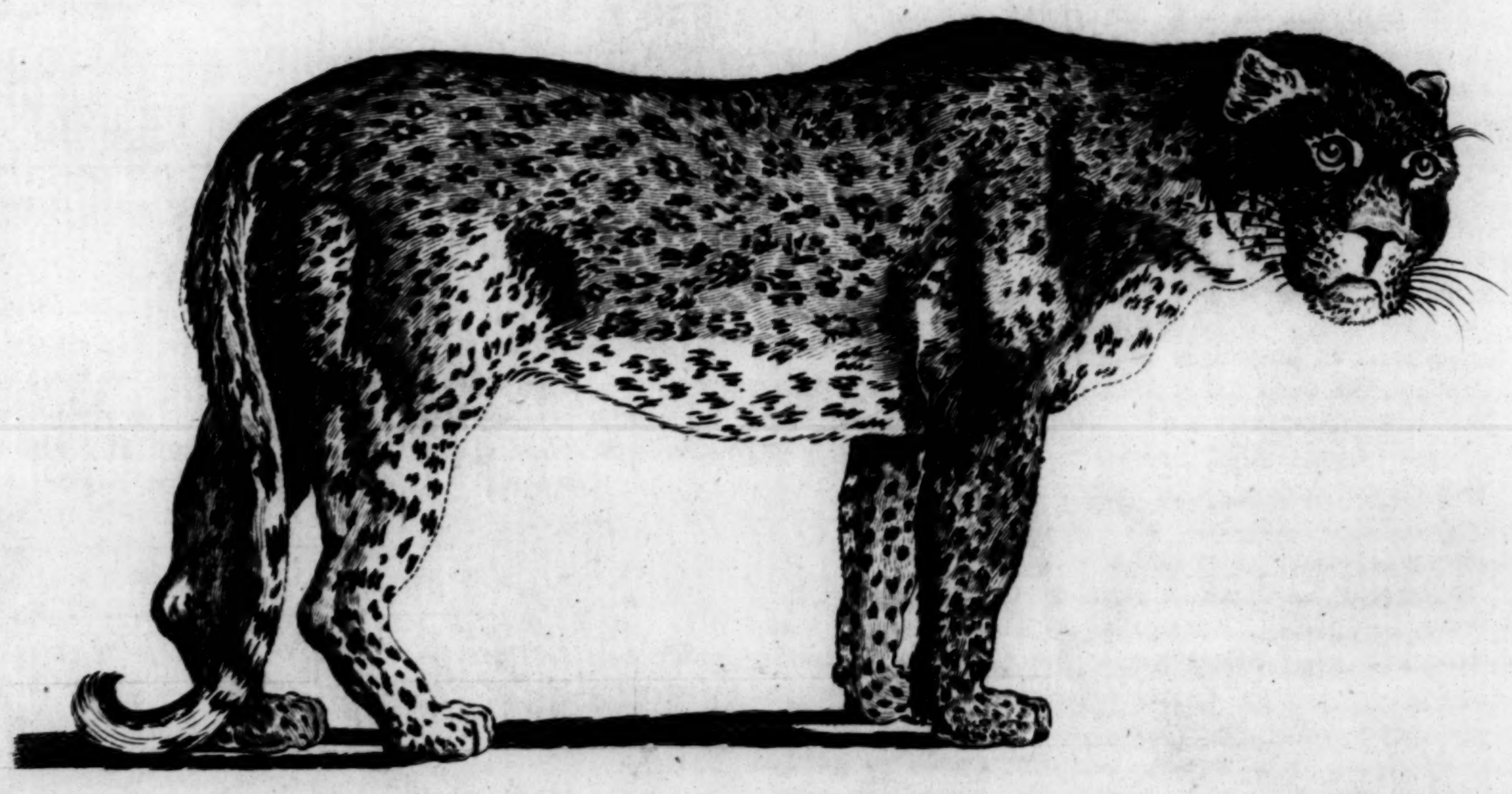


Fig. 2. Felis Leopardus *or* Leopard



A. Bell Sculp.t

the tail, which, ſuppoſing it to be four feet, makes the body of the tiger about 10 feet in length. The ſkeleton preſerved in the cabinet of the French king, indicates that the animal was about 7 feet long from the point of the muzzle to the origin of the tail; but then it muſt be conſidered that he was caught young, and lived all his days in confinement. The head of the tiger is large and roundiſh; and the ears are ſhort, and at a great diſtance from each other. The form of the body has a great reſemblance to that of the panther. The ſkin is of a darkiſh yellow colour, ſtriped with long black ſtreaks; the hair is ſhort, excepting on the ſides of the head, where it is about four inches long. The point of the tail is black, and the reſt of it is interſperſed with black rings. His legs and claws reſemble thoſe of the lion, only the legs are much ſhorter in proportion to the ſize of the animal.

The tiger is more ferocious, cruel, and ſavage than the lion. Although gorged with carnage, his thirſt for blood is not appeaſed; he ſeizes and tears in pieces a new prey with equal fury and rapacity, the very moment after devouring a former one; he lays waſte the country he inhabits; he neither dreads the aſpect nor the weapons of men; puts to death whole troops of domeſtic animals; and attacks young elephants, rhinoceros's, and ſometimes even braves the lion himſelf. The tiger ſeems to have no other inſtinct but a conſtant thirſt after blood, a blind fury which knows no bounds or diſtinction, and which often ſtimulates him to devour his own young, and to tear the mother in pieces for endeavouring to defend them. He lies in wait at the banks of rivers, *&c.* where the heat of the climate obliges the other animals to repair for drink. Here he ſeizes his prey, or rather multiplies his maſſacres: for he no ſooner kills one animal, than he flies with equal fury upon the next, with no other view but to plunge in his head into their bodies and drink their blood. However, when he kills a large animal, as a horſe or a buffalo, he ſometimes does not tear out the entrails on the ſpot; but, to prevent any interruption, he drags them off to the wood, which he executes with incredible ſwiftneſs. This is a ſufficient ſpecimen of the ſtrength of this rapacious animal.

Neither force, reſtraint, or violence can tame the tiger. He is equally irritated with good as with bad treatment: he tears the hand which nouriſhes him with equal fury as that which adminiſters blows: he roars, and is enraged at the ſight of every living creature. Almoſt every natural hiſtorian agrees in this horrible character. When viewing the beautiful tiger which is at preſent exhibiting in the city of Edinburgh, we at firſt ſuſpected that his character was not ſo bad or ferocious as repreſented by hiſtorians: he allowed the keeper not only to come near him, but to ſtroke his head and take his paw in his hand. However, this appeared to be only a forced complaiſance; he was chained ſo cloſe to the floor, that he had only juſt room to ſtand: he ſnarled and roared when his maſter troubled him more than he inclined; and, upon throwing him a piece of fleſh, his eyes inſtantly ſparkled with rage; he put himſelf in a poſture of defence, ſet up the moſt horrible roarings, and made ſeveral bounds to get at the keeper as well as the ſpectators.

It is happy for other animals, that the ſpecies of the tiger is not numerous, and that they are confined to the warm climates. They are found in Malabar, Siam, Bengal, the interior parts of Africa, and, in general, in all the regions that are inhabited by the elephant and rhinoceros.

The tiger has always been a more rare animal than the lion, and yet brings forth an equal number of young, namely, four or five at a litter. The female is furious at all times; but, when her young are attempted to be taken from her, her rage is redoubled: ſhe braves every danger; ſhe purſues the raviſhers, who are obliged, when hard preſſed, to drop one of the young in order to retard her motion; ſhe ſtops, takes it up, and carries it into ſome ſecret part of the foreſt; but ſhe inſtantly returns and purſues the hunters into their villages or boats.

The tiger moves the ſkin of his face, grinds his teeth, and roars, like the lion; but the ſound of his voice is different.

3. The **Panther**.—It is about the ſize of a large dog, and has a great reſemblance to a domeſtic cat. The tongue is rough and remarkably red; the teeth are ſtrong and ſharp; the ſkin is exceedingly beautiful, being of a yellow colour, variegated with roundiſh black ſpots, and the hair is ſhort.

The panther has a cruel and ferocious aſpect; his motions are briſk and lively; his cry reſembles that of an enraged dog, but more ſtrong and rough. He is not ſo perfectly ungovernable as the tiger: but, notwithſtanding all attempts to render him obedient and tractable, he may rather be ſaid to be ſubdued than tamed; for he never entirely loſes his natural ferocity. Accordingly, when kept with a view to hunting bucks, goats, or other animals, great care is neceſſary in training him, and ſtill greater in conducting him. When leading out to the field, they put him in a cage and carry him on a cart. When the game is ſprung, they open the door of the cage; he inſtantly ſprings towards the animal, often ſeizes him in a few bounds, throws him to the ground, and ſtrangles him. But, if he happens to miſs his aim, he becomes mad with rage, and ſometimes falls upon his maſter, who, in order to prevent accidents of this kind, generally carries along with him pieces of fleſh, or perhaps a lamb or a kid, which he throws to him in order to appeaſe his fury.

The panther is no where to be found but in Africa, and the regions of the Indies.

4. The **Onca** or **Once**, is leſs than the panther; the tail is longer; the hair is likewiſe longer, and of a whitiſh grey colour. The once is eaſily tamed; and is employed in hunting in ſeveral parts of Aſia, where dogs are very ſcarce. He has not the delicate ſcent of a dog; does not trace other animals by the ſmell; neither can he run them down in a fair chaſe; but lies in wait for their approach, and then darts upon them unawares. He leaps ſo nimbly, that he eaſily clears a ditch or a wall ſeveral feet high: beſides, he often climbs trees, waits till ſome animal paſſes, and inſtantly leaps down upon them. This method of catching their prey, is practiſed by the panther and leopard, as well as the once.

5. The **Leopard** differs from the panther and the once in the beauty of his colour, which is a lively yellow, with ſmaller ſpots than thoſe of the two latter, and

diſpoſed in groups. He is larger than the once, and leſs than the panther. The manners and diſpoſition of the leopard are nearly the ſame with thoſe of the panther. He is never tamed or employed in hunting. The panther, once, and leopard, are inhabitants of Africa and the warmer regions of Aſia. In general, theſe animals delight in thick foreſts, and frequent the banks of rivers, and the neighbourhood of ſolitary villages, where they lie in wait to ſurpriſe domeſtic animals and the wild beaſts that come in queſt of water. They ſeldom attack men, even when provoked. With regard to their ſkins, they are all valuable, and make excellent furs.

6. The Lynx is about 2½ feet long and 15 inches high. He has a great reſemblance to the cat; but his ears are longer, and his tail is much ſhorter; his hair is ſtreaked with yellow, white, and black colours. The lynx is an inhabitant of Muſcovy, Poland, Canada, *&c.* his eyes are brilliant, his aſpect is ſoft, and his air is gay and ſprightly; like the cat, he covers his urine with earth; he howls ſomething like the wolf, and is heard at a conſiderable diſtance; he does not run like the dog or wolf, but walks and leaps like a cat; he purſues his prey even to the tops of trees; neither wild-cats nor ſquirrels can eſcape him; he lies in wait for ſtags, goats, hares, *&c.* and darts ſuddenly upon them; he ſeizes them by the throat and ſucks their blood, then opens the head and eats the brain; after this, he frequently leaves them and goes in queſt of freſh prey; the colour of his ſkin changes according to the ſeaſon or the climate; the winter furs are more beautiful than thoſe of ſummer.

7. The Cat, is a well-known domeſtic animal, and therefore requires no particular deſcription. The wild-cat, the cat of Angora, *&c.* differ only in the length of their hair, and ſome ſmall varieties ariſing from climate and their manner of living.

Of all domeſtic animals, the character of the cat is the moſt equivocal and ſuſpicious. He is kept, not for any amiable qualities, but purely with a view to baniſh rats, mice, and other noxious animals from our houſes, granaries, *&c.* Although cats, when young, are playful and gay, they poſſeſs at the ſame time an innate malice and perverſe diſpoſition, which increaſes as they grow up, and which education learns them to conceal, but never to ſubdue. Conſtantly bent upon theft and rapine, though in a domeſtic ſtate, they are full of cunning and diſſimulation; they conceal all their deſigns; ſeize every opportunity of doing miſchief, and then fly from puniſhment. They eaſily take on the habits of ſociety, but never its manners; for they have only the appearance of friendſhip and attachment. This diſingenuity of character is betrayed by the obliquity of their movements, and the ambiguity of their looks. In a word, the cat is totally deſtitute of friendſhip; he thinks and acts for himſelf alone. He loves eaſe, ſearches for the ſofteſt and warmeſt places to repoſe himſelf. The cat is likewiſe extremely amorous; and, which is very ſingular, the female is more ardent than the male; ſhe not only invites, but ſearches after and calls upon him to ſatisfy the fury of her deſires; and, if the male diſdains or flies from her, ſhe purſues, bites, and in a manner compels him. This heat of paſſion in females laſts but nine or ten days, and happens twice in the year, namely in the ſpring and autumn; however, in ſome it happens thrice or four times in the year. The female goes with young 55 or 56 days, and generally produces four or five at a litter. As the male has an inclination to deſtroy the young, the female takes care to conceal them from him; and, when ſhe is apprehenſive of a diſcovery, ſhe takes them up in her mouth one by one, and hides them in holes or inacceſſible places. When ſhe has nurſed a few weeks, ſhe brings them mice, ſmall birds, *&c.* in order to learn them to eat fleſh. But, it is worth notice, that theſe careful and tender mothers ſometimes become unnaturally cruel, and devour their own offſpring.

The cat is incapable of reſtraint, and conſequently of being educated to any extent. However, we are told, that the Greeks in the iſland of Cyprus trained this animal to catch and devour ſerpents, with which that iſland was greatly infeſted. This however was not the effect of obedience, but of a general taſte for ſlaughter; for he delights in watching, attacking, and deſtroying all kinds of weak animals indifferently. He has no delicacy of ſcent, like the dog; he hunts only by the eye: neither does he properly purſue: he only lies in wait, and attacks animals by ſurpriſe: and after he has caught them, he ſports with and torments them a long time, and at laſt kills them (when his belly is full) purely to gratify his ſanguinary appetite.

The eye of the cat differs greatly from that of moſt other animals. The pupil is capable of a great degree of contraction and dilatation; it is narrow and contracted like a line during the day, round and wide in the dark; it is from this conformation of the eye that the cat ſees beſt in the night, which gives him a great advantage in diſcovering and ſeizing his prey.

Although cats live in our houſes, they can hardly be called domeſtic animals; they may rather be ſaid to enjoy full liberty; for they never act but according to their own inclination. Beſides, the greateſt part of them are half wild; they do not know their maſters, and frequent only the barns, out-houſes, *&c.* unleſs when preſſed with hunger.

Cats have a natural antipathy at water, cold, and bad ſmells. They love to baſk in the ſun, and lie in warm places. They likewiſe have an affection for certain aromatic ſmells; they are tranſported with the root of the valerian.

Cats take about eighteen months before they come to their full growth; but they are capable of propagation in twelve months, and retain this faculty all their life, which generally extends to nine or ten years. They eat ſlowly, and are peculiarly fond of fiſhes. They drink frequently; their ſleep is light; and they often aſſume the appearance of ſleeping, when in reality they are meditating miſchief. They walk ſoftly, and without making any noiſe. As their hair is always dry, it eaſily gives out an electrical fire, which becomes viſible when rubbed a-croſs in the dark. Their eyes likewiſe ſparkle in the dark like diamonds.

The wild, or ſavage cat, couples with the domeſtic one, and is conſequently the ſame ſpecies. It is not unuſual for domeſtic cats, both male and female, when ſtimulated by love, to repair to the woods in queſt of theſe

Plate LXXX.

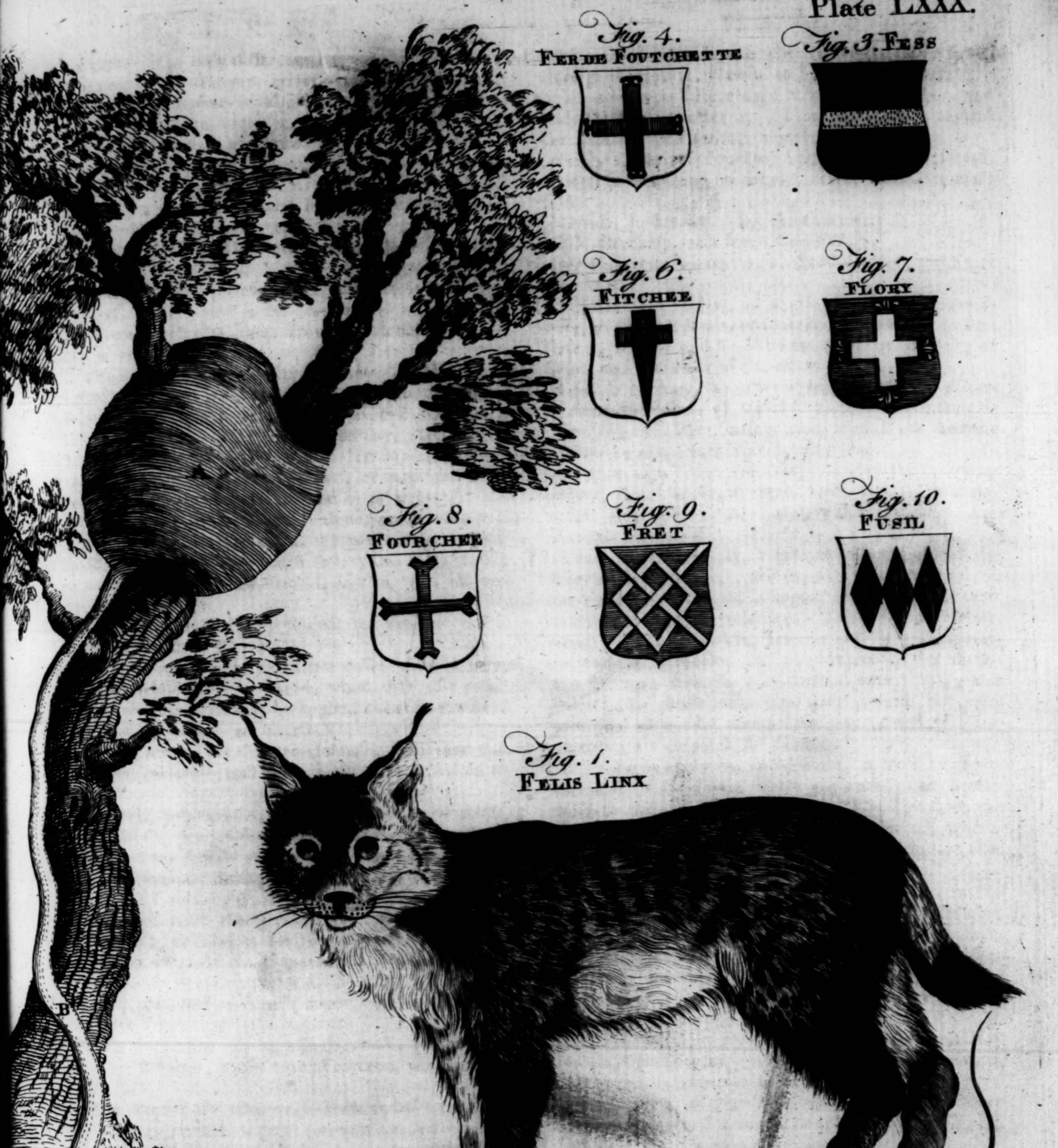


Fig. 4.
Fer de Foutchette
Fig. 3. Fess
Fig. 6.
Fitchee
Fig. 7.
Flory
Fig. 8.
Fourchee
Fig. 9.
Fret
Fig. 10.
Fusil
Fig. 1.
Felis Linx
B
Fig. 3
Formica Herculanea or Largest Ant
Fig. 2.
Fistulapia Tabacaria or Tobacco pipe Fish

A Bell Sculpt.

4 AP 54

vage cats. The only difference between them is, that the ſavage cat is ſtronger, larger, and more ferocious. The cat is a native of almoſt every country in the world; and all the varieties in their appearance may be reaſonably enough attributed to the climates which produce them. See figures of the principal ſpecies of the Felis, on Plate LXXVIII, LXXIX, and LXXX.

FELKIRK, a town of Auſtria, in Germany, thirty-five miles ſouth-eaſt of Conſtance.

FELLOWSHIP, or Company, in arithmetic. See Arithmetic, p. 386.

FELO de se, in law, a perſon that lays deliberately violent hands on himſelf, and is the occaſion of his untimely death, whether by hanging, drowning, ſtabbing, ſhooting, or any other way.

FELON, in law, a perſon guilty of felony. See Felony.

FELONY, in law, a capital crime, next in degree to petit treaſon, and committed with an evil intention; ſuch are murder, theft, ſuicide, ſodomy, rape, *&c.*

FELT, in commerce, a ſort of ſtuff deriving all its conſiſtence merely from being fulled, or wrought with lees and ſize, without either ſpinning or weaving.

Felt is made either of wool alone, or of wool and hair. Thoſe of French make, $3\frac{1}{2}$ yards long, and $1\frac{1}{2}$ broad, for cloaks, pay each 2 l. 14 s. $1\frac{80}{100}$ d. on importation; and draw back 1 l. 12 s. 3 d. on exporting them again.

FELTRI, a town of Italy, ſubject to Venice, thirty-five miles north of Padua.

FELUCCA, in ſea-affairs, a little veſſel with ſix oars, frequent in the Mediterranean, which has this peculiarity, that its helm may be applied either in the head or ſtern, as occaſion requires.

FEMALE, a term peculiar to animals, ſignifying that ſex which conceives and generates its young within itſelf.

FEMININE, in grammar, one of the genders of nouns. The feminine gender ſerves to intimate that the noun belongs to the female. In Latin, the femine gender is moſt commonly diſtinguiſhed by the article *hæc*, as it is in the Greek by ἡ. In the French, the article *la* commonly denotes this gender; but we have no ſuch diſtinction by articles in the Engliſh language.

FEMUR, os femoris, in anatomy. See Anatomy, p. 182.

FEN, a place overflowed with water, or abounding with bogs.

FENCE, in country-affairs, a hedge, wall, ditch, bank, or other incloſure, made around gardens, woods, cornfields, *&c.*

The chief reaſon why wood-lands and plantations ſo ſeldom proſper, is in a great meaſure owing to the neglect of fencing them round to keep out the cattle. This neglect prevails much in the northern parts of this iſland, though the uſe of fences is certainly more neceſſary there than in the ſouth, as the lands require more ſhelter and warmth. There are ſeveral ways of fencing lands, but the uſual is that of hedging it with either white or black thorn, crab, holly, alder, or furze, *&c.*

Fence month, the month wherein deer begin to fawn, during which it is unlawful to hunt in the foreſt.

It commences fifteen days before mid-ſummer, and ends fifteen days after it. This month, by ancient foreſters is called defence-month.

FENCING, the art of making a proper uſe of the ſword, as well for attacking an enemy, as for defending one's ſelf.

FENNEL, in botany. See Anethum.

FEOD, the ſame with fee. See Fee.

FEODAL, and Feodatory. See Feudal, and Feudatory.

FEOFFMENT, in law, is a gift or grant of any manors, meſſuages, lands, or tenements, to another in fee; that is, to him and his heirs for ever, by delivery of ſeiſin, and poſſeſſion of the eſtate granted.

FERÆ, in zoology, an order of quadrupeds, the diſtinguiſhing characters of which are, that all the animals belonging to it have ſix fore-teeth in each jaw, and the canine, or dog-teeth, conſiderably long.

Under this order are comprehended the following genera, *viz.* the phoca, canis, felis, viverra, muſtela, urſus, didelphis, talpa, ſorex, and erinaceus. See Canis, Felis, *&c.*

FERALIA, in antiquity, a feſtival obſerved among the Romans on February 21ſt, or, according to Ovid, on the 17th of that month, in honour of the manes of their deceaſed friends and relations. During the ceremony, which conſiſted in making preſents at their graves, marriages were forbidden, and the temples of the divinities ſhut up; becauſe they fancied that, during this feſtival, the ghoſts ſuffered no pains in hell, but were permitted to wander about their graves, and feaſt upon the meats prepared for them.

Fer de fourchette, in heraldry, a croſs having at each end a forked iron, like that formerly uſed by ſoldiers to reſt their muſquets on. It differs from the croſs fourché, the ends of which turn forked, whereas this has that ſort of fork fixed upon the ſquare end. See Plate LXXX. fig. 4.

Fer de moulin, *milrinde, inke de moulin,* in heraldry, is a bearing ſuppoſed to repreſent the iron-ink or ink of a mill, which ſuſtains the moving mill-ſtone.

FERDEN, or Verden, a city of Germany, ſubject to Hanover; it is ſituated in lower Saxony, on the river Aller, twenty ſix miles ſouth eaſt of Bremen: E. lon. 9°, and N. lat. 53° 24'.

FERENTARII, in Roman antiquity, were auxiliary troops, lightly armed; their weapons being a ſword, bow, arrows, and a ſling.

FERETINO, a city and biſhop's ſee of Italy, about fifty miles eaſt of Rome: E. long. 14° 5', and N. lat. 41° 45'.

FERIÆ, in Roman antiquity, holidays, or days upon which they abſtained from work.

The Romans had two kinds of feriæ: 1. The public, common to all the people in general. 2. The private, which were only kept by ſome private families.

The public feriæ were fourfold: 1. Stativæ feriæ, holidays which always fell out upon the ſame day of the month, and were marked in the calendar; of theſe the chief were the agonalia, carmentalia, and lupercalia. 2. Conceptivæ feriæ, holidays appointed every year upon certain or uncertain days by the magiſtrates or the pontiff; ſuch were the latinæ, paganalia, compitalia, *&c.* See PAGANALIA, *&c.* 3. Imperativæ feriæ, holidays commanded or appointed by the authority of the conſuls or prætors; of this kind we may reckon the lectiſternium. See LECTISTERNIUM. 4. Nundinæ, the days for fairs. See NUNDINÆ.

FERIÆ LATINÆ were inſtituted by Tarquinius Superbus, who having overcome the Tuſcans, made a league with the Latins, and propoſed to them to build a temple in common to Jupiter Latialis, in which both nations might meet, and offer ſacrifice for their common ſafety. At this feſtival a white bull was ſacrificed; and each town, both of the Latins and Romans, provided a certain quantity of meat, wine, and fruits. At firſt the ſolemnity continued but one day; after the expulſion of the kings, the ſenate added a third, a fourth, and ſo on to ten days.

FERIA, in the Romiſh breviary, is applied to the ſeveral days of the week; thus Monday is the feria ſecunda, Tueſday the feria tertia; though theſe days are not working days, but holidays. The occaſion of this was, that the firſt Chriſtians were uſed to keep the eaſter week holy, calling Sunday the prima feria, *&c.* whence the term feria was given to the days of every week. But beſides theſe, they have extraordinary feriæ, *viz.* the three laſt days of paſſion-week, the two following eaſter-day, and the ſecond feriæ of rogation.

FERMANACH, a county of Ireland, in the province of Ulſter, the chief town of which is Inniſkilling.

FERMENT, any body which, being applied to another, produces fermentatton.

Ferments are either matters already in the act of fermentation, or that ſoon run into this act. Of the firſt kind are the flowers of wine, yeaſt, fermenting beer, or fermenting wine, *&c.* and of the ſecond are the new expreſſed vegetable juices of ſummer-fruit.

Among diſtillers, ferments are all thoſe bodies which, when added to the liquor, only correct ſome fault therein, and, by removing ſome obſtacle to fermentation, forward it by ſecondary means; as alſo ſuch as, being added in time of fermentation, make the liquor yield a larger proportion of ſpirit, and give it a finer flavour.

FERMENTATION, may be defined a ſenſible internal motion of the conſtituent particles of a moiſt, fluid, mixt or compound body; by the continuance of which motion, theſe particles are gradually removed from their former ſituation or combination, and again, after ſome viſible ſeparation is made, joined together in a different order and arrangement. See CHEMISTRY. p. 94.

FERMO, a port-town of Italy, ſituated on the gulf of Venice, about thirty miles ſouth of Ancona. It is an archbiſhop's ſee.

FERN, *filix*, in botany. See FILIX, OSMUNDA, ACROSTICUM, *&c.*

FERNANDO, or FERNANDES, an iſland in the Pacific ocean: W. long. 83°, S. lat. 33°.

FERRARA, a city and archbiſhop's ſee of Italy: E. long. 12° 6′, N. lat. 44° 50′.

FERRE, or *le* FERRE, a city of Picardy, in France, forty miles ſouth-eaſt of Amiens: E. long. 3° 26′, N. lat. 49° 45′.

FERRET, in zoology. See MUSTELA.

FERRETS, among glaſs-makers, the iron with which the workmen try the melted metal, to ſee if it be fit to work.

It is alſo uſed for thoſe irons which make the rings at the mouth of bottles.

FERRETTO, in glaſs-making, a ſubſtance which ſerves to colour glaſs.

This is made by a ſimple calcination of copper, but it ſerves for ſeveral colours: there are two ways of making it, the firſt is this. Take thin plates of copper, and lay them on a layer of powdered brimſtone, in the bottom of a crucible; over theſe lay more brimſtone, and over that another lay of the plates, and ſo on alternately till the pot is full. Cover the pot, lute it well, place it in a wind furnrce, and make a ſtrong fire about it for two hours. When it is taken out and cooled, the copper will be found ſo calcined, that it may be crumbled to pieces between the fingers, like a friable earth. It will be of a reddiſh, and, in ſome parts, of a blackiſh colour. This muſt be powdered and ſifted fine for uſe.

FERRO, W. long. 19.°, N. lat. 28°, the moſt weſterly of the Canary iſlands, near the African coaſt, where the firſt meridian was lately fixed in moſt maps; but now, the geographers of almoſt every kingdom make their reſpective capitals the firſt meridian, as we do London.

FERRO, ſome little iſlands ſituated in the northern ocean, 200 miles north-weſt of the Orcades, and as many ſouth-eaſt of Iceland: W. long 7°, N. lat. 63°.

FERROL, a ſea-port-town of Spain, in the principality of Galicia, ſituated on a bay of the Atlantic ocean, twenty miles north-eaſt of the Groyne, and fifty miles north of Compoſtella, a good harbour, where the Spaniſh ſquadrons frequently ſecured themſelves in the late war: W. long 8° 40′, N. lat. 43° 30′.

FERRUGINOUS, any thing partaking of iron, or which contains particles of that metal.

FERRUGO, RUST. See RUST.

FERRUM, IRON. See IRON.

FERRY, a liberty by preſcription, or the king's grant, to have a boat for paſſage, on a firth or river, for carrying paſſengers, horſes, *&c.* over the ſame for a reaſonable toll.

FERTILITY, that quality which denominates a thing fruitful or prolific.

FERULA, in botany, a genus of the pentandria digynia claſs. The fruit is oval, compreſſed, and has three furrows on each ſide. There are nine ſpecies, none of them natives of Britain.

FESSE, in heraldry, one of the nine honourable ordinaries, conſiſting of a line drawn directly acroſs the ſhield, from ſide to ſide, and containing the third part of it, between the honour-point and the nombril.

It repreſents a broad girdle or belt of honour, which knights at arms were anciently girded with. See Plate LXXX. fig. 5.

FESSE POINT, is the exact centre of the eſcutcheon. See POINT.

FESSE-WAYS, or *in* FESSE, denotes any thing borne after the manner of a feſſe; that is, in a rank acroſs the middle of the ſhield.

Party per FESSE, implies a parting acroſs the middle of the ſhield, from ſide to ſide, through the feſſe point.

FESTI DIES, in Roman antiquity, certain days in the year, devoted to the honour of the gods.

Numa, when he diſtributed the year into twelve months, divided the ſame into the dies feſti, dies profeſti, and dies interciſi.

The feſti were again divided into days of ſacrifices, banquets, games, and feriæ. See SACRIFICE, EPULÆ, LUDI, and FERIÆ.

The profeſti were thoſe days allowed to men for the adminiſtration of their affairs, whether of a public or private nature: theſe were divided into faſti, comitiales, comperendini, ſtati, and præliares. See FASTI, COMITIALES, &c.

The interciſi were days common both to gods and men, ſome parts of which were allotted to the ſervice of the one, and ſome to that of the other.

FESTINO, in logic. the third mood of the ſecond figure of the ſyllogiſm, the firſt propoſition whereof is an univerſal negative, the ſecond a particular affirmative, and the third a particular negative: as in the following example:

FES No bad man can be happy,
TI Some rich men are bad men:
NO *Ergo*, ſome rich men are not happy.

FESTIVAL, the ſame with feaſt. See FEAST.

FESTOON, in architecture and ſculpture, &c. an ornament in form of a garland of flowers, fruits and leaves, intermixed or twiſted together.

FESTUCA, in botany, a genus of graſſes, belonging to the triandria digynia claſs. The calix has two valves; and the ſpica is oblong and cylindrical. There are ſixteen ſpecies; eleven of which are natives of Britain, *viz.* the ovina, or ſheep's feſcue-graſs; the rubiuſcula, or hard feſcue-graſs; the rubra, or purple feſcue-graſs; the bromoides, or barren feſcue-graſs; the myuros, or wall feſcue-graſs; the pratenſis, or meadow feſcue-graſs; the elatior, or tall feſcue-graſs; the decumbens, or ſmall feſcue-graſs; the fluitans, or flat feſcue-graſs; the loliacea, or ſpiked feſcue-graſs; and the ſylvatica, or wood feſcue graſs.

FETIPOUR, a city of the hither India, twenty-five miles weſt of Agra: E. long. 78° 40′, N. lat. 27°.

FETLOCK, in the menage, a tuft of hair growing behind the paſtern joint of many horſes; for thoſe of a low ſize have ſcarce any ſuch tuft.

FEUD, the ſame with fee. See FEE.

FEUDAL. or FEODAL, denotes any thing belonging to a fee See FEE.

FEUDATORY, or FEODATORY, a tenant who formerly held his eſtate by feodal ſervice.

FEU-DUTY, in Scots law, is the annual rent or duty which a vaſſal, by the tenor of his right, becomes bound to pay to his ſuperior. See SCOTS LAW, title 11.

FEU-HOLDING, in Scots law, is that particular tenor by which a vaſſal is taken bound to pay an annual rent or feu-duty to his ſuperior. See SCOTS LAW, tit. 11.

FEVER, in medicine. See MEDICINE.

FEVERFEW, in botany. See MATRICARIA.

FEVERSHAM, a port-town of Kent, and one of the cinqueports. See CINQUEPORT.

It ſtands ſeven miles weſt of Canterbury.

FEZ, the capital of the empire of Fez and Morocco, in Africa: W. long 6°, N. lat. 33° 30′.

It is a large and populous city, and the uſual reſidence of the emperor.

FIAR, in Scots law, the perſon veſted in the feudal property of a ſubject. See FEE.

FIASCONE, a city and biſhop's ſee of Italy, about twelve miles ſouth of Orvietto.

FIAT, in law, a ſhort order or warrant ſigned by a judge, for making out and allowing certain proceſſes.

FIBRARIÆ, a claſs of foſſils, naturally and eſſentially ſimple, not inflammable nor ſoluble in water, and compoſed of parallel fibres, ſome ſhorter, others longer; their external appearance being bright, and in ſome degree tranſparent: add to this, that they never give fire with ſteel, nor ferment with, or are ſoluble in acid menſtrua.

FIBRE, in anatomy, a perfectly ſimple body, or at leaſt as ſimple as any thing in the human ſtructure; being fine and ſlender like a thread, and ſerving to form other parts. Hence ſome fibres are hard, as the bony ones; and others ſoft, as thoſe deſtined for the formation of all the other parts.

The fibres are divided alſo, according to their ſituation, into ſuch as are ſtraight, oblique, tranſverſe, annular, and ſpiral; being found arranged in all theſe directions, in different parts of the body.

FIBROSE, ſomething conſiſting of fibres, as the roots of plants. See ROOT.

FIBULA, in anatomy. See ANATOMY, p. 184.

FICARIA, in botany. See RANUNCULUS.

FICEDULA, in ornithology. See MOTACILLA.

FICOIDEA, in botany. See AIZOON.

FICOIDES, a name given to ſeveral diſtinct plants, as the meſembryanthemum muſa, and opuntia. See MESEMBRYANTHEMUM.

FICTION. See FABLE.

FICUS, the FIG-TREE, in botany, a genus of the polygamia polyœcia claſs. The common receptacle is turbinated, fleſhy, and conceals the floſcules. The calix of the male conſiſts of three ſegments; it has no corolla, but has three ſtamina: the calix of the female conſiſts of five ſegments; it has no corolla, and but one piſtil, and one ſeed. There are ſeven ſpecies, all of them natives of warm climates. The fruit of the fig-tree is a ſoft emollient ſweet, and as ſuch enters into ſeveral compoſitions.

FIDA, a town on the ſlave-coaſt of Guinea: E. long. 3°, N. lat. 6°.

FIDD, in the ſea-language, an iron, or wooden pin, to ſplice and faſten ropes together.

Fidd-hammer, one whoſe handle is a fidd, or made taper-wiſe.

FIDDLE. See Violin.

FIDEI Commissum, in Roman antiquity, an eſtate left in truſt with one perſon, for the uſe of another. See Trustee.

FIDICINALES, muſcles of the fingers. See Lumbricales.

FIEF, or **Fee**. See Fee.

FIELD, in agriculture, a piece of ground incloſed, whether for tillage or paſture.

Field, in heraldry, is the the whole ſurface of the ſhield, or the continent, ſo called becauſe it containeth thoſe atchievements anciently acquired in the field of battle. It is the ground on which the colours, bearings, metals, furs, charges, *&c.* are repreſented. Among the modern heralds, field is leſs frequently uſed in blazoning than ſhield or eſcutcheon. See the article Shield, *&c.*

Field-book, in ſurveying, that wherein the angles, ſtations, diſtances, *&c.* are ſet down.

Field-colours, in war, are ſmall flags of about a foot and half ſquare, which are carried along with the quarter-maſter general, for marking out the ground for the ſquadrons and battalions.

Field-fare, in ornithology. See Turdus.

Field-officers, in the art of war. See Officer.

Field-pieces, ſmall cannons, from three to twelve pounders, carried along with an army in the field.

Field-staff, a weapon carried by the gunners, about the length of a halbert, with a ſpear at the end; having on each ſide ears ſcrewed on, like the cock of a match-lock, where the gunners ſcrew in lighted matches, when they are upon command; and then the field-ſtaffs are ſaid to be armed.

Field works, in fortification, are thoſe thrown up by an army in beſieging a fortreſs, or by the beſieged to defend the place. Such are the fortifications of camps, highways, *&c.*

Elyſian **Fields.** See Elysian.

FIERI FACIAS, in law, a writ that lies where a perſon has recovered judgment for debt or damages in the king's courts againſt one, by which the ſheriff is commanded to levy the debt and damages on the defendant's goods and chattels.

FIFE, in muſic, is a ſort of wind-inſtrument, being a ſmall pipe. See Pipe.

Fife, in geography, a county of Scotland bounded by the Frith of Tay on the north; by the German ſea on the eaſt; by the Frith of Forth on the ſouth; and by Monteeth and Stirling on the weſt.

Fife-rails, in a ſhip, are thoſe that are placed on baniſters, on each ſide of the top of the poop, and ſo along with hances or falls.

They reach down to the quarter-deck, and to the ſtair of the gang-way.

FIFTH, in muſic, one of the harmonical intervals or concords. See Music.

FIG, or fig-tree. See Ficus.

Figwort, a plant called by the botaniſts ſcrophularia. See Scrophularia.

FIGURAL, **Figurate**, or **Figurative**, a term applied to whatever is expreſſed by obſcure reſemblances. The word is chiefly applied to the types and myſteries of the Moſaic law; as alſo to any expreſſion whch is not taken in its primary and literal ſenſe.

FIGURE, in phyſics, expreſſes the ſurface or terminating extremities of any body.

Figures, in arithmetic, are certain characters whereby we denote any number which may be expreſſed by any combination of the nine digits, *&c.* See Arithmetic.

Figure, among divines, is uſed for the myſteries repreſented under certain types.

Figure, in dancing, denotes the ſeveral ſteps which the dancer makes in order and cadence, conſidered as they mark certain figures on the floor.

Figure, in painting and deſigning, denotes the lines and colours which form the repreſentation of any animal, but more particularly of a human perſonage.

Figure, in compoſition. See Allegory, Apoſtrophe, Hyperbole, Personification, *&c.*

FIGURED, in general, ſomething marked with figures.

The term figured is chiefly applied to ſtuffs, whereon the figures of flowers, and the like, are either wrought or ſtamped.

FILAMENT, in phyſiology and anatomy. See Fibre.

Filaments, among botaniſts, is particularly uſed for the ſtamina. See Botany, Sect. II.

FILBERT, or **Filberd**, the fruit of the corylus, or hazel. See Corylus.

FILE, among mechanics, a tool uſed in metal, *&c.* in order to ſmooth, poliſh, or cut.

This inſtrument is of iron, or forged ſteel, cut in little furrows, with chiſſels and a mallet, this and that way, and of this or that depth, according to the grain or touch required. After cutting the file, it muſt be tempered with a compoſition of chimney ſoot, very hard and dry, diluted, and wrought up with urine, vinegar, and ſalt; the whole being reduced to the conſiſtence of muſtard. Tempering the files conſiſts in rubbing them over with this compoſition, and covering them in loam; after which they are put in a charcoal fire, and taken out by that time they have acquired a cherry colour, which is known by a ſmall rod of the ſame ſteel put in along with them. Being taken out of the fire, they are thrown into cold ſpring-water; and when cold, they are cleaned with charcoal and a rag; and being clean and dry, are kept from ruſt by laying them up in wheat bran. Iron files require more heating than ſteel ones. Files are of different forms, ſizes, cuts, and degrees of fineneſs, according to the different uſes and occaſions for which they are made.

File, in the art of war, a row of ſoldiers, ſtanding one behind another, which is the depth of the battalion or or ſquadron. The files of a battalion of foot are generally three deep; as are ſometimes thoſe of a ſquadron of horſe. The files muſt be ſtraight, and parallel one to another.

FILIGRANE, or Filigree-work, any piece of gold or ſilver-work that is curiouſly done with grains or drops on the filaments or threads.

FILIPENDULA, in botany. See Spiræa.

FILIX, in botany, an order of the cryptogamia claſs of plants. See Botany, p. 636.

FILLET, in anatomy. See Froenum.

Fillet, or Filet, in architecture, a little ſquare member, ornament, or moulding, uſed in divers places, and upon divers occaſions, but generally as a crowning over a greater moulding.

Fillet, in heraldry, a kind of orle or bordure, containing only a third or fourth part of the breadth of the common bordure. It is ſuppoſed to be withdrawn inwards, and is of a different colour from the field. It runs quite round, near the edge, as a lace over a cloak.

Fillet, in the menage, the loins of an horſe, which begin at the place where the hinder part of the ſaddle reſts.

FILLER horse, one yoked immediately to a cart.

FILLY, a term among horſe-dealers, to denote the femaleor mare-colt.

FILM, a thin ſkin or pellicle. In plants, it is uſed for that thin, woody ſkin, which ſeparates the ſeeds in the pods, and keeps them apart.

FILTER, or Filtre, in chemiſtry, a ſtrainer commonly made of bibulous or filtering paper in the form of a funnel, through which any fluid is paſſed, in order to ſeparate the groſs particles from it, and render it limpid.

FIMBRIÆ, denotes appendages diſpoſed by way of fringe round the border of any thing.

FIMBRIATED, in heraldry, an ordinary with a narrow bordure or hem of another tincture.

FIN, in natural hiſtory, a well-known part of fiſhes, conſiſting of a membrane ſupported by rays, or little bony or cartilaginous oſſicles.

FINAL, in general, whatever terminates or concludes a thing.

Final letters, among Hebrew grammarians, five letters ſo called, becauſe they have a different figure at the end of words from what they have in any other ſituation.

Final, in geography, a port town of Italy, ſubject to Genoa, and ſituated on the Mediterranean, about thirty-ſeven miles ſouth-weſt of that city.

FINANCES, in the French polity, ſignify the revenues of the king and ſtate.

FINCH-kind, in ornithology, an appellation given to a genus of birds, known among authors by the name of fringilla. See Fringilla.

FINE, in law, has divers ſignifications, it being ſometimes taken for a ſum of money advanced and paid for the income of lands. It is likewiſe uſed in another ſenſe, where a ſum is paid as an amends, or by way of puniſhment for an offence committed.

FINERS *of gold and ſilver*, are thoſe who ſeparate theſe metals from coarſer ores. See Refiners.

FINERY, in the iron works, one of the forges at which the iron is hammered and faſhioned into what they call a bloom, or ſquare bar.

FINGERS, in anatomy, the extreme part of the hand divided into five members. See Anatomy, part I. and II.

FINISTERRA, the moſt weſterly cape or promontory of Spain, in 10° 15′ W. long. and 43° N. lat. This cape is likewiſe the moſt weſterly part of the continent of Europe.

FINITE, ſomething bounded or limited, in contradiſtinction to infinite. See Infinite.

FINLAND, a province of Sweden, lying northward of the gulph of Finland, and eaſtward of the Bothnick gulph. It is a frontier province, bounded by Ruſſia on the eaſt.

FIR-tree, in botany. See Pinus.

FIRE, a general name, by which men ſeem to underſtand a certain ſenſation or complex notion of light, heat, burning, melting, *&c.*

The power of fire is ſo great, its effects ſo extenſive, and the manner of its acting ſo wonderful, that ſome of the wiſeſt nations of old reverenced and worſhipped it, as the ſupreme deity. Some of the chemiſts alſo, after they had diſcovered its ſurpriſing operations, ſuſpected it to be an uncreated being: and indeed the moſt famous of them have acknowledged it as the ſource of all their knowledge; and hence have profeſſed themſelves philoſophers by fire, nor thought they could be honoured with a nobler title. Now, amongſt all the wonderful properties of fire, there is none more extraordinary than this, that though it is the principal cauſe of almoſt all the ſenſible effects that continually fall under our obſervation, yet it is itſelf of ſo infinitely a ſubtile nature, that it illudes the moſt ſagacious enquiries, nor ever comes within the cognizance of our ſenſes. Fire is generally divided into three kinds or ſpecies, *viz.* celeſtial, ſubterraneous, and culinary.

By celeſtial fire is principally underſtood that of the ſun, without regard to that of the fixed ſtars, though this perhaps may be of the ſame nature.

By ſubterraneous fire we underſtand that which manifeſts itſelf in fiery eruptions of the earth, volcanoes, or burning mountains; or by any other effects it produces in mines, or the more central parts of the earth.

By culinary fire we mean that employed in all chemical operations, and the common occaſions of life.

The ſun's heat appears to be the actuating principle, or general inſtrument of all the operations in the animal, vegetable, atmoſpherical, marine, and mineral kingdoms.

Fire, conſidered in itſelf, ſeems to exiſt in the greateſt purity and perfection in the celeſtial regions; at leaſt we are inſenſible of any conſiderable ſmoke it yields: for the rays of light come to us from the ſun, unmixed with any of that groſs, feculent, or terreſtrial matter, found in culinary and ſubterranean fires: but, allowing for this difference, the effects of the ſolar fire appear the ſame as thoſe of culinary fire.

If we to examine the effects of ſubterraneous fires, we ſhall find them the ſame with thoſe produced by culinary fire. Thus, burnt coals, cinders, and melted minerals, are thrown up by Veſuvius and other burning mountains. Warm nephritical exhalations, natural hot ſprings, ſteams, vapours, ſmoke, &c. are found in ſeveral parts of the globe, riſing nearly in the ſame manner as if they were produced by the heat of a furnace. Whence it appears, that ſubterraneous fires are of the ſame nature with the culinary.

As men generally affix to the word fire, a complex idea of burning, light, heat, melting, &c. this idea ſhould be analyſed, in order to ſee what parts are eſſential, and what precarious or arbitrary.

We frequently find the effects of fire produced where no viſible fire appeared. Thus the fingers are eaſily burnt by an iron heated below the degree of ignition, or ſo as to be no ways viſibly red-hot or fiery: whence it follows, that the eye is no judge of fire.

So likewiſe the touch gives no poſitive notice of any degree of fire below the natural heat of the body, or any ſo great as to deſtroy the organ.

Again, the effects of fire are often produced without any manifeſt ſigns of burning, melting, &c. as in evaporations, &c. If this method of excluſion and rejection were purſued to its due length, we ſhould perhaps find no criterion, infallible mark, or characteriſtic of fire in general, but that of a particular motion ſtruggling among the minute parts of bodies, and tending to throw them off at the ſurface. If this ſhould prove the caſe, then ſuch a motion will be the form and eſſence of fire; and which, being preſent, makes fire alſo preſent: and, when abſent, makes fire alſo abſent: whence to produce fire, and produce this motion in bodies, will be one and the ſame thing.

The great and fundamental difference in reſpect to the nature of fire is, whether it be originally ſuch, formed thus by the Creator himſelf at the beginning of things; or whether it be mechanically producible from other bodies, by inducing ſome alterations in the particles thereof. The former opinion is mantained by Homberg, Boerhaave, the younger Lemery, and s'Graveſande; the latter is chiefly ſupported by the Engliſh philoſophers, lord Bacon, Mr Boyle, and Sir Iſaac Newton.

Bacon, in the treatiſe De Forma Calicli, deduces, from a great number of particulars, that heat in bodies is no other than motion ſo and ſo circumſtanced; ſo that to produce heat in a body, nothing is required but to excite a certain motion in the parts thereof.

Boyle ſeconds him in an expreſs treatiſe of the mechanical origin of heat and cold, and maintains the ſame doctrine with new obſervations and experiments; as a ſpecimen of which, we ſhall hear give the two following.

1. In the production of heat, ſays that able philoſopher, there appears nothing on the part either of the agent or patient, but motion and its natural effects. When a ſmith briſkly hammers a piece of iron, the metal thereby becomes exceedingly hot; yet there is nothing to make it ſo, except the forcible motion of the hammer impreſſing a vehement and variouſly determined agitation on the ſmall parts of the iron, which, being a cold body before, grows, by that ſuper-induced commotion of its ſmall parts, hot: firſt, in a more looſe acceptation of the word, with regard to ſome other bodies, compared with which it was cold before; then ſenſibly hot, becauſe this agitation ſurpaſſes that of the points of our fingers; and in this inſtance oftentimes the hammer and anvil continue cold after the operation; which ſhews, that the heat acquired by the iron was not communicated by either of thoſe implements, as heat; but produced in it by a motion, great enough ſtrongly to agitate the parts of ſo ſmall a body as the piece of iron, without being able to have the like effect upon ſo much greater maſſes of metal as the hammer and the anvil: though if the percuſſions were often and briſkly renewed, and the hammer were ſmall, this alſo might be heated: whence it is not neceſſary that a body itſelf be hot to give heat.

2. If a large nail be driven by a hammer into a plank of wood, it will receive ſeveral ſtrokes on its head before it grows hot; but when it is once driven to the head, a few ſtrokes ſuffice to give it a conſiderable heat; for while, at every blow of the hammer, the nail enters further into the wood, the motion produced is chiefly progreſſive, and is of the whole nail tending one way; but when that motion ceaſes, the impulſe given by the ſtroke being unable to drive the nail further on, or break it, muſt be ſpent in making a various, vehement, and inteſtine commotion of the parts among themſelves, wherein the nature of heat conſiſts.

Agreeable to this is the opinion of Sir Iſaac Newton, who conceives that groſs bodies may be converted into light, by the agitation of their particles; and light, again, into groſs bodies, by being fixed therein.

On the other hand, M. Homberg, in his Eſſai du Souffre Principe, holds, that the chemical principle, or element ſulphur, which is ſuppoſed one of the ſimple, primary, pre-exiſtent ingredients of all natural bodies, is real fire, and conſequently that fire is coeval with bodies.

Dr s'Graveſande goes on much the ſame principle: fire, according to him, enters the compoſition of all bodies, is contained in all bodies, and may be ſeparated or procured from all bodies, by rubbing them againſt each other; and thus putting their fire in motion: but fire, he adds, is by no means generated by ſuch motion

Mr Lemery, the younger, agrees with theſe two authors in aſſerting this abſolute and ingenerable nature of fire: but he extends it farther. Not contented to confine it as an element to bodies, he endeavours to ſhew, that it is equally diffuſed through all ſpace, and that it is preſent in all places; in the void ſpaces between bodies, as well as in the inſenſible interſtices between their parts.

This laſt ſentiment falls in with that of Boerhaave and the celebrated M. Muſſchenbroek. But notwithſtanding what thoſe able philoſophers have advanced, it is evident that fire, heat, flame, *&c.* are only the different modifications of the particles of light, and that the particles of light themſelves depend entirely on velocity for their lucific quality; ſince, by many experiments, we know, that the particles of bodies become lucid, or particles of light, by only producing in them a requiſite degree of velocity: thus the particles in a rod of iron, being hammered very nimbly, ſhine and become red-hot: thus alſo the violent ſtroke of the flint againſt the ſteel, in ſtriking fire, puts the particles of the ſteel, which it takes off, into ſuch a motion as cauſes them to melt, and become red-hot, which makes the ſparks of fire produced by each ſtroke: as, therefore, fire conſiſts in the great velocity of the particles, ſo it may be communicated from one body in which it is, to another in which it is not, after the ſame manner that one body in motion will communicate motion to another that has got none.

Fire differs from heat only in this, that heat is a motion in the particles of a body, with a leſſer degree of velocity; and fire, a motion with a greater degree of velocity, *viz.* ſuch as is ſufficient to make the particles ſhine; though we often call ſuch a ſtate as will burn, *fire*, though it does not actually ſhine; and we ſeldom call thoſe lucid bodies fires, which only ſhine, and do not burn. Theſe are a ſort of phoſphori, which, though they have no heat, yet ſeem to owe their lucidity to the motion of their parts.

There ſeems to be no other difference between fire and flame, than this; that fire conſiſts in a glowing degree of velocity in the parts of a body, while yet ſubſiſting together in the maſs; but flame is the ſame degree of velocity in the particles diſſipated and flying off in vapours: or, to uſe Sir Iſaac Newton's expreſſion, flame is nothing elſe but a red-hot vapour. See FLAME.

FIRE, in chemiſtry. See CHEMISTRY, p. 67. and 110. Vol. II.

Electrical **FIRE**. See ELECTRICITY.

Walking **FIRE**, in meteorology. See WILL-WITH-A WHISP.

FIRE, in theology. See HELL.

We read of the ſacred fire in the firſt temple of Jeruſalem, concerning which the Jews have a tradition that it came down from heaven: it was kept with the utmoſt care, and it was forbidden to carry any ſtrange fire into the temple. This fire is one of the five things which the Jews confeſs were wanting in the ſecond temple.

The Pagans had their ſacred fires, which they kept in their temples with the moſt religious care, and which were never to be extinguiſhed. Numa was the firſt who built a temple to Fire as a goddeſs, at Rome, and inſtituted an order of prieſteſſes for the preſervation of it. See VESTALS.

Fire was the ſupreme god of the Chaldæans; the magi were worſhippers of fire; and the Greeks and Armenians ſtill keep up a ceremony called the Holy Fire, upon a perſuaſion that every Eaſter-day a miraculous fire deſcends from heaven into the holy ſepulchre, and kindles all the lamps and candles there.

FIRE-LOCK. See GUN, MUSQUET, *&c.*

FIRE-POTS, in the military art, ſmall earthern pots, into which is put a charged grenade, and over that powder enough till the grenade is covered; then the pot is covered with a piece of parchment, and two pieces of match acroſs lighted: this pot being thrown by a handle of matches where it is deſigned, it breaks and fires the powder, and burns all that is near it, and likewiſe fires the powder in the grenade, which ought to have no fuſe, to the end its operations may be the quicker.

FIRE-WORKS. See PYROTECHNIA.

FIRE-SHIP, in the navy, a veſſel charged with artificial fire-works, which having the wind of an enemy's ſhip, grapples her, and ſets her on fire.

FIRE-OFFICE, an office of inſurance from fire. See ASSURANCE.

Wild-**FIRE**, a kind of artificial or factitious fire, which burns even under water, and that with greater violence than out of it. It is compoſed of ſulphur, naphtha, pitch, gum, and bitumen; and is only extinguiſhable by vinegar mixed with ſand and urine, or by covering it with raw hides. Its motion or tendency is ſaid to be contrary to that of natural fire, and it always follows the direction in which it is thrown, whether it be downwards, ſideways, or otherwiſe.

FIRING-IRON, in farriery, an inſtrument not unlike the blade of a knife; which being made red-hot, is applied to a horſe's hams, or other places ſtanding in need of it, as in preternatural ſwellings, farcy, knots, *&c.* in order to diſcuſs them.

FIRKIN, an Engliſh meaſure of capacity, for things liquid, being the fourth part of the barrel: it contains 8 gallons of ale, ſoap, or herrings; and 9 gallons of beer. See MEASURE and BARREL.

FIRLOT, a dry meaſure uſed in Scotland. The oat-firlot contains 21¼ pints of that country; the wheat-firlot contains about 2211 cubical inches; and the barley-firlot, 31 ſtandard pints. Hence it appears that the Scotch wheat-firlot exceeds the Engliſh buſhel by 33 cubical inches.

FIRMAMENT, in the Ptolemaic aſtronomy, the eighth heaven or ſphere, with reſpect to the ſeven ſpheres of the planets which it ſurrounds. It is ſuppoſed to have two motions; a diurnal motion, given to it by the primum mobile, from eaſt to weſt, about the poles of the ecliptic; and another oppoſite motion from weſt to eaſt; which laſt it finiſhes, according to Tycho, in 25412 years, according to Ptolemy in 36000, and according to Copernicus in 25800, in which time the fixed ſtars return to the ſame points in which they were at the beginning. This period is commonly called the Platonic year, or the great year.

FIRMAMENT is alſo uſed in divers places of ſcripture, to denote the middle region of the air.

FIRMAN is a paſſport or permit granted by the great mogul to foreign veſſels, to trade within the territories of his juriſdiction.

FIRMNESS, denotes the conſiſtence of a body, or that ſtate wherein its ſenſible parts cohere in ſuch a manner, that the motion of one part induces a motion of the reſt.

FIRST-FRUITS, among the Hebrews, were oblations of part of the fruit of the harveſt, offered to God as an acknowledgment of his ſovereign dominion.

FIRST-FRUITS, in the church of England, are the profits of every ſpiritual benefice for the firſt year, according to the valuation thereof in the king's books.

FISC, in the civil law, the treaſury of a prince. It differs from the ærarium, which was the treaſury of the public or people: thus, when the money ariſing from the ſale of condemned perſons goods was appropriated for the uſe of the public, their goods were ſaid *publicari*; but when it was deſtined for the ſupport of the prince, they were called *confiſcari*.

FISCAL, in the civil law, ſomething relating to the pecuniary intereſt of the prince or people. The officers appointed for the management of the fiſc, were called *procuratores fiſci*, and *advocati fiſci*; and among the caſes enumerated in the conſtitutions of the empire where it was their buſineſs to plead, one is againſt thoſe who have been condemned to pay a fine to the fiſc on account of their litigiouſneſs, or frivolous appeals.

FISH, in natural hiſtory. See NATURAL HISTORY.

Breeding of **FISHES** may be turned to great advantage; for beſides furniſhing your table, obliging your friends, and raiſing money, your land will be thereby greatly improved, ſo as to yield more this way than by any other employment whatever.

When fiſh are fed in large pools or ponds, either malt boiled, or freſh grains, is the beſt food; thus carps may be raiſed and fed like capons, and tenches will feed as well. The care of feeding them is beſt committed to a gardener or the butler, who ſhould be always at hand. In a ſtew, any ſort of grain boiled, eſpecially peas, and malt coarſe ground; alſo the grains after brewing, while freſh and ſweet: but one buſhel of malt not brewed, will go as far as of grains. See FISH-POND, *infra*.

FISH, in a ſhip, a plank or piece of timber, faſtened to a ſhip's maſt or yard, to ſtrengthen it, which is done by nailing it on with iron ſpikes, and woulding or winding ropes hard about them.

FISHES, in heraldry, are the emblems of ſilence and watchfulneſs; and are borne either upright, imbowed, extended, endorſed reſpecting each other, ſurmounting one another, fretted, *&c.*

In blazoning fiſhes, thoſe borne feeding, ſhould be termed devouring; all fiſhes borne upright and having fins, ſhould be blazoned hauriant; and thoſe borne tranſverſe the eſcutcheon, muſt be termed naiant.

FISH-PONDS, thoſe made for the breeding or feeding of fiſh.

Fiſh-ponds are no ſmall improvement of watery and boggy lands, many of which are fit for no other uſe. In making of a pond, its head ſhould be at the loweſt part of the ground, that the trench of the flood-gate or ſluice, having a good fall, may not be too long in emptying. The beſt way of making the head ſecure, is to drive in two or three rows of ſtakes above ſix feet long, at about four feet diſtance from each other, the whole length of the pond-head, whereof the firſt row ſhould be rammed at leaſt about four feet deep. If the bottom is falſe, the foundation may be laid with quick-lime; which ſlacking, will make it as hard as a ſtone. Some lay a layer of lime, and another of earth dug out of the pond, among the piles and ſtrakes; and when theſe are well covered, drive in others as they ſee occaſion, ramming in the earth as before, till the pond-head be of the height deſigned.

The dam ſhould be made ſloping on each ſide, leaving a waſte to carry off the over-abundance of water in times of floods or rains; and as to the depth of the pond, the deepeſt part need not exceed ſix feet, riſing gradually in ſhoals towards the ſides, for the fiſh to ſun themſelves, and lay their ſpawn. Gravelly and ſandy bottoms, eſpecially the latter, are beſt for breeding; and a fat ſoil with a white fat water, as the waſhings of hills, commons, ſtreets, ſinks, *&c.* is beſt for fattening all ſorts of fiſh. For ſtoring a pond, carp is to be preferred for its goodneſs, quick growth, and great increaſe, as breeding five or ſix times a-year. A pond of an acre, if it be a feeding and not breeding one, will every year feed two hundred carps of three years old, three hundred of two years old, and four hundred of a year old. Carps delight in ponds that have marl or clay bottoms, with plenty of weeds and graſs, whereon they feed in hot months.

Your pond ſhould be drained every three or four years, and your fiſh ſorted. If it is a breeding one, the ſmaller ones are to be taken out, to ſtore other ponds with; leaving a good ſtock of females, at leaſt eight or nine years old, as they never breed before that age. In feeding ponds, it is beſt to keep them pretty near of a ſize.

FISHERY, a place where great numbers of fiſh are caught.

The principal fiſheries for ſalmon, herring, mackrel, pilchards, *&c.* are along the coaſts of Scotland, England, and Ireland; for cod, on the banks of Newfoundland; for whales, about Greenland; and for pearls, in the Eaſt and Weſt-Indies.

FISHERY denotes alſo the commerce of fiſh, more particularly the catching them for ſale.

Were we to enter into a very minute and particular conſideration of fiſheries, as at preſent eſtabliſhed in this kingdom, this article would ſwell beyond its proper bounds; becauſe to do juſtice to a ſubject of that concernment to the Britiſh nation, requires a very ample and diſtinct diſcuſſion. We ſhall, however, obſerve, that ſince the Divine Providence has ſo eminently ſtored the coaſts of Great Britain and Ireland with the moſt valuable fiſh; and ſince fiſheries, if ſucceſsful, become permament nurſeries for breeding expert ſeamen: it is not only a duty we owe to the Supreme Being, not to deſpiſe the wonderful plenty he hath afforded us, by neglecting to extend this branch of commerce to the utmoſt; but it is a duty we owe to our country, for its natural ſecurity, which depends upon the ſtrength of our royal navy. No nation can have a navy, where there is not a fund of buſineſs to breed and employ ſeamen, without any expence to the public; and no trade is ſo well calculated for training up theſe uſeful members of this ſociety, as fiſheries.

The ſituation of the Britiſh coaſts is the moſt advantageous for catching fiſh in the world: the Scottiſh iſlands, particularly thoſe to the north and weſt, lie moſt commodious for carrying on the fiſhing trade to perfection; for no country in Europe can pretend to come up to Scotland in the abundance of the fineſt fiſh, with which its various creeks, bays, rivers, lakes, and coaſt are repleniſhed. King Charles I. was ſo ſenſible of the great advantage to be derived from fiſheries, that he began the experiment, together with a company of merchants; but the civil wars ſoon occaſioned that project to be ſet aſide. King Charles II. made a like attempt; but his preſſing wants made him withdraw what money he had employed that way, whereupon the merchants that joined with him did ſo too. Since the union, ſeveral attempts have been made to retrieve the fiſheries, and a corporation ſettled to that effect, entitled the Royal Britiſh Fiſhery.

In the year 1750, the parliament of Great Britain taking the ſtate of the fiſheries into conſideration, an act was paſſed for the encouragement of the white-herring fiſhery, granting a charter, whereby a corporation is created, to continue twenty one years, by the name of the Society of the Free Britiſh Fiſhery, to be under the direction of a governor, preſident, vicepreſident, council, *&c.* who are to continue in office the ſpace of three years, with power to make bye-laws, *&c.* and to raiſe a capital of 500,000l. by way of ſubſcription. And any number of perſons, who, in any part of Great Britain, ſhall ſubſcribe 10,000l. into the ſtock of this ſociety, under the name of the Fiſhing Chamber, and carry on the ſaid fiſhery on their own account of profit and loſs, ſhall be entitled to the ſame bounty allowed to the ſociety. The bounty is 30s. the tun, to be paid yearly, for fourteen years, beſides 3 *per cent.* for the money advanced by each chamber. The act contains other proper regulations relative to the nets, marks on the herring-barrels, number of hands, and the quantity of ſalt that is entitled to the bounty, *&c.* It is then by the encouragement given by this act, that we now ſee a laudable emulation prevailing all over the two kingdoms, and fiſhing buſſes fitted out from almoſt every port, in order to repair to the Shetland iſlands, where the herring-fiſhery is carried on with an ardor becoming ſo important a branch of trade. Scotland, which ſuffered incredibly from the neglect of this valuable and natural produce of the ſeas, has not been backward to join in a ſcheme that tends ſo evidently to its own advantage; for the cities of Edinburgh and Glaſgow, the towns of Montroſe, Dundee, Perth, Inverneſs, and ſome other boroughs, have raiſed the proper ſum, and chambers have been erected in each of them; the gentlemen of eſtates adjoining to the reſpective places above-mentioned, liberally contributing with merchants, towards the proſecution of an undertaking ſo viſibly tending to the good of their country in general.

Cod-FISHERY. There are two kinds of cod-fiſh, the one green or white cod, and the other dried or cured cod; though it is all the ſame fiſh differently prepared; the former being ſometimes ſalted and barrelled, then taken out for uſe; and the latter, having lain ſome competent time in ſalt, dried in the ſun or ſmoke. We ſhall therefore ſpeak of each of theſe apart; and firſt of

Green-cod FISHERY. The chief fiſheries for green cod are in the bay of Canada, on the great bank of Newfoundland, and on the iſle of St Peter, and the iſle of Sable, to which places veſſels reſort from divers parts both of Europe and America. They are from 100 to 150 tuns burden, and will catch between thirty and forty thouſand cod each. The moſt eſſential part of the fiſhery is, to have a maſter who knows how to cut up the cod, one who is ſkilled to take off the head properly, and above all a good ſalter, on which the preſerving of them, and conſequently the ſucceſs of the voyage, depends. The beſt ſeaſon is from the beginning of February to the end of April; the fiſh, which in the winter retire to the deepeſt water, coming then on the banks, and fattening extremely. What is caught from March to June keeps well; but thoſe taken in July, Auguſt, and September, when it is warm on the banks, are apt to ſpoil ſoon. Every fiſher takes but one at a time: the moſt expert will take from 350 to 400 in a day; but that is the moſt, the weight of the fiſh and the great coldneſs on the bank fatiguing very much. As ſoon as the cod are taken, the head is taken off; they are opened, gutted, and ſalted; and the ſalter ſtows them in the bottom of the hold, head to tail, in beds a fathom or two ſquare; laying layers of ſalt and fiſh alternately, but never mixing fiſh caught on different days. When they have lain thus three or four days to drain off the water, they are replaced in another part of the ſhip, and ſalted again; where they remain till the veſſel is loaded. Sometimes they are cut in thick pieces, and put up in barrels for the conveniency of carriage.

Dry-cod FISHERY. The principal fiſhery for dry cod is, from Cape Roſe to the Bay des Exports, along the coaſt of Placentia, in which compaſs there are divers commodious ports for the fiſh to be dried in. Theſe, though of the ſame kind with the freſh cod, are much ſmaller, and therefore fitter to keep, as the ſalt penetrates more eaſily into them. The fiſhery of both is much alike; only this latter is moſt expenſive, as it takes up more time, and employs more hands, and yet ſcarce half ſo much ſalt is ſpent in this as in the other. The bait is herrings, of which great quantities are taken on the coaſt of Placentia. When ſeveral veſſels meet and intend to fiſh in the ſame port, he whoſe ſhalloop firſt touches ground, becomes entitled to the quality and privileges of admiral: he has the choice of his ſtation, and the refuſal of all the wood on the coaſt at his arrival. As faſt as the maſters arrive, they unrig all their veſſels, leaving nothing but the ſhrouds to ſuſtain the maſts, and in the mean time the mates provide a tent on ſhore, covered with branches of trees, and ſails over them, with a ſcaffold of great trunks of pines, twelve, fifteen, ſixteen, and often twenty feet high, commonly from forty to ſixty feet long, and about one third as much in breadth. While the ſcaffold is preparing, the crew are a fiſhing; and as faſt as they catch, they bring their fiſh aſhore; open and ſalt them upon moveable benches; but the main ſalting is performed on the ſcaffold. When the fiſh have taken ſalt, they waſh and hang them to drain on rails; when drained, they are laid on kinds of ſtages, which are ſmall pieces of wood laid a-croſs, and covered with branches of trees, having the leaves ſtripped off for the paſſage of the air. On theſe ſtages, they are diſpoſed, a fiſh thick, head againſt tail, with the back uppermoſt, and are turned carefully four times every twenty four hours. When they begin to dry, they are laid in heaps ten or twelve thick, in order to retain their warmth; and every day the heaps are enlarged, till they become double their firſt bulk; then two heaps are joined together, which they turn every day as before; laſtly, they are ſalted again, beginning with thoſe firſt ſalted; and being laid in huge piles, they remain in that ſituation till they are carried on board the ſhips, where they are laid on the branches of trees diſpoſed for that purpoſe, upon the ballaſt, and round the ſhip, with mats to prevent their contracting any moiſture.

There are four kinds of commodities drawn from cod, *viz.* the zounds, the tongues, the roes, and the oil extracted from the liver. The firſt is ſalted at the fiſhery, together with the fiſh, and put in barrels from 6 to 700 pound. The tongues are done in like manner, and brought in barrels from 4 to 500 pounds. The roes are alſo ſalted in barrels, and ſerve to caſt into the ſea to draw fiſh together, and particularly pilchards. The oil comes in barrels, from 400 to 520 pounds, and is uſed in dreſſing leather.—In Scotland, they catch a ſmall kind of cod on the coaſts of Buchan, and all along the Murray frith on both ſides; as alſo in the frith of Forth, Clyde, *&c.* wich is much eſteemed. They ſalt and dry them in the ſun upon rocks, and ſometimes in the chimney. They alſo cure ſkait, and other ſmaller fiſh in the ſame manner; but moſt of theſe are for home-conſumption.

Coral-Fishery. See Coral-*fiſhery*.

Herring-Fishery. See Clupea.

Pilchard-Fishery. The chief pilchard-fiſheries are along the coaſts of Dalmatia on the coaſt of Bretagne, and along the coaſts of Cornwall and Devonſhire. That of Dalmatia is very plentiful: that on the coaſts of Bretagne employs annually about 300 ſhips. The pilchards caught on our coaſts, though bigger, are not ſo much valued as thoſe on the coaſts of France, owing principally to their not being ſo thoroughly cured They naturally follow the light, which contributes much to the facility of the fiſhery: the ſeaſon is from June to September. On the coaſts of France they make uſe of the roes of the cod-fiſh as a bait, which thrown into the ſea, makes them riſe from the bottom, and run into the nets. On our coaſts there are perſons poſted aſhore, who, ſpying by the colour of the water where the ſhoals are, make ſigns to the boats to go among them to caſt their nets. When taken, they are brought on ſhore to a warehouſe, where they are laid up in broad piles, ſupported with backs and ſides; and as they are piled, they ſalt them with bay-ſalt, in which lying to ſoak for thirty or forty days, they run out a deal of blood, with dirty pickle and bittern: then they waſh them clean in ſea-water; and, when dry, barrel and preſs them hard down to ſqueeze out the oil, which iſſues out at a hole in the bottom of the caſk. The Corniſhmen obſerve of the pilchard, that it is the leaſt fiſh in ſize, moſt in number, and greateſt for gain, of any they take out of the ſea.

Salmon-Fishery. The chief ſalmon-fiſheries in Europe are in England, Scotland, and Ireland, in the rivers, and ſea-coaſts adjoining to the river-mouths. The moſt diſtinguiſhed for ſalmon in Scotland are, the river Tweed, the Clyde, the Tay, the Dee, the Don, the Spey, the Neſs, the Bewley, *&c.* in moſt of which it is very common, about the height of ſummer, eſpecially if the weather happen to be very hot, to catch four or five ſcore of ſalmon at a draught. The chief rivers in England for ſalmon are, the Tyne, the Trent, the Severn, and the Thames. The fiſhing uſually begins about January; and in Scotland they are obliged to give over about the middle of Auguſt; becauſe, as it is then ſuppoſed the fiſh come up to ſpawn, it would be quite depopulating the rivers to continue fiſhing any longer. It is performed with nets, and ſometimes with a kind of locks or wears made on purpoſe, which in certain places have iron or wooden grates ſo diſpoſed, in an angle, that being impelled by any force in a contrary direction to the courſe of the river, they may give way and open a little at the point of contact, and immediately ſhut again, cloſing the angle. The ſalmon, therefore, coming up into the rivers, are admitted into theſe grates, which open, and ſuffer them to paſs through, but ſhut again, and prevent their return. Salmon are alſo caught with a ſpear, which they dart into him when they ſee him ſwimming near the ſurface of the water. It is cuſtomary likewiſe to catch them with a candle and lanthorn, or wiſp of ſtraw ſet on fire; for the fiſh naturally following the light, are ſtruck with the ſpear, or taken in a net ſpread for that purpoſe, and lifted with a ſudden jerk from the bottom. We make no mention of the method of catching ſalmon with a line or hook, becauſe it is much the ſame with that explained under the article *Trout*-Fishing.

Curing Salmon. When the ſalmon are taken, they open them along the back, take out the guts and gills, and cut out the greateſt part of the bones, endeavouring to make the inſide as ſmooth as poſſible; then ſalt the fiſh in large tubs for the purpoſe, where they lie a conſiderable time ſoaking in brine; and about October, they are packed cloſe up in barrels, and ſent to London, or exported up the Mediterranean. They have alſo in Scotland, a great deal of ſalmon ſalted in the common way, which after ſoaking in brine a competent time, is well preſſed, and then dried in ſmoke: this is called *kipper*, and is chiefly made for home conſumption, and, if properly cured and prepared, is reckoned very delicious.

Sturgeon-Fishery. The greateſt ſturgeon-fiſhery is in the mouth of the Volga, on the Caſpian ſea, where the Muſcovites employ a great number of hands, and catch them in a kind of incloſure formed by huge ſtakes repreſenting the letter Z, repeated ſeveral times. Theſe fiſheries are open on the ſide next the ſea, and cloſe on the other; by which means the fiſh aſcending in its ſeaſon up the river, is embarraſſed in theſe narrow angular retreats, and ſo is eaſily killed with a harping-iron. Sturgeons, when freſh, eat deliciouſly; and in order to make them keep, they are ſalted or pickled in large pieces, and put up in cags from thirty to fifty pounds. But the great object of this fiſhery is the roe, of which the Muſcovites are extremely fond, and of which is made the cavear; or kavia, ſo much eſteemed by the Italians. See Cavear.

Whale-Fishery. Whales are chiefly caught in the north ſea: the largeſt ſort are found about Greenland, or Spitzbergen. At the firſt diſcovery of this country, whales not being uſed to be diſturbed, frequently came into the very bays, and were accordingly killed almoſt cloſe to the ſhore, ſo that the blubbler being cut off was immediately boiled into oil on the ſpot. The ſhips in theſe times took in nothing but the pure oil and the fins, and all the buſineſs was executed in the country, by which means a ſhip could bring home the product of many more whales than ſhe can according to the preſent method of conducting this trade. The fiſhery alſo was then ſo plentiful, that they were obliged ſometimes to ſend other ſhips to fetch off the oil they had made, the quantity being more than the fiſhing ſhips could bring away. But time and change of circumſtances have ſhifted the ſituation of this trade. The ſhips coming in ſuch numbers from Holland, Denmark, Hamburgh, and other northern countries, all intruders upon the Engliſh, who were the firſt diſcoverers of Greenland, the whales were diſturbed, and gradually, as other fiſh often do, forſaking the place, were not to be killed ſo near the ſhore as before; but are now found, and have been ſo ever ſince, in the openings and ſpace among the ice, where they have deep water, and where they go ſometimes a great many leagues from the ſhore.

The whale-fiſhery begins in May, and continues all June and July; but whether the ſhips have good or bad ſucceſs, they muſt come away, and get clear of the ice, by the end of Auguſt; ſo that in the month of September at fartheſt, they may be expected home; but a ſhip that meets with a fortunate and early fiſhery in May, may return in June or July.

The manner of taking whales at preſent is as follows. As ſoon as the fiſhermen hear the whale blow, they cry out, *Fall! fall!* and every ſhip gets out its long boat, in each of which there are ſix or ſeven men: they row till they come pretty near the whale, then the harpooner ſtrikes it with his harpoon. This requires great dexterity; for through the bone of his head there is no ſtriking, but near his ſpout there is a ſoft piece of fleſh, into which the iron ſinks with eaſe. As ſoon as he is ſtruck, they take care to give him rope enough, otherwiſe, when he goes down, as he frequently does, he would inevitably ſink the boat: this rope he draws with ſuch violence, that, if it were not well watered, it would, by its friction againſt the ſides of the boat, be ſoon ſet on fire. The line faſtened to the harpoon is ſix or ſeven fathom long, and is called the fore-runner; it is made of the fineſt and ſofteſt hemp, that it may ſlip the eaſier: to this they join a heap of lines of 90 or 100 fathoms each; and when there are not enough in one long boat, they borrow from another. The man at the helm obſerves which way the rope goes, and ſteers the boat accordingly, that it may run exactly out before; for the whale runs away with the line with ſo much rapidity, that he would overſet the boat, if it were not kept ſtreight. When the whale is ſtruck, the other long boats row before, and obſerve which way the line ſtands, and ſometimes pull it; if they feel it ſtiff, it is a ſign the whale ſtill pulls in ſtrength; but if it hangs looſe, and the boat lies equally high before and behind upon the water, they pull it in gently, but take care to coil it ſo, that the whale may have it again eaſily if he recovers ſtrength: they take care, however, not to give him too much line, becauſe he ſometimes entangles it about a rock, and pulls out the harpoon. The fat whales do not ſink as ſoon as dead, but the lean one's do, and come up ſome days afterwards. As long as they ſee whales, they loſe no time in cutting up what they have taken, but keep fiſhing for others: when they ſee no more, or have taken enough, they begin with taking off the fat and whiſkers in the following manner. The whale being laſhed along-ſide, they lay it on one ſide, and put two ropes, one at the head, and the other in the place of the tail, which, together with the fins, is ſtruck off as ſoon as he is taken, to keep thoſe extremities above water. On the off-ſide of the whale are two boats, to receive the pieces of fat, utenſils, and men, that might otherwiſe fall into the water on that ſide. Theſe precautions being taken, three or four men with irons at their feet, to prevent ſlipping, get on the whale, and begin to cut out pieces of about three feet thick, and eight long, which are hauled up at the capſtane or windlaſs. When the fat is all got off, they cut off the whiſkers of the upper jaw with an ax. Before they cut, they are all laſhed to keep them firm, which alſo facilitates the cutting, and prevents them from falling into the ſea: when on board, five or ſix of them are bundled together, and properly ſtowed; and after all is got off, the carcaſe is turned a-drift, and devoured by the bears, who are very fond of it. In proportion as the large pieces of fat are cut off, the reſt of the crew are employed in ſlicing them ſmaller, and picking out all the lean. When this is prepared, they ſtow it under the deck, where it lies till the fat of all the whales is on board; then cutting it ſtill ſmaller, they put it up in tubs in the hold, cramming them very full and cloſe. Nothing now remains but to ſail homewards, where the fat is to be boiled and melted down into train oil. See Train Oil.

It were in vain to ſpeak in this place of the advantages that may be derived to Great Britain from the whale-fiſhery. We ſhall only remark, that the legiſlature think that trade of ſo great importance, as to grant a very conſiderable bounty for the encouragement of it; for every Britiſh veſſel of 200 tuns or upwards, bound to the Greenland ſeas on the whale-fiſhery, if found to be duly qualified according to the act, obtains a licence from the commiſſioners of the cuſtoms to proceed on ſuch voyage: and on the ſhip's return, the maſter and mate making oath that they proceeded on ſuch voyage and no other, and uſed all their endeavours to take whales, &c. and that all the whale fins, blubber, oil, &c. imported in their ſhip, were taken by their crew in thoſe ſeas, there ſhall be allowed 40 s. for every ton according to the admeaſurement of the ſhip.

Beſides theſe fiſheries, there are ſeveral others both on the coaſts of Great Britain and in the North Seas, which, although not much the ſubject of merchandize, nevertheleſs employ great numbers both of ſhips and men; as, 1. The oyſter-fiſhing at Colcheſter, Feverſham, the Iſle of Wight, in the Swales of the Medway, and in all the creeks between Southampton and Chicheſter, from whence they are carried to be fed in pits about Wevenhoe and other places. See OYSTER. 2. The lobſter-fiſhing all along the Britiſh Channel, the Frith of Edinburgh, on the coaſt of Northumberland, and on the coaſt of Norway, from whence great qantities are brought to London. And laſtly, the fiſhing of the pot-fiſh, fin-fiſh, ſea-unicorn, ſea-horſe, and the ſeal, or dog-fiſh; all which are found in the ſame ſeas with the whales, and yield blubber in a certain degree; beſides, the horn of the unicorn is as eſtimable as ivory, and the ſkins of the ſeals are particularly uſeful to trunkmakers.

Trout FISHING. The baits for this purpoſe are either natural or artificial, as earth, worms, minnows, and fiſhing flies, both natural and artificial. Whatever worms are uſed, they anſwer beſt if kept ſome time in an earthen pot, with moſs often changed in ſummer. If you fiſh for trout with hand on the ground, the hook is to be introduced into the worm a little above the middle, coming out again a little below; then draw the worm above the arming of the hook, making your firſt entrance at the tail-end, that the point of the hook may come out at the head-end. When you fiſh with minnows, take the whiteſt and middle ſized; and after putting the hook in at the mouth, and out at the gills, and drawing it through about three inches, ſlip it again into his mouth, ſo as the point and beard may come out at the tail. This done, tie the hook and tail together with a fine white thread, and let the body of the minnow be almoſt ſtreight upon the hook.

FISSURE *of the bones*, in ſurgery, is when they are divided either tranſverſely or longitudinally, not quite through, but cracked after the manner of glaſs, by any external force. See SURGERY.

FISTULA, in the ancient muſic, an inſtrument of the wind-kind, reſembling our flute, or flageolet.

The principal wind-inſtruments of the ancients, were the tibia and fiſtula. But how they were conſtituted, wherein they differed, or how they were played on, does not appear.

FISTULA, in medicine and ſurgery. See MEDICINE and SURGERY.

FISTULA, in farriery. See FARRIERY.

FISTULAR, or FISTULOUS, appellations given by ſurgeons to wounds and ulcers, which degenerate into fiſtulas.

FIT, in medicine. See PAROXYSM.

FITCHEE', in heraldry, a term applied to a croſs, when the lower end of it is ſharpened into a point, as in Plate LXXX. fig. 6.

FITCHES, in huſbandry, a ſort of pulſe, more generally known by the name of chick-pea, or cicer. See CICER.

FITZ, makes part of the ſurname of ſome of the natural ſons of the kings of England, as Fitz-roy; which is purely French, and ſignifies the king's ſon.

FIVE CHURCHES, a biſhop's ſee of lower Hungary, 76 miles ſouth of Buda.

FIVES, or VIVES, in farriery. See FARRIERY, p. 555.

FIXATION, in chemiſtry, the rendering any volatile ſubſtance fixed, ſo as not to fly off upon being expoſed to a great heat; hence,

FIXED BODIES are thoſe which bear a conſiderable degree of heat without evaporating, or loſing any of their weight.

FLACCIDITY, among phyſicians, a diſorder of the ſolids, cured by aſtringent and cardiac medicines, joined with exerciſe and good air.

FLAG, a general name for colours, ſtandards, ancients, banners, enſigns, &c.

The faſhion of pointed or triangular flags, as now uſed, Rod. Toletan aſſures, came from the Mahometan Arabs, or Saracens, upon their ſeiznre of Spain, before which time all the enſigns of war were ſtretched or extended on croſs pieces of wood, like the banners of a church. The pirates of Algiers, and throughout the coaſts of Barbary, bear an hexonal flag.

FLAG is more particularly uſed at ſea; for the colours, ancients, ſtandards, &c. borne on the top of the maſts of veſſels, to notify the perſon who commands the ſhip, of what nation it is, and whether it be equipped for war or trade, ſee Plate LXXXI.

The admiral in chief carries his flag on the main top, the vice-admiral on the fore-top, and the rear-admiral on the mizzen-top.

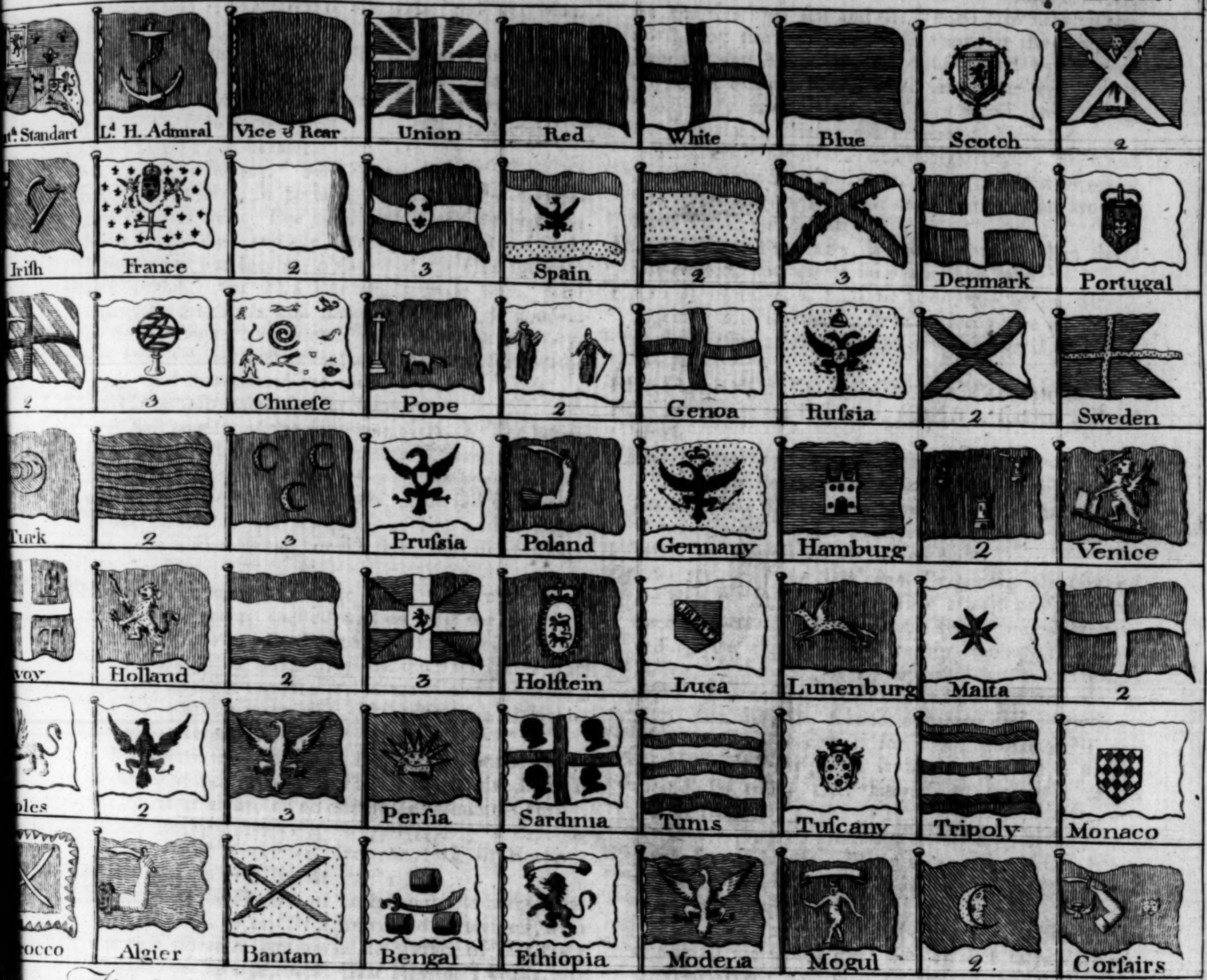
When a council of war is to be held at ſea, if it be on board the admiral, they hang a flag in the main ſhrouds; if in the vice-admiral, in the fore-ſhrouds; and if in the rear-admiral, in the mizzen ſhrouds.

Beſides the national flag, merchant-ſhips frequently bear leſſer flags on the mizzen-maſt, with the arms of the city where the maſter ordinarily reſides; and on the fore-maſt, with the arms of the place where the perſon who freights them lives.

FLAG-OFFICERS, thoſe who command the ſeveral ſquadrons of a fleet, ſuch are the admirals, vice-admirals, and rear-admirals.

FLAGS

Plate LXXXII.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White
Blue
Scotch
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Spain
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Chinese
Pope
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Genoa
Russia
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Sweden
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Prussia
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Germany
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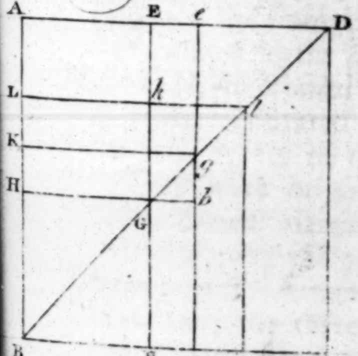
FLUXIONS

Fig. 1.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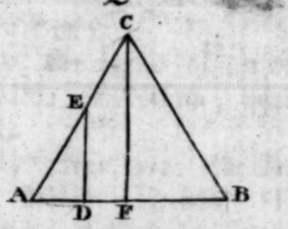

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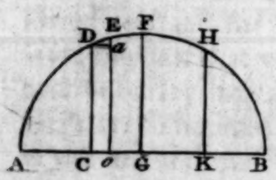
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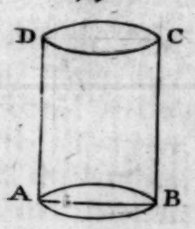

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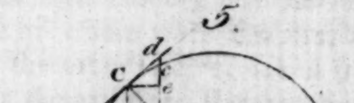

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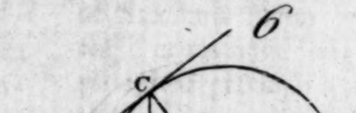

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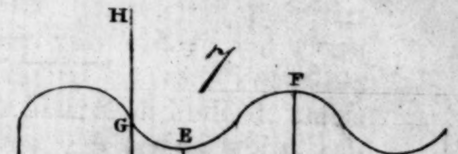

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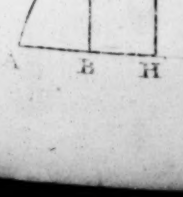

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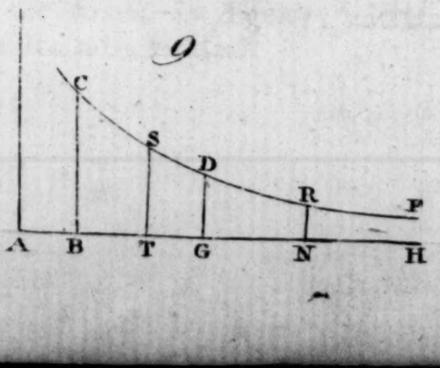
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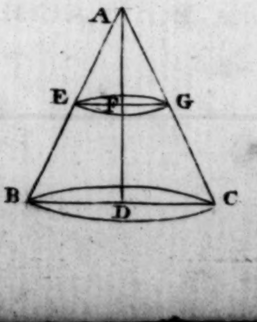

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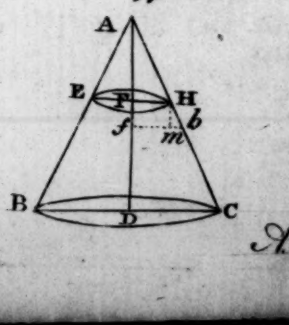
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A.B. sc.

4 AP 54

The flag officers in our pay, are the admiral, vice-admiral, and rear-admiral of the white, red, and blue. See ADMIRAL.

FLAG SHIP, a ſhip commanded by a general or flag-officer, who has a right to carry a flag, in contradiſtinction to the ſecondary veſſels under the command thereof.

FLAG-FLOWER, in botany. See IRIS.

Corn FLAG, in botany. See GLADIOLUS.

FLAGELLARIA, in botany, a genus of the hexandria trigynia claſs. The calix conſiſts of ſix ſegments; it has no corolla; and the berry contains but one ſeed. There is but one ſpecies, a native of the Eaſt-Indies.

FLAGEOLET, or FLAJEOLET, a little flute, uſed chiefly by ſhepherds and country people. It is made of box, or other hard wood, and ſometimes of ivory, and has ſix holes beſides that at the bottom, the mouth-piece, and that behind the neck.

FLAIL, an inſtrument for threſhing corn.

A flail conſiſts of the following parts. 1. The hand-ſtaff, or piece held in the threſher's hand. 2. The ſwiple, or that part which ſtrikes out the corn. 3. The caplins, or ſtrong double leathers, made faſt to the tops of the hand ſtaff and ſwiple. 4. The middle-band, being the leather thong, or fiſh ſkin, that ties the caplins together.

FLAMBEAU, a kind of large taper, made of hempen wicks, by pouring melted wax on their top, and letting it run down to the bottom. This done, they lay them to dry; after which they roll them on a table, and join four of them together by means of a red-hot iron; and then pour on more wax, till the flambeau is brought to the ſize required.

Flambeaus are of different lengths, and made either of white or yellow wax. They ſerve to give light in the ſtreets at night, or on occaſion of illuminations.

FLAMBOROUGH-HEAD, in geography, a cape or promontory of Yorkſhire, five miles eaſt of Burlington: E. long. 20′, N. lat. 54° 15′.

FLAME, the ſmall parts of an inflammable body, that are ſet on fire, or briſkly agitated and thrown off, with a certain vibrative motion at the ſurface of that body into the open air: or, in Sir Iſaac Newton's words, the flame of a body is only the ſmoke thereof heated red hot; and the ſmoke is only the volatile part of the body ſeparated by the fire. See FIRE.

FLAMEN, in Roman antiquity, the name of an order of prieſts, inſtituted by Romulus or Numa; authors not being agreed on this head.

They were originally only three, *viz.* the flamen dialis, flamen martialis, and flamen quirinus. They were choſen by the people, and inſtalled by the ſovereign pontiff. Afterwards, their number was increaſed to fifteen; the three firſt of whom were ſenators, and called flamines majores; the other twelve, taken from among the people, being denominated flamines minores.

The flamen dialis, or prieſt of Jupiter, was a conſiderable perſon at Rome; the flamen martialis, or prieſt of Mars, was the ſecond in dignity; and the flamen quirinalis, was the next to him.

FLANDERS, a province of the Netherlands, bounded by the German ſea and the United provinces on the north; by the province of Brabant, on the eaſt; by Hainault and Artois, on the ſouth; and by another part of Artois and the German ſea, on the weſt; being about ſixty miles long, and fifty broad, and divided between the Auſtrians, the French, and the Dutch.

Flanders is a perfectly champaign country, with not a riſing ground or hill in it, and watered with many fine rivers and canals. Its chief commodities are fine lace, linen, and tapeſtry.

FLANEL, or FLANNEL, a looſe ſort of woollen ſtuff, not croſſed, and woven on a loom like bays.

FLATS, in muſic, a kind of additional notes, which, together with ſharps, ſerve to remedy the defects of muſical inſtruments, wherein temperament is required. See MUSIC.

FLATULENCY, in medicine. See MEDICINE.

FLAW, in the ſea-language, ſignifies a ſudden guſt of wind.

FLAX, in botany. See LINUM.

The following particulars with regard to the manner of raiſing flax has been for ſome years paſt warmly commended by the Truſtees for fiſheries, manufactures, and improvements in Scotland.

Of the choice of the Soil, and Preparing the Ground for FLAX. A ſkilful flax-raiſer always prefers a free open deep loam, and all grounds that produced the preceding year a good crop of turnip, cabbage, potatoes, barley, or broad clover; or has been formerly laid down rich, and kept for ſome years in paſture.

A clay ſoil, the ſecond or third crop after being limed, will anſwer well for flax; provided, if the ground be ſtill ſtiff, that it be brought to a proper mould, by tilling after harveſt, to expoſe it to the winter froſts.

All new grounds produce a ſtrong crop of flax, and pretty free of weeds. When a great many mole-heaps appear upon new ground, it anſwers the better for flax after one tilling.

Flax-ſeed ought never to be ſown on grounds that are either too wet or dry; but on ſuch as retain a natural moiſture: and ſuch grounds as are inclined to weeds ought to be avoided, unleſs prepared by a careful ſummer-fallow.

If the lintſeed be ſown early, and the flax not allowed to ſtand for ſeed, a crop of turnip may be got after the flax that very year; the ſecond year a crop of bear or barley may be taken; and the third year, graſs-ſeeds are ſometimes ſown along with the lintſeed. This is the method moſtly practiſed in and about the counties of Lincoln and Somerſet, where great quantities of flax and hemp are every year raiſed, and where theſe crops have long been capital articles. There, old ploughed grounds are never ſown with lintſeed, unleſs the ſoil be very rich and clean. A certain worm, called in Scotland the Coup-worm, abounds in new broke up grounds, which greatly hurts every crop but flax. In ſmall incloſures ſurrounded with trees or high hedges, the flax, for want of free air, is ſubject to fall before it be ripe, and the droppings of rain and dew from the trees prevent the flax within the reach of the trees from growing to any perfection.

Of preceding crops, potatoes and hemp are the beſt preparation for flax. In the fens of Lincoln, upon proper ground of old tillage, they ſow hemp, dunging well the firſt year; the ſecond year hemp without dung; the third year flax without dung; and that ſame year a crop of turnip eat on the ground by ſheep; the fourth year hemp with a large coat of dung, and ſo on for ever.

If the ground be free and open, it ſhould be but once ploughed, and that as ſhallow as poſſible, not deeper than 2½ inches. It ſhould be laid flat, reduced to a fine garden-mould by much harrowing, and all ſtones and ſods ſhould be carried off.

Except a little pigeon's dung for cold or ſour ground, no other dung ſhould be uſed preparatory for flax, becauſe it produces too many weeds, and throws up the flax thin and poor upon the ſtalk.

Before ſowing, the bulky clods ſhould be broken, or carried off the ground; and ſtones, quickenings, and every other thing that may hinder the growth of the flax, ſhould be removed.

Of the choice of Lintſeed. The brighter in colour, and heavier the ſeed is, ſo much the better: that which when bruiſed appears of a light or yellowiſh green, and freſh in the heart, oily and not dry, and ſmells and taſtes ſweet, and not fuſty, may be depended upon.

Dutch ſeed of the preceding year's growth, for the moſt part, anſwers beſt; but it ſeldom ſucceeds if kept another year. It ripens ſooner than any other foreign ſeed. Philadelphia ſeed produces fine lint and few bolls, becauſe ſown thick, and anſwers beſt in wet cold ſoils. Riga ſeed produces coarſer lint, and the greateſt quantity of ſeed. Scots ſeed, when well winned and kept, and changed from one kind of ſoil to another, ſometimes anſwers pretty well; but ſhould be ſown thick, as many of its grains are bad, and fail. It ſprings well, and its flax is ſooner ripe than any other; but its produce afterwards is generally inferior to that from foreign ſeed.

A kind has been lately imported, called memmelſeed, which looks well, is ſhort and plump, but ſeldom grows above eight inches, and on that account ought not to be ſown.

Of Sowing Lintſeed. The quantity of lintſeed ſown, ſhould be proportioned to the condition of the ſoil; for if the ground be in good heart, and the ſeed ſown thick, the crop will be in danger of falling before it is ready for pulling. From eleven to twelve pecks Linlithgow meaſure of Dutch or Riga ſeed, is generally ſufficient for one Scots acre; and about ten pecks of Philadelphia ſeed, which being the ſmalleſt grained, goes fartheſt. Riga lintſeed, and the next year's produce of it, is preferred in Lincolnſhire.

The time for ſowing lintſeed is from the middle of March to the end of April, as the ground and ſeaſon anſwers; but the earlier the ſeed is ſown, the leſs the crop interferes with the corn-harveſt.

Late ſown lintſeed may grow long, but the flax upon the ſtalk will be thin and poor.

After ſowing, the ground ought to be harrowed till the ſeed is well covered, and then (ſuppoſing the ſoil as before mentioned to be free and reduced to a fine mould) the ground ought to be rolled.

When a farmer ſows a large quantity of lintſeed, he may find it proper to ſow a part earlier and part later, that in the future operations of weeding, pulling, watering, and graſſing, the work may be the eaſier and more conveniently gone about.

It ought always to be ſown on a dry bed.

Of Weeding FLAX. It ought to be weeded when the crop is about four inches long. If longer deferred, the weeders will ſo much break and crook the ſtalks, that they will never perhaps recover their ſtraightneſs again; and when the flax grows crooked, it is more liable to be hurt in the rippling and ſwingling.

Quickening-graſs ſhould not be taken up; for, being ſtrongly rooted, the pulling of it always looſens a deal of the lint.

If there is an appearance of a ſettled drought, it is better to defer the weeding, than by that operation to expoſe the tender roots of the flax to the drought.

How ſoon the weeds are got out, they ought to be carried off the field, inſtead of being laid in the furrows, where they often take root again, and at any rate obſtruct the growth of the flax in the furrows.

Of Pulling FLAX. When the crop grows ſo ſhort and branchy, as to appear more valuable for ſeed than flax, it ought not to be pulled before it be thoroughly ripe; but if it grows long and not branchy, the ſeed ſhould be diſregarded, and all the attention given to the flax. In the laſt caſe it ought to be pulled after the bloom has fallen, when the ſtalk begins to turn yellow, and before the leaves fall, and the bolls turn hard and ſharp-pointed.

When the ſtalk is ſmall, and carries few bolls, the flax is fine; but the ſtalk of coarſe flax is groſs, rank, branchy, and carries many bolls.

When flax has fallen and lies, ſuch as lies ought to be immediately pulled, whether it has grown enough or not, as otherwiſe it will rot altogether.

When parts of the ſame field grow unequally, ſo that ſome parts are ready for pulling before other parts; only what is ready ſhould be pulled, and the reſt ſhould be ſuffered to ſtand till ready.

The flax-raiſer ought to be at pains to pull, and keep by itſelf, each different kind of lint which he finds in his field; what is both long and fine, by itſelf; what is both long and coarſe, by itſelf; what is both ſhort and fine, by itſelf; what is both ſhort and coarſe, by itſelf; and in like manner every other kind by itſelf that is of the ſame ſize and quality. If the different kinds be not thus kept ſeparate, the flax muſt be much damaged in the watering, and the other ſucceeding operations.

What is commonly called under-growth, may be neglected as uſeleſs.

Few perſons that have ſeen flax pulled, are ignorant of the method of laying it in handfuls acroſs other: which gives the flax ſufficient air, and keeps the handfuls ſeparate and ready for the rippler.

Of Stacking up FLAX *during the winter, and Winning* *the Seed.* If the flax be more valuable than the ſeed, it ought by no means to be ſtacked up; for its own natural juice aſſiſts it greatly in the watering: whereas, if kept long unwatered, it loſes that juice, and the harle adheres ſo much to the boon, that it requires longer time to water, and even the quality of the flax becomes thereby harſher and coarſer. Beſides, the flax ſtacked up over-year, is in great danger from vermin and other accidents; the water in ſpring is not ſo ſoft and warm as in harveſt; and near a year is thereby loſt of the uſe of the lint: but if the flax be ſo ſhort and branchy as to appear moſt valuable for ſeed, it ought, after pulling, to be ſtooked and dried upon the field, as is done with corn, then ſtacked up for winter, rippled in ſpring, and after ſheeling the ſeed ſhould be well cleaned from bad ſeeds, *&c.*

Of Rippling FLAX. After pulling, if the flax is to be regarded more than the ſeed, it ſhould be allowed to lie ſome hours upon the ground to dry a little, and ſo gain ſome firmneſs, to prevent the ſkin or harle, which is the flax, from rubbing off in the rippling; an operation which ought by no means to be neglected, as the bolls, if put into the water along with the flax, breed vermin there, and otherwiſe ſpoil the water. The bolls alſo prove very inconvenient in the graſſing and breaking.

In Lincolnſhire and Ireland, they think that rippling hurts the flax; and therefore, in place of rippling, they ſtrike the bolls againſt a ſtone.

The handfuls for rippling ſhould not be great, as that endangers the lint in the rippling comb.

After rippling, the flax-raiſer will perceive, that he is able to aſſort each ſize and quality of the flax by itſelf more exactly than he could before.

Of Watering FLAX. A running ſtream waſtes the lint, makes it white, and frequently carries it away. Lochs, by the great quantity and motion of the water, alſo waſte and whiten the flax, though not ſo much as running ſtreams. Both rivers and lochs water the flax quicker than canals.

But all flax ought to be watered in canals, which ſhould be digged in clay ground if poſſible, as that ſoil retains the water beſt: but if a firm retentive ſoil cannot be got, the bottom or ſides of the canal, or both the bottom and ſides, may be lined with clay; or, inſtead of lining the ſides with clay, which might fall down, a ditch may be dug without the canal, and filled with clay, which will prevent both extraneous water from entering, and the water within from running off.

A canal of forty feet long, ſix broad, and four deep, will generally water the growth of an acre of flax.

It ought to be filled with freſh ſoft water from a river or brook, if poſſible two or three weeks before the flax is put in, and expoſed all that time to the heat of the ſun. The greater way the river or brook has run, the ſofter, and therefore the better will the water be. Springs, or ſhort runs from hills, are too cold, unleſs the water is allowed to ſtand long in the canal. Water from coal or iron, is very bad for flax. A little of the powder of galls thrown into a glaſs of water, will immediately diſcover if it comes from minerals of that kind, by turning it into a dark colour, more or leſs tinged in proportion to the quantity of vitriol it contains.

The canal ought not to be under any ſhade; which, beſides keeping the ſun from ſoftening the water, might make part of the canal cooler than other parts, and ſo water the flax unequally.

The flax-raiſer will obſerve, when the water is brought to a proper heat, that ſmall plants will be riſing quickly in it, numbers of ſmall inſects and reptiles will be generating there, and bubbles of air riſing on the ſurface. If no ſuch ſigns appear, the water muſt not be warm enough, or is otherwiſe unfit for flax.

Moſs-holes, when neither too deep nor too ſhallow, frequently anſwer well for watering flax, when the water is proper, as before deſcribed.

The proper ſeaſon for watering flax is, from the end of July to the end of Auguſt.

The adavntage of watering flax as ſoon as poſſible, after pulling, has been already mentioned.

The flax being ſorted after rippling, as before-mentioned, ſhould next be put in beets, never larger than a man can graſp with both his hands, and tied very ſlack, with a band of a few ſtalks. Dried ruſhes anſwer exceedingly well for binding flax, as they do not rot in the water, and may be dried and kept for uſe again.

The beets ſhould be put into the canals ſlope-ways, or half ſtanding upon end, the root-end uppermoſt. Upon the crop-ends, when uppermoſt, there frequently breeds a deal of vermin, deſtructive of the flax, which is effectually prevented by putting the crop-end downmoſt.

The whole flax in the canal ought to be carefully covered from the ſun with divots; the graſſy ſide of which ſhould be next the flax, to keep it clean. If it is not thus covered, the ſun will diſcolour the flax, though quite covered with water. If the divots are not weighty enough to keep the flax entirely under water, a few ſtones may be laid above them. But the flax ſhould not be preſſed to the bottom.

When the flax is ſufficiently watered, it feels ſoft to the grip, and the *harle* parts eaſily with the *boon* or *ſhow*, which laſt is then become brittle, and looks whitiſh. When theſe ſigns are found, the flax ſhould be taken out of the water, beet after beet; each gently rinſed in the water, to cleanſe it of the naſtineſs which has gathered about it in the canal; and as the lint is then very tender, and the beet ſlackly tied, it muſt be carefully and gently handled.

Great care ought to be taken that no part is overdone; and as the coarſeſt waters ſooneſt, if different kinds be mixed together, a part will be rotted, when the reſt is not ſufficiently watered.

When lint taken out of the canal is not found ſufficiently watered, it may be laid in a heap, for twelve, eighteen, or twenty-four hours, which will have an effect like more watering; but this operation is nice, and may prove dangerous in unſkilful hands.

After the flax is taken out of the canal, freſh lint ſhould not be put a ſecond time into it, until the former water be run off, and the canal cleaned, and ſupplied with freſh water.

Of graſſing FLAX. Short heath is the beſt field for graſſing flax, as, when wet, it faſtens to the heath, and is thereby prevented from being blown away by the wind. The heath alſo keeps it a little above the earth, and ſo expoſes it the more equally to the weather. When ſuch heath is not to be got, links, or clean old lea-ground is the next beſt. Long graſs-grounds ſhould be avoided, as the graſs growing thro' the lint frequently ſpots, tenders, or rots it; and grounds expoſed to violent winds ſhould alſo be avoided.

The flax, when taken out of the water, muſt be ſpread very thin upon the ground; and being then very tender, it muſt be gently handled. The thinner it is ſpread the better, as it is then the more equally expoſed to the weather. But it ought never to be ſpread during a heavy ſhower, as that would waſh and waſte the harle too much, which is then exceſſively tender, but ſoon after becomes firm enough to bear the rains, which, with the open air and ſunſhine, cleans, ſoftens, and purifies the harle to the degree wanted, and makes it bliſter from the boon. In ſhort, after the flax has got a little firmneſs by being a few hours ſpread in dry weather, the more rain and ſunſhine it gets the better.

If there be little danger of high winds carrying off the flax, it will be much the better of being turned about once a-week. If it is not to be turned, it ought to be very thin ſpread. The ſpreading of flax and hemp requires a deal of ground, and enriches it greatly.

The ſkilful flax-raiſer ſpreads his firſt row of flax at the end of the field oppoſite to the point from from whence the moſt violent wind commonly comes, placing the root-ends foremoſt; he makes the root-ends of every other row overlap the crop-ends of the former row three or four inches, and binds down the laſt row with a rope; by which means the wind does not eaſily get below the lint to blow it away: and as the crop-ends are ſeldom ſo fully watered as the root-ends, the aforeſaid overlapping has an effect like giving the crop-ends more watering. Experience only can fully teach a perſon the ſigns of flax being ſufficiently graſſed: then it is of a clearer colour than formerly; the harle is bliſtered up, and eaſily parts with the boon, which is then become very brittle. The whole ſhould be ſufficiently graſſed before any of it is lifted; for if a part be lifted ſooner than the reſt, that which remains is in great danger from the winds.

A dry day ought to be taken for taking up the flax; and if there is no appearance of high wind, it ſhould be looſed from the heath or graſs, and left looſe for ſome hours, to make it thoroughly dry.

As a great quantity of flax can ſcarcely be all equally watered and graſſed, and as the different qualities will beſt appear at lifting the flax off the graſs; therefore at that time each different kind ſhould be gathered together, and kept by itſelf; that is, all of the ſame colour, length, and quality.

The ſmaller the beets lint is made up in, the better for drying, and the more convenient for ſtacking, houſing, *&c.* and in making up theſe beets, as in every other operation upon flax, it is of great conſequence that the lint be laid together as it grew, the root-ends together, and the crop-ends together.

Of keeping FLAX *after it is graſſed.* Nothing needs be ſaid here, but that if the flax is to be ſtacked, it ſhould be ſet in an airy place, upon a dry foundation, ſuch as pob middings, or the like, and well covered from the weather; and if houſed, the floor muſt be dry, and the houſe well aired, and water-tight.

Follows an Eſtimate of the Expence, Produce, and Profit of a Scots acre of FLAX,*—ſuppoſing the ſeaſon favourable, that no accidental loſſes happen, and that the farmer is neither unſkilſul nor negligent.*

	A medium crop.	A great crop.	An extraordinary crop.
Ground-rent, labouring the ground, and leading the flax	L. 2 10 0	L. 3 10 0	L. 5 0 0
Lintſeed from L. 2 to L. 4 *per* hogſhead, the medium 3s. 4d. *per* peck — — —	1 16 8 for 11 pecks.	1 10 0 for 9 pecks.	1 6 8 for 8 pecks.
Clodding and ſowing — — — —	0 2 0	0 2 0	0 2 0
Weeding — — — — —	0 12 0	0 8 0	nothing.
Pulling, rippling, putting in, and covering in the water	0 14 0	0 15 0	1 0 0
Taking out of the water, graſſing, and ſtacking	0 8 0	0 12 0	0 18 0
Breaking, and ſcutching, at 2s. *per* ſtone —	3 0 0 for 30 ſtones.	4 0 0 for 40 ſtones.	6 0 0 for 60 ſtones.
Total expence	L. 9 2 8	L. 10 17 0	L. 14 6 8
Produce at 10s. *per* ſtone — — —	L. 15 0 0 for 30 ſtones.	L. 20 0 0 for 40 ſtones.	L. 30 0 0 for 60 ſtones.
Lintſeed ſold for oil at 1s. *per* peck — — The chaff of the bolls is well worth the expence of drying the ſeed; as it is good food, boiled and mixed with beer, for horſes.	0 16 0	0 18 0	1 0 0
Total produce	L. 15 16 0	L. 20 18 0	L. 31 0 0
Ballance for profit — — —	L. 6 14 4	L. 10 1 0	L. 16 13 4

There is nothing ſtated here as expence of the canal in which the flax is watered; becauſe that varies much according to the conveniencies people have for making it: and a canal once made requires for after-years only to be repaired and cleanſed.

It is a certain fact, that the greater the crop is, the better is the quality of the ſame kind of flax.

The advantage of having both a crop of flax and a crop of turnip the ſame year—or of ſowing graſs-ſeeds along with the lintſeed—and of reducing the ground to a fine garden mould, free of weeds, ought to be attended to.

For Cambrick and fine Lawn. The ground muſt be a rich light ſoil, rather ſandy, but cannot be too rich.

It ought to be ploughed in September, or the beginning of October, firſt putting a little hot rotten dung upon it.

Second ploughing in January after a hard froſt; and when you intend to ſow it, plough it a third time, or rather hoe it, reducing the clods very fine; but make no furrows: the land muſt be made level like a garden; but never work the land when wet.

The ſeed ſhould be ſown the beginning of April, and about double the quantity that is generally ſown by our farmers; if the land be very rich, it will require rather more than double.

As ſoon as ſown (if the weather be dry) it will be neceſſary to roll the ground.

The lint muſt be weeded very clean when about three inches high; directly after which you muſt ſet forked ſticks, of about one and half inch thick (which ought to be prepared before) every four or five feet, according to the length of the poles you are to lay upon them; they ſhould be well fixed in the ground, the forked part to receive the poles about ſix or ſeven inches above the lint; each row of poles ſhould be two, three, or four feet aſunder, according to the length of the bruſhwood you are to lay upon them.

The poles ought to be from ten to fifteen feet long, and ſtrong enough to ſupport the bruſh acroſs the poles; take the longeſt bruſhwood you can get, the more branchy the better, very thick, filling up the vacancies with ſmaller bruſh, and any of the branches that riſe higher than eighteen or twenty inches ought to be lopt off to make the bruſh lie as level as poſſible: any ſort of bruſh will do except oak, as that tinges the lint.

Your lint muſt be pulled as ſoon as the ſeed is fully formed, which is a few days after it is out of the bloom before the lint turn yellow.

It muſt be pulled above the bruſhwood, and every handful laid upon it as ſoon as poſſible: if it is fine weather, leave it four or five hours in that manner; then carry it to a ſcreen near a barn, to put it under cover in caſe of rain; there it muſt be ſpread four or five days, and always put in the barn at night, or when it appears to rain: the bundles muſt be opened in the barn, or made hollow, to prevent it from heating.

Theſe operations muſt be performed until the lint is perfectly dry, and out of danger of heating; taking care all the time to keep the roots as even as poſſible, and if poſſible, keep it from rain or wet: if you cannot prevent it from being wet, it will be better to leave it on the graſs till dry; becauſe when once wet, the putting it under cover before dry will make it turn black; a thing which muſt be prevented at all events.

If any of the lint upon the border, or through the piece of ground, be coarſer than another, it muſt be ſeparated from the reſt.

The utmoſt care muſt be taken to preſerve the lint entire, or unbroke; for this reaſon they beat off the ſeed with a round mell or bittle.

The moſt proper ground is ſummer fallow, or after potatoes, or lea; if poſſible near a wood, to prevent the expence of carrying bruſh.

As ſoon as the ſeed is off, if you intend to water it that ſeaſon, it muſt be tied in bundles about as large as you can graſp with your two hands.

The water proper for it, is a very ſmall rivulet or ſoft ſpring free of any metallic ore, and taking care that no flood or foul water enters your pit; which muſt be at leaſt five feet deep, about nine or ten broad at the top, and ſeven or eight at the bottom, the length will depend on the quantity of flax you have to water. A very ſmall ſtripe of water, when clear, ſhould always be running in and off from your pit when the lint is in it.

The pit ought to be made three or four months before it be uſed.

You muſt drive poles about four inches thick, with a hook inclining downwards, in this form 7, all along the ſides of the pit, about five feet aſunder. The hooks muſt be level, or rather under the ſurface of the water. A long pole, the whole length of the pit, muſt be fixed into theſe hooks on each ſide; and croſs poles put under that, to keep the lint under water; but, the croſs poles are not uſed till the lint is put in. You muſt order it ſo, that all the lint ſhould be three or four inches under water. You next bring your lint to the ſides of the pit; then put your ſheaves head to head, cauſing each overlap the other about one third, and take as many of theſe as make a bundle of two or two and a half feet broad, laying the one above the other, till it is about four or four and a half feet high; then you tie them together in the middle, and at each root-end: after this, you wrap your bundle in ſtraw, and lay it in the water, putting the thin or broad ſide undermoſt, taking care that none of your lint touch the earth; after it is fully preſſed under water, put in your croſs poles to keep it under. The bundles ought to lie in the pit a foot ſeparate from each other. This renders it eaſy to take out; for, if the bundles entangle, they will be too heavy to raiſe.

The time of watering depends ſo much upon the weather, and ſoftneſs or hardneſs of the water, that it is impoſſible to fix any certain time. This muſt be left to the ſkill of the farmer. If the flax be intended for ſpinning yarn ſoft and fit for cambrick, it ought to be ſpread upon ſhort graſs for four or five days before you put it into the water; but if for lawns, lace, or thread, it is beſt to dry it outright. In either caſe, avoid as much as poſſible to let it get rain; as much rain blanches and waſhes out the oil, which is neceſſary to preſerve the ſtrength.

The great property of this flax is to be fine and long. Thick ſowing raiſes all plants fine and ſlender, and when the ground is very rich, it forces them to a great length. Pulling green prevents that coarſe hardneſs which flax has when let ſtand till it be full ripe, and gives it the fine ſilky property. The bruſhwood, when the flax ſprings up, catches it by the middle, prevents it from lying down and rotting; infallible conſequences of ſowing thick upon rich ground. It likewiſe keeps it ſtraight, moiſt, and ſoft at the roots; and by keeping it warm, and ſhaded from the ſun, greatly promotes its length. The keeping it from rain, heating, taking proper care of your water, preſerves the colour, and prevents theſe bars in cloth ſo much complained off by bleachers.

FLAX-DRESSING. *The different methods of that operation.*

For many ages it was the practice to ſeparate the boon or core from the flax, which is the bark of the plant, by the following ſimple *hand-methods*. Firſt, for breaking the boon; the ſtalks in ſmall parcels were beat with a mallet; or, more dexterouſly, the *break* (Plate LXXXII. fig. 1. and 2.) was uſed thus: The flax being held in the left-hand a-croſs the three *under-teeth* or *ſwords* of the break (A, fig. 1. and *a*, fig. 2.), the *upper-teeth* (B, fig. 1. and *b*, fig. 2.) were with the right-hand quickly and often forced down upon the flax, which was artfully ſhifted and turned with the left-hand. Next, for clearing the flax of the broken boon; the workman with his left-hand held the flax over the *ſtock* (fig. 3. and 4.) while with his right-hand he ſtruck or threſhed the flax with the *ſcutcher* (fig. 5.).

Theſe methods of breaking and ſcutching the flax being ſlow and very laborious, a *water-mill* was invented in Scotland about forty years ago, which, with ſome late improvements, makes great diſpatch, and in ſkilful and careful hands gives ſatisfaction. It has been generally conſtructed to break the boon by three dented rollers, placed one above the other. The middle one of which being forced quickly round takes the other two along with it, and one end of handfuls of the flax being by the workman directed in between the upper and middle rollers, the flax is immediately drawn in by the rollers; a curved board or plate of tin behind the rollers directs the flax to return again between the middle and undermoſt rollers;—and thus the operation is repeated until the boon be ſufficiently broke. Great weights of timber or ſtone at the ends of levers, preſs the upper and under-rollers towards the middle one.

The ſcutching is next carried on by the mill in the following manner: Four arms, ſomething like the hand-ſcutchers before deſcribed, project from a perpendicular axle; a box around the axle incloſes theſe projecting ſcutchers; and this box is divided among the workmen, each having ſufficient room to ſtand and handle his flax, which, through ſlits in the upper-part and ſides of the box, they hold in to the ſtroke of the ſcutchers; which, moving round horizontally, ſtrike the flax a-croſs or at right angles, and ſo threſh out or clear it of the boon.

The breaking of the flax by *rollers* is ſcarcely ſubject to any objection, but that it is dangerous to workmen not ſufficiently on their guard, who ſometimes allow the rollers to take hold of their fingers, and thereby their whole arm is inſtantly drawn in: thus many have loſt their arms. To avoid this danger, a break upon the general principles of the hand-break before deſcribed, has been lately adapted to water machinery, and uſed in place of rollers. The horizontal ſtroke of the ſcutchers was long thought too ſevere, and waſteful of the flax; but very careful experiments have diſcovered that the waſte complained of muſt be charged to the unſkilfulneſs or negligence of the workmen, as in good hands the mill carries away nothing but what, if not ſo ſcutched off, muſt be taken off in the heckling with more loſs both of time and flax. But to obviate this objection of the violence of the *horizontal ſcutchers*, an imitation of hand-ſcutching has lately been applied to water. The ſcutchers then project from an horizontal axle, and move like the arms of a check-reel, ſtriking the flax neither acroſs nor perpendicularly down, but ſloping in upon the parcel exactly as the flax is ſtruck by the hand-ſcutcher. This ſloping ſtroke is got by raiſing the ſcutching-ſtock ſome inches higher than the centre of the axle; and by raiſing or lowering the ſtock, over which the flax is held, or ſcrewing it nearer to or farther from the ſcutchers, the workman can temper or humour the ſtroke almoſt as he pleaſes.

A lint-mill with horizontal ſcutchers upon a perpendicular axle, requires a houſe of two ſtories, the rollers or break being placed in the ground ſtory, and the ſcutchers in the loft above; but a mill with vertical ſcutchers on an horizontal axle, requires but one ground ſtory for all the machinery.

Another method of breaking and ſcutching flax, more expeditious than the old hand-methods, and more gentle than water-mills, has alſo been lately invented in Scotland. It is much like the break and ſcutcher giving the ſloping ſtroke laſt deſcribed, moved by the foot. The treddle is remarkably long, and the ſcutchers are fixed upon the rim of a fly-wheel. The foot-break is alſo aſſiſted in its motion by a fly. Theſe foot machines are very uſeful where there are no water-mills, but they are far inferior to the mills in point of expedition.—[*See plans of the* water-mills, *and* foot-machine, *on the unnumbered plates betwixt the* LXXXII. *and* LXXXIII.]

The next operation that flax undergoes after ſcutching, is heckling. The *heckle* (fig. 6. Plate LXXXII.) is firmly fixed to a bench before the workman, who ſtrikes the flax upon the teeth of the heckle, and draws it thro' the teeth. To perſons unacquainted with that kind of work this may ſeem a very ſimple operation; but, in fact, it requires as much practice to acquire the ſlight of heckling well, and without waſting the flax, as any other operation in the whole manufacture of linen. They uſe coarſer and wider teethed heckles, or finer, according

Plate LXXXII.

Fig. 1. Flax hand break

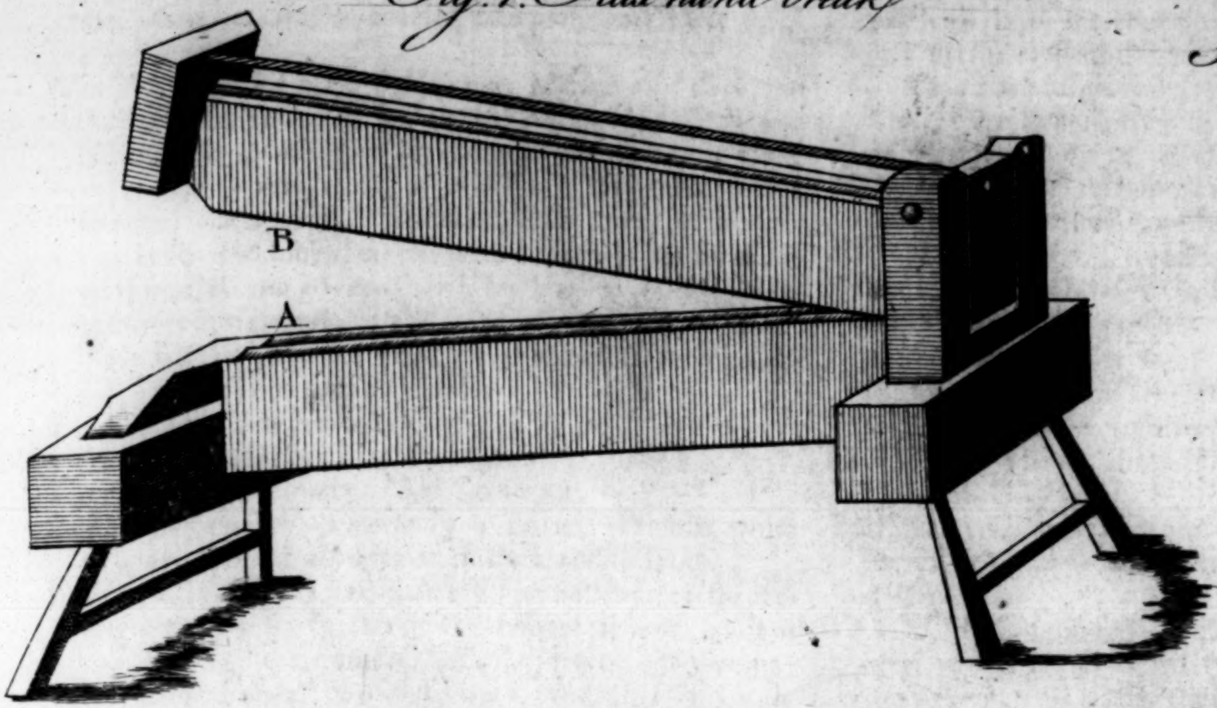


Fig. 2. Section of the Break

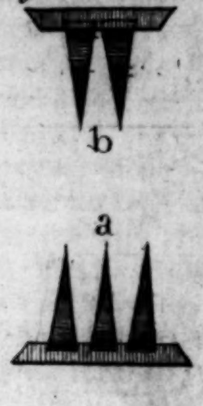
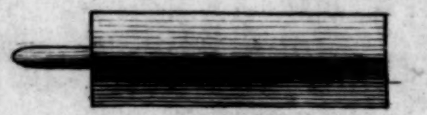


Fig. 5. Hand Skutcher



Skutching Stock

Fig. 3. Side view

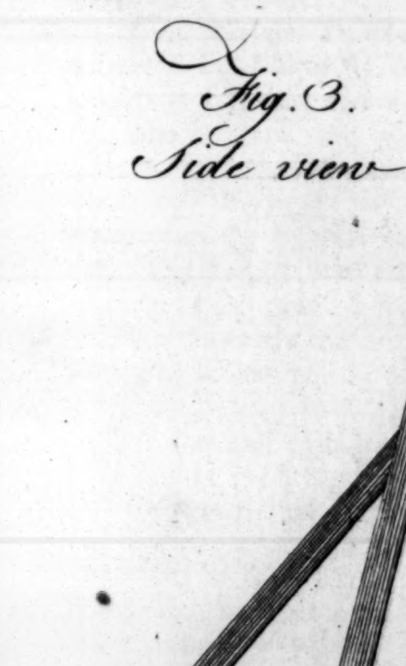


Fig. 4. Front view

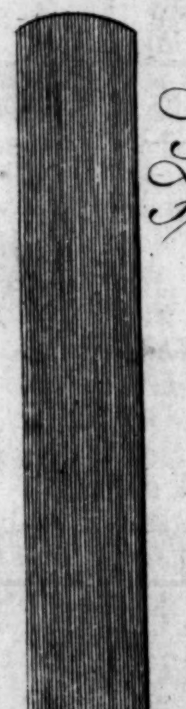


Fig. 6. Heckle

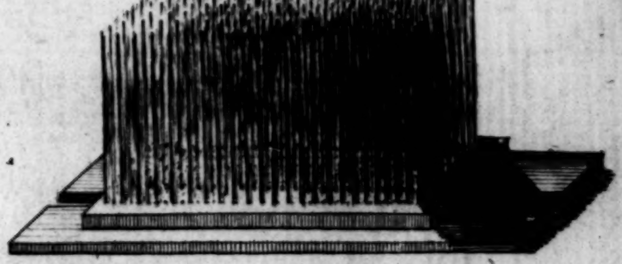
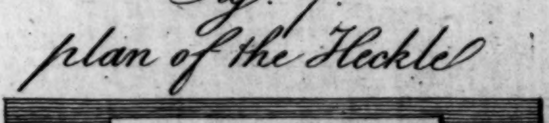


Fig. 7. plan of the Heckle



A. Bell Sct.

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ing to the quality of the flax; generally putting the flax thro' two heckles, a coarſer one firſt, and next thro' a fine heckle.

Flax for cambrick and fine lawn, thread and lace, is dreſſed in a manner ſomewhat different. It is not ſkutched ſo thoroughly as common flax; which from the ſkutch proceeds to the heckle, and from that to the ſpinner: whereas this fine flax, after a rough ſkutching, is ſcraped and cleanſed with a blunt knife upon the workman's-knee covered with his leather apron; from the knife it proceeds to the ſpinner, who, with a bruſh made for the purpoſe, ſtraights and dreſſes each parcel juſt before ſhe begins to ſpin it.

Toad-**FLAX**. See LINARIA.

FLEA, in zoology. See PULEX.

FLEA-BANE, in botany. See CONYZA.

FLEA-BITTEN, that colour of a horſe, which is white or grey, ſpotted all over with dark rediſh ſpots.

FLEAM, in ſurgery and farriery, an inſtrument for letting a man or horſe blood. A caſe of fleams, as it is called by farriers, comprehends ſix ſorts of inſtruments; two hooked ones, called drawers, and uſed for cleaning wounds; a pen-knife; a ſharp pointed lancet, for making inciſions; and two fleams, one ſharp and the other broad pointed. Theſe laſt are ſomewhat like the point of a lancet, fixed in a flat handle, only no longer than is juſt neceſſary to open the vein.

FLECHE, a town of France, under the meridian of London, twenty miles north-eaſt of Angers.

FLEECE, the covering of wool, ſhorn off the bodies of ſheep. See WOOL.

Order of the Golden **FLEECE**, an order of knighthood inſtituted by Philip II. duke of Burgundy. Theſe knights at firſt were twenty-four, beſides the duke himſelf, who reſerved the nomination of ſix more: but Charles V. increaſed them to fifty. He gave the guardianſhip of this order to his ſon Philip king of Spain, ſince which the Spaniſh monarchs are chiefs of the order. The knights had three different mantles ordained them at the grand ſolemnity, the collar and fleece.

FLEET, commonly implies a company of ſhips of war, belonging to any prince or ſtate: but ſometimes it denotes any number of trading ſhips, employed in a particular branch of commerce.

In ſailing, a fleet of men of war is uſually divided into three ſquadrons; the admiral's, the vice admiral's, and the rear-admiral's ſquadron, all which, being diſtinguiſhed by their flags and pendants, are to put themſelves, and, as near as may be, to keep themſelves in their cuſtomary places, *viz.* The admiral, with his ſquadron, to ſail in the van, that ſo he may lead the way to all the reſt in the day-time, by the ſight of his flag in the main-top-maſt-head; and in the night time, by his lights or lanterns. The vice-admiral and his ſquadron, is to ſail in the centre or middle of the fleet. The rear-admiral, and the ſhips of his ſquadron, is to bring up the rear. But ſometimes other diviſions are made; and thoſe compoſed of the lighter ſhips and the beſt ſailors, are placed as wings to the van, centre, and rear.

FLEET is alſo a noted priſon in London, where perſons are committed for contempt of the king and his laws, particularly of his courts of juſtice: or for debt, where any perſon will not, or is unable to pay his creditors.

There are large rules and a warden belonging to the fleet priſon, which had its name from the float or fleet of the river or ditch, on the ſide whereof it ſtands.

FLENSBURGH, a port town ſubject to Denmark, ſixteen miles north of the city of Sleſwick.

FLESH, in anatomy, a ſimilar, fibrous part of an animal body, ſoft and bloody, being that whereof moſt of the other parts are compoſed, and whereby they are connected together: or more properly, it is ſuch parts of the body where the blood-veſſels are ſo ſmall, as only to retain blood enough to preſerve their colour red.

FLEURY, a town of Burgundy, in France, thirty miles north of Chalons.

FLEXIBLE, in phyſics, a term applied to bodies capable of being bent or diverted from their natural figure or direction.

FLEXOR, in anatomy, a name applied to ſeveral muſcles, which are ſo called from their office, which is to bend the part to which they belong; in oppoſition to the extenſors, which open or ſtretch them. See ANATOMY, part II.

FLINT, in natural hiſtory, a ſemipellucid ſtone, compoſed of cryſtal debaſed with earth, of one uniform ſubſtance, and free from veins; but of different degrees of colour, according to the quantity of earth it contains, and naturally ſurrounded with a whitiſh cruſt.

Flint is a ſtone of an extremely fine, compact, and firm texture, and very various, both in ſize and figure. It is of all the degrees of grey, from nearly quite black, to almoſt quite white. It breaks with a fine, even, gloſſy ſurface; and is moderately tranſparent, very hard, and capable of a fine poliſh. It readily ſtrikes fire with ſteel, and makes not the leaſt effervеſcence with aquafortis, and burns to a whiteneſs. Its uſes in glaſs-making, &c. are too well known to need a particular recital.

FLOATAGES, all things floating on the top of the ſea or any water, a word much uſed in the commiſſions of water bailiffs.

FLOOD. See DELUGE.

FLORENCE, an archbiſhop's ſee and city of Italy, ſituated on the river Arno, in Tuſcany, forty-five miles eaſt of Leghorn: E. long. 12° 15', and N. lat. 43^{d} 30'. Florence is one of the moſt elegant towns in Italy, has an univerſity, and is ſix miles in circumference. The ſtatues, paintings, and curioſities in the grand duke's palace are the admiration of travellers.

FLORENTINE, a town of Champaign in France, twenty-eight miles ſouth-weſt of Troyes.

FLORES, in geography, one of the Azores iſlands, ſubject to Portugal.

FLORID STYLE, is that too much enriched with figures and flowers of rhetoric.

FLORIDA, in geography, a name firſt given by the Spaniards to all that part of North America which lies north of the gulph of Mexico. However, all that retains the name Florida, at preſent, is the peninſula between the Britiſh colony of Georgia and cape Florida, *viz.* between 25° and 30° of N. latitude, and between 81° and 85° W. longitude.

FLORIN, is ſometimes uſed for a coin, and ſometimes for a money of account.

Florin, as a coin, is of different values, according to the different metals and different countries where it is ſtruck. The gold florins are moſt of them of a very coarſe alloy, ſome of them not exceeding thirteen or fourteen carrats, and none of them ſeventeen and a half. As to ſilver florins, thoſe of Holland are worth about 1 s. 8 d. thoſe of Genoa were worth $8\frac{1}{4}$ Sterling.

Florin, as a money of account, is uſed by the Italian, Dutch, and German merchants and bankers, but admits of different diviſions in different places. In Holland, it is on the footing of the coin of that name, containing 20 ſtivers. At Frankfort and Nuremberg it is equivalent to 3 s. Sterling, and is divided into creutzers, and pfinnings. At Liege, it is equivalent to 2 s 3 d. At Straſburg, to 1 s. 8 d. In Savoy, to 11 d. At Genoa, to $8\frac{1}{4}$ d. And at Geneva, to $6\frac{1}{2}$ d. See Coin.

FLORIST, a perſon well ſkilled in flowers, their kinds and cultivation.

FLORY, Flowry, or **Fleury**, in heraldry, a croſs that has the flowers at the end circumflex and turning down, differing from the potence, inaſmuch as the latter ſtretches out more like that which is called patee.

The croſs flory is repreſented in Plate LXXX. fig. 7

FLOS, Flower, in botany. See Flower.

Flos, in chemiſtry, the moſt ſubſtile part of bodies ſeparated from the more groſs parts by ſublimation, in a dry form. See Chemistry.

FLOTSON, or **Flotsom**, goods that by ſhipwreck are loſt, and floating upon the ſea; which, with jetſon and lagan, are generally given to the lord admiral: but this is the caſe only where the owners of ſuch goods are not known. And here it is to be obſerved, that jetſon ſignifies any thing that is caſt out of a ſhip when in danger, and afterwards is beat on the ſhore by the water, notwithſtanding which the ſhip periſhes. Lagan is where heavy goods are thrown overboard, before the wreck of the ſhip, and ſink to the bottom of the ſea.

FLOUNDER, the Engliſh name of a ſpecies of pleuronectes. See Pleuronectes.

FLOUR, the meal of wheat-corn, finely ground and ſifted. See Meal.

FLOWER, among botaniſts and gardeners, the moſt beautiful part of trees and plants, containing the organs or parts of fructification. See Botany.

External **Flower**. See Xeranthemum.

Everlaſting **Flower**. See Gnaphalium.

Flower Fence. See Poinciana.

Flower de luce. See Iris.

Sultan-**Flower**. See Cyanus.

Sun-**Flower**. See Helianthus.

Trumpet-**Flower**. See Bignonia.

Wind-**Flower**. See Anemone.

Flower de lis, or **Flower de luce**, in heraldry, a bearing repreſenting the lily, called the queen of flowers, and the true hieroglyphic of royal majeſty; but of late it is become more common, being borne in ſome coats one, in others three, in others five, and in ſome ſemee, or ſpread all over the eſcutcheon in great numbers.

The arms of France are, three flower de lis or, in a field azure.

FLUDDER. See Colymbus.

FLUID, an appellation given to all bodies whoſe particles eaſily yield to the leaſt partial preſſure, or force impreſſed.

Laws and properties of **Fluids**. See Hydraulics and Hydrostatics.

FLUOR, in phyſics, a fluid; or, more properly, the ſtate of a body that was before hard or ſolid, but is now reduced by fuſion, or fire, into a ſtate of fluidity.

Fluor, in mineralogy, implies a ſort of mineral concretion, frequently found amongſt ores and ſtones, in mines and quarries.

Fluor albus, or **Whites**. See Medicine.

FLUSHING, or **Vlissengen**, a port town of Zealand in Holland, five miles ſouth of Middleburgh: E. long. 3° 25′, N. lat. 51° 30′. It is a town of great foreign trade, and has a good ſecure harbour.

FLUTE, an inſtrument of muſic, the ſimpleſt of all thoſe of the wind kind. It is played on by blowing it with the mouth, and the tones or notes are changed by ſtopping and opening the holes diſpoſed for that purpoſe along its ſide.

German **Flute**, is an inſtrument entirely different from the common flute. It is not, like that, put into the mouth to be played, but the end is ſtopt with a tampion or plug; and the lower lip is applied to a hole about two inches and a half, or three inches, diſtant from the end. This inſtrument is uſually about a foot and a half long; rather bigger at the upper end than the lower; and perforated with holes, beſides that for the mouth, the loweſt of which is ſtopt and opened by the little finger's preſſing on a braſs or ſometimes a ſilver key, like thoſe in hautboys, baſſoons, *&c.* Its ſound is exceeding ſweet and agreeable; and ſerves as a treble in a concert.

Coarſe flutes, on importation, pay the gros, containing twelve dozen, 3 s. $10\frac{20}{100}$ d. and on exportation draw back 3 s. $4\frac{50}{100}$ d.

Flutes, or **Flutings**. See Architecture.

FLUVIALIS, in botany. See Najas.

FLUX, in medicine, an extraordinary iſſue, or evacuation of ſome humours of the body. See Medicine.

Flux, in metallurgy, whatever can cauſe a body otherwiſe not at all, or hardly, fuſible by fire, to melt. See Chemistry.

F L U X I O N S.

FLUXIONS, a method of calculation which greatly facilitates computations in the higher parts of mathematics. Sir Iſaac Newton and Mr Leibnitz contended for the honour of inventing it It is probable they had both made progreſs in the ſame diſcovery, unknown to each other, before there was any publication on the ſubject.

In this branch of mathematics magnitudes of every kind are ſuppoſed generated by motion: a line by the motion of a point, a ſurface by the motion of a line, and a ſolid by the motion of a ſurface. And ſome part of a figure is ſuppoſed generated by an uniform motion; in conſequence of which the other parts may increaſe uniformly or with an accelerated or retarded motion, or may decreaſe in any of theſe ways; and the computations are made by tracing the comparative velocities with which the parts flow.

Fig. 1. If the parallelogram ABCD be generated by an uniform motion of the line AB toward CD while it moves from FE towards *fe*, while the line BF receives the increment F*f*, and the figure will be increaſed by the parallelogram F*e*; the line FE in this caſe undergoes no variation.

The fluxion of any magnitude at any point is the increment that it would receive in any given time, ſuppoſing it to increaſe uniformly from that point; and as the meaſures will be the ſame, whatever the time be, we are at liberty to ſuppoſe it leſs than any aſſigned time.

The firſt letters in the alphabet are uſed to repreſent invariable quantities; the letters x, y, z variable quantities; and the ſame letters with points over them $\dot{x}$, $\dot{y}$, $\dot{z}$, repreſent their fluxions.

Therefore if AB$=a$, and BF$=x$; F*f*, the fluxion of BF, will be $=\dot{x}$, and F*e*, the fluxion of AF, $=a\dot{x}$.

If the rectangle be ſuppoſed generated by the uniform motion of FG towards CD, at the ſame time HG moves uniformly towards AD, the point G keeping always on the diagonal, the lines FG HG will flow uniformly; for while B*f* receives the increment F*f* and HB, the increment HK, FG will receive the increment *hg* and HG the increment *hg*, and they will receive equal increments in equal ſucceſſive times. But the parallelogram will flow with an accelerated motion; for while F flows to *f* and H to K, it is increaſed by the gnomon KG*f*; but while F and H flow through the equal ſpaces *fm* KL, it is increaſed by the gnomen L*gm* greater than KG*f*; conſequently when fluxions of the ſides of a parallelogram are uniform, the fluxion of the parallelogram increaſes continually.

The fluxion of the parallelogram BHGF is the two parallelograms KG and G*f*; for though the parameter receives an increment of the gnomen KG*f*, while its ſides flow to *f* and K, the part *g*G is owing to the additional velocity wherewith the parallelogram flows during that time; and therefore is no part of the meaſure of the fluxion, which muſt be computed by ſuppoſing the parameter to flow uniformly as it did at the beginning, without any acceleration.

Therefore if the ſides of a parallelogram be x and y, their fluxions will be $\dot{x}$ $\dot{y}$; and the fluxion of the parallelogram $x\dot{y}+y\dot{x}$; and if $x=y$, that is, if the figure be a ſquare, the fluxion of x^2 will be $2x\dot{x}$.

Fig. 2. Let the triangle ABC be deſcribed by the uniform motion of DE from A towards B, the point E moving in the line DF, ſo as always to touch the lines AC, CB; while D moves from A to F, DE is uniformly increaſed, and the increaſe of the triangle is uniformly accelerated. When DE is in the poſition FC, it is a maximum. As D moves from F to B, the line FC decreaſes, and the triangle increaſes, but with a motion uniformly retarded.

Fig. 3. If the ſemicircle AFB be generated by the uniform motion of CD from A towards B, while C moves from A to G, the line CD will increaſe, but with a retarded motion; the circumference alſo increaſes with a retarded motion, and the circular ſpace increaſes with an accelerated motion, but not uniformly, the degrees of acceleration growing leſs as CD approaches to the poſition GF. When C moves from G to B, it decreaſes with a motion continually accelerated, the circumference increaſes with a motion continually accelerated, and the area increaſes with a motion continually retarded, and more quickly retarded as CD approaches to B.

The fluxion of a quantity which decreaſes is to be conſidered as negative.

When a quantity does not flow uniformly, its fluxion may be repreſented by a variable quantity, or a line of a variable length; the fluxion of ſuch a line is called the ſecond fluxion of the quantity whoſe fluxion that line is: and if it be variable, a third fluxion may be deduced from it, and higher orders from theſe in the ſame manner: the ſecond fluxion is repreſented by two points, as $\ddot{x}$.

The increment a quantity receives by flowing for any given time, contains meaſures of all the different orders of fluxions; for if it increaſes uniformly, the whole increment is the firſt fluxion; and it has no ſecond fluxion. If it increaſes with a motion uniformly accelerated, the part of the increment occaſioned by the firſt motion meaſures the firſt fluxion, and the part occaſioned by the acceleration meaſures the ſecond fluxion. If the motion be not only accelerated, but the degree of acceleration continually increaſed, the two firſt fluxions are meaſured as before; and the part of the increment occaſioned by the additional degree of acceleration meaſures the third; and ſo on These meaſures require to be corrected, and are only mentioned here to illuſtrate the ſubject.

DIRECT METHOD.

Any flowing quantity being given, to find its fluxion.

RULE I. To find the fluxion of any power of a quantity, multiply the fluxion of the root by the exponent of the power, and the product by a power of the ſame root leſs by unity than the given exponent.

The fluxion of x^3 is $3x^2\dot{x}$, of x^n $nx^{n-1}\dot{x}$; for the root of x^n is x, whoſe fluxion is $\dot{x}$; which multiplied by the exponent n, and by a power of x leſs by unity than n, gives the above fluxion.

If x receive the increment $\dot{x}$, it becomes $x+\dot{x}$; raiſe both to the power of n, and x^n becomes $x^n+nx^{n-1}\dot{x}+\frac{n.n-1}{2}x^{n-2}\dot{x}^2+$, &c.; but all the parts of the increment, except the firſt term, are owing to the accelerated increaſe of x^n, and form meaſures of the higher fluxions. The firſt term only meaſures the firſt fluxion; the fluxion of $\overline{a^2+z^2}^{\frac{3}{2}}$ is $\frac{3}{2}\times 2z\dot{z}\times\overline{a^2+z^2}^{\frac{1}{2}}$; for put $x=a^2+z^2$, we have $\dot{x}=2z\dot{z}$, and the fluxion of $x^{\frac{3}{2}}$, which is equal to the propoſed fluent, is $\frac{3}{2}x^{\frac{1}{2}}\dot{x}$, for which ſubſtituting the values of x and $\dot{x}$, we have the above fluxion.

Rule II. To find the fluxion of the product of ſeveral variable quantities multiplied together, multiply the fluxion of each by the product of the reſt of the quantities, and the ſum of the products thus ariſing will be the fluxion ſought.

Thus the fluxion of xy, is $\dot{x}y+\dot{y}x$; that of xyz, is $xy\dot{z}+xz\dot{y}+yz\dot{x}$; and that of $xyzu$, is $xyz\dot{u}+xyu\dot{z}+xzu\dot{y}+yzu\dot{x}$.

Rule III. To find the fluxion of a fraction.—From the fluxion of the numerator multiplied by the denominator, ſubtract the fluxion of the denominator multiplied by the numerator, and divide the remainder by the ſquare of the denominator.

Thus, the fluxion of $\frac{x}{y}$ is $\frac{y\dot{x}-x\dot{y}}{y^2}$; that of $\frac{x}{x+y}$, is $\frac{\dot{x}\times\overline{x+y}-\overline{\dot{x}+\dot{y}}\times x}{\overline{x+y}|^2}=\frac{y\dot{x}-x\dot{y}}{\overline{x+y}|^2}$.

Rule IV. In complex caſes, let the particulars be collected from the ſimple rules and combined together.

The fluxion of $\frac{x^2y^2}{z}$ is $\frac{\overline{2x^2y\dot{y}+2y^2x\dot{x}}\times z-x^2y^2\dot{z}}{z^2}$; for the fluxion of x^2 is $2x\dot{x}$, and of y^2 is $2y\dot{y}$, by Rule I. and therefore the fluxion of x^2y^2 (by Rule II.) $2x^2y\dot{y}+2y^2x\dot{x}$; from which, multiplied by z, (by Rule III.) and ſubtracting from it the fluxion of the denominator z, multiplied by the numerator, and dividing the whole by the ſquare of the denominator, gives the above fluxion.

Rule IV. The ſecond fluxion is derived from the firſt, in the ſame manner as the firſt from the flowing quantity.

Thus the fluxion of x^3, $3x^2\dot{x}$; its ſecond, $6x\dot{x}^2+3x^2\ddot{x}$ (by Rule II); and ſo on: but if $\dot{x}$ be invariable, $\ddot{x}=0$, and the ſecond fluxion of $x^3=6x\dot{x}^2$.

Prob. 1. *To determine maxima and minima.*

When a quantity increaſes, its fluxion is poſitive; when it decreaſes, it is negative; therefore when it is juſt betwixt increaſing and decreaſing, its fluxion is $=0$.

Rule. Find the fluxion, make it $=0$, whence an equation will reſult that will give an anſwer to the queſtion.

Fig. 4. Examp. To determine the dimenſions of a cylindric meaſure ABCD, open at the top, which ſhall contain a given quantity (of liquor, grain, &c.) under the leaſt internal ſuperficies poſſible.

Let the diameter AB$=x$, and the altitude AD$=y$; moreover, let p (3,14159, &c.) denote the periphery of the circle whoſe diameter is unity, and let c be the given content of the cylinder. Then it will be $1 : p :: x : (px)$ the circumference of the baſe; which, multiplied by the altitude y, gives pxy for the concave ſuperficies of the cylinder. In like manner, the area of the baſe, by multiplying the ſame expreſſion into $\frac{1}{4}$ of the diameter x, will be found $=\frac{px^2}{4}$; which drawn into the altitude y, gives $\frac{px^2y}{4}$ for the ſolid content of the cylinder; which being made $=c$, the concave ſurface pxy will be found $=\frac{4c}{x}$, and conſequently the whole ſurface $=\frac{4c}{x}+\frac{px^2}{4}$: Whereof the fluxion, which is $-\frac{4c\dot{x}}{x^2}+\frac{px\dot{x}}{2}$ being put $=0$, we ſhall get $-8c+px^3=0$; and therefore $x=2\sqrt[3]{\frac{c}{p}}$: further, becauſe $px^3=8c$, and $px^2y=4c$, it follows, that $x=2y$; whence y is alſo known, and from which it appears, that the diameter of the baſe muſt be juſt the double of the altitude.

Fig. 7. To find the longeſt and ſhorteſt ordinates of any curve, DEF, whoſe equation or the relation which the ordinates bear to the abſciſſas is known.

Make AC the abſciſſa x, and CE the ordinate $=y$; take a value y in terms of x, and find its fluxion; which making $=0$, an equation will reſult whoſe roots give the value of x when y is a maximum or minimum.

To determine when it is a maximum and when a minimum, take the value of y, when x is a little more than the root of the equation ſo found, and it may be perceived whether it increaſes or decreaſes.

If the equation has an even number of equal roots, y will be neither a maximum nor minimum when its fluxion is $=0$.

Prob. 2. *To draw a tangent to any curve.*

Fig. 5. When the abſciſſa CS of a curve moves uniformly from A to B, the motion of the curve will be retarded if it be concave, and accelerated if convex towards AB; for a ſtraight line TC is deſcribed by an uniform motion, and the fluxion of the curve at any point is the ſame as the fluxion of the tangent, becauſe it would deſcribe the tangent if it continued to move equally from that point. Now if S*s* or C*e* be the fluxion of the baſe, C*d* will be the fluxion of the tangent, and *de* of the ordinate. And becauſe the triangles TSC, *ced*, are equiangular, *de* : *ce* :: CS : ST, wherefore

Rule. Find a fourth proportional to the fluxion of the ordinate valued in terms of the abſciſſa, the fluxion of the abſciſſa, and the ordinate, and it determines the line ST, which is called the ſemi-tangent, and TC joined is a tangent to the curve.

Fig. 6. **Examp.** To draw a right line CT, to touch a given circle BCA in a given point C.

Let CS be perpendicular to the diameter AB, and put AB$=a$, BS$=x$, and SC$=y$: Then, by the property of the circle, y^2 (CS^2) $=$BS$\times$AS $(=x\times\overline{a-x})=ax-x^2$; whereof the fluxion being taken, in order to determine the ratio of $\dot{x}$ and $\dot{y}$, we get $2y\dot{y}=a\dot{x}-2x\dot{x}$; conſequently $\frac{\dot{x}}{\dot{y}}=\frac{2y}{a-2x}=\frac{y}{\frac{1}{2}a-x}$; which multiplied by y, gives $\frac{y\dot{x}}{\dot{y}}=\frac{y^2}{\frac{1}{2}a-x}=$ the ſubtangent ST. Whence (O being ſuppoſed the centre) we have OS $(\frac{1}{2}a-x)$: CS (y) :: CS (y) : ST; which we alſo know from other principles.

Prob. 3. *To determine points of contrary flexure in curves.*

Fig. 7. Suppoſing C to move uniformly from A to B, the curve DEF will be convex towards AB when the celerity of E increaſes, and concave when it decreaſes; therefore at the point where it ceaſes to be convex and begins to be concave, or the oppoſite way, the celerity of E will be uniform, that is, CE will have no ſecond fluxion. Therefore,

Rule. Find the ſecond fluxion of the ordinate in terms of the abſciſſa, and make it $=0$; and from the equation that ariſes you get a value of the abſciſſa, which determines the point of contrary flexure.

Ex. Let the nature of the curve ARS be defined by the equation $ay=a^{\frac{3}{2}}x^{\frac{1}{2}}+xx$, (the abſciſſa AF and the ordinate FG being, as uſual, repreſented by x and y reſpectively). Then $\dot{y}$, expreſſing the celerity of the point r, in the line FH, will be equal to $\frac{\frac{1}{2}a^{\frac{3}{2}}x^{-\frac{1}{2}}\dot{x}+2x\dot{x}}{a}$: Whoſe fluxion, or that of $\frac{1}{2}a^{\frac{3}{2}}x^{-\frac{1}{2}}+2x$ (becauſe a and $\dot{x}$ are conſtant) muſt be equal to nothing; that is, $-\frac{1}{4}a^{\frac{3}{2}}x^{-\frac{3}{2}}\dot{x}+2\dot{x}=0$: Whence $a^{\frac{3}{2}}x^{-\frac{3}{2}}=8$, $a^{\frac{3}{2}}=8x^{\frac{3}{2}}$, $64x^3=a^3$, and $x=\frac{1}{4}a=$AF; therefore FG $\left(=\frac{a^{\frac{1}{2}}x^{\frac{1}{2}}+xx}{a}\right)=\frac{9}{16}a$: From which the poſition of the point G is given.

Prob. 4. *To find the radii of curvature.*

The curvature of a circle is uniform in every point, that of every other curve continually varying; and it is meaſured at any point by that of a circle whoſe radius is of ſuch a length as to coincide with it in curvature in that point.

All curves that have the ſame tangent have the ſame firſt fluxion, becauſe the fluxion of a curve and its tangent are the ſame. If it moved uniformly on from the point of contact, it would deſcribe the tangent. And the deflection from the tangent is owing to the acceleration or retardation of its motion, which is meaſured by its ſecond fluxion; and conſequently two curves which have not only the ſame tangent, but the ſame curvature at the point of contact, will have both their firſt and ſecond fluxions equal. It is eaſily proven from thence, that the radius of curvature is $=\frac{\dot{z}^3}{-\dot{x}\ddot{y}}$, where x, y, and z repreſent the abſciſſa, ordinate, and curve reſpectively.

Examp. Let the given curve be the common parabola, whoſe equation is $y=a^{\frac{1}{2}}x^{\frac{1}{2}}$: Then will $\dot{y}=\frac{1}{2}a^{\frac{1}{2}}\dot{x}x^{-\frac{1}{2}}=\frac{a^{\frac{1}{2}}\dot{x}}{2x^{\frac{1}{2}}}$, and (making $\dot{x}$ conſtant) $\ddot{y}-=\frac{1}{2}\times\frac{1}{2}a^{\frac{1}{2}}\dot{x}^2x^{-\frac{3}{2}}=\frac{-a^{\frac{1}{2}}\dot{x}^2}{4x^{\frac{3}{2}}}$: Whence $\dot{z}\left(\sqrt{\dot{x}^2+\dot{y}^2}\right)=\frac{\dot{x}}{2}\sqrt{\frac{4x+a}{x}}$, and the radius of curvature $\left(\frac{\dot{z}^3}{-\dot{x}\ddot{y}}\right)=\frac{\overline{a+4x}|^{\frac{3}{2}}}{2\sqrt{a}}$: Which at the vertex, where $x=0$, will be $=\frac{1}{2}a$.

INVERSE METHOD:

From a given fluxion to find a fluent.

This is done by tracing back the ſteps of the direct method. The fluxion of x is $\dot{x}$; and therefore the fluent of $\dot{x}$ is x: but as there is no direct method of finding fluents, this branch of the art is imperfect. We can aſſign the fluxion of every fluent, but we cannot aſſign the fluent of a fluxion, unleſs it be ſuch a one as may be produced by ſome rule in the direct method from a known fluent.

General Rule. Divide by the fluxion of the root, add unity to the exponent of the power, and divide by the exponent ſo increaſed.

For, dividing the fluxion $nx^{n-1}\dot{x}$ by $\dot{x}$ (the fluxion of the root x) it becomes nx^{n-1}; and, adding 1 to the exponent $(n-1)$ we have nx^n; which, divided by n, gives x^n, the true fluent of $nx^{n-1}\dot{x}$.

Hence (by the ſame rule) the

Fluent of $3x^2\dot{x}$ will be $=x^3$;

That of $8x^4\dot{x}=\frac{8x^5}{3}$;

That of $2x^5\dot{x}=\frac{x^6}{3}$;

That of $y^{\frac{1}{2}}\dot{y}=\frac{2}{3}y^{\frac{3}{2}}$.

Sometimes the fluent ſo found requires to be corrected. The fluxion of x is $\dot{x}$, and the fluxion of $a+x$ is alſo $\dot{x}$, becauſe a is invariable, and has therefore no fluxion.

Now when the fluent of $\dot{x}$ is required, it muſt be determined, from the nature of the problem, whether any invariable part, as a, muſt be added to the variable part x.

When fluents cannot be exactly found, they can be approximated by infinite ſeries.

Ex. Let it be required to approximate the fluent of $\frac{\overline{a^2-x^2}|^{\frac{1}{2}}\times x^n\dot{x}}{\overline{c^2-x^2}|^{\frac{1}{2}}}$ in an infinite ſeries.

The value of $\frac{\overline{a^2-x^2}|^{\frac{1}{2}}}{\overline{c^2-x^2}|^{\frac{1}{2}}}$, expreſſed in a ſeries, is $\frac{a}{c}+\overline{\frac{a}{2c^3}-\frac{1}{2ac}}\times x^2+\overline{\frac{3a}{8c^5}-\frac{1}{4ac^3}-\frac{1}{8a^3c}}\times x^4+\overline{\frac{5a}{16c^7}-\frac{3}{16ac}-\frac{1}{16a^3c^3}-\frac{1}{16a^5c}}\times x^6+$ &c. Which value being therefore multiplied by $x^n\dot{x}$, and the fluent taken (by the common method) we get $\frac{ax^{n+1}}{\overline{n+1}\times c}+\overline{\frac{a}{2c^3}-\frac{1}{2ac}}\times\frac{x^{n+3}}{n+3}+\overline{\frac{3a}{8c^5}-\frac{1}{4ac^3}-\frac{1}{8a^3c}}\times\frac{x^{n+5}}{n+5}+\overline{\frac{5a}{16c^7}-\frac{3}{16ac^5}-\frac{1}{16a^3c^3}-\frac{1}{16a^5c}}\times\frac{x^{n+7}}{n+7}+$ &c.

Prob. I. *To find the area of any curve.*

Rule. Multiply the ordinate by the fluxion of the abſciſſa, and the product gives the fluxion of the figure, whoſe fluent is the area of the figure.

Examp. I. Fig. 8. Let the curve ARMH, whoſe area you will find, be the common parabola. Let u repreſent the area, and $\dot{u}$ its fluxion.

In which caſe the relation of AB (x) and BR (y) being expreſſed by $y^2=ax$ (where a is the parameter) we thence get $y=a^{\frac{1}{2}}x^{\frac{1}{2}}$; and therefore $\dot{u}=$ R*m*HB $(=y\dot{x})$ $=a^{\frac{1}{2}}x^{\frac{1}{2}}\dot{x}$: whence $u=\frac{2}{3}\times a^{\frac{1}{2}}x^{\frac{3}{2}}=\frac{2}{3}a^{\frac{1}{2}}x^{\frac{1}{2}}\times x=\frac{2}{3}yx$ (becauſe $a^{\frac{1}{2}}x^{\frac{1}{2}}=y$) $=\frac{2}{3}\times$ AB $\times$ BR : hence a parabola is $\frac{2}{3}$ of a rectangle of the ſame baſe and altitude.

Examp. 2. Let the propoſed curve CSDR (fig. 9.) be of ſuch a nature, that (ſuppoſing AB unity) the ſum of the areas CSTBC and CDGBC anſwering to any two propoſed abſciſſas AT and AG, ſhall be equal to the area CRNBC, whoſe correſponding abſciſſa AN is equal to AT×AG, the product of the meaſures of the two former abſciſſas.

Firſt, in order to determine the equation of the curve, (which muſt be known before the area can be found) let the ordinates GD and NR move parallel to themſelves towards HF; and then having put GD$=y$, NR$=z$, AT$=a$, AG$=s$, and AN$=u$, the fluxion of the area CDGB will be repreſented by $y\dot{s}$, and that of the area CRNB by $z\dot{u}$: which two expreſſions muſt, by the nature of the problem, be equal to each other; becauſe the latter area CRNB exceeds the former CDGB by the area CSTB, which is here conſidered as a conſtant quantity: and it is evident, that two expreſſions, that differ only by a conſtant quantity, muſt always have equal fluxions.

Since, therefore, $y\dot{s}$ is $=z\dot{u}$, and $u=as$, by hypotheſis, it follows, that $\dot{u}=a\dot{s}$, and that the firſt equation (by ſubſtituting for $\dot{u}$) will become $y\dot{s}=az\dot{s}$, or $y=az$, or laſtly $ys=zas$. that is, GD×AG=NR×AN : therefore, GD : NR :: AN : AG; whence it appears, that every ordinate of the curve is reciprocally as its correſponding abſciſſa.

Now, to find the area of the curve ſo determined, put AB$=1$, BC$=b$, and BG$=x$: then, ſince AG $(1+x)$: AB (1) :: BC (b) : GD (y) we have $y=\frac{b}{1+x}$, and conſequently $\dot{u}\ (=y\dot{x})=\frac{b\dot{x}}{1+x}=b\times\overline{\dot{x}-x\dot{x}+x^2\dot{x}-x^3\dot{x}+x^4\dot{x}-\text{\&c.}}$ Whence, BGDC, the area itſelf will be $=b\times\overline{x-\frac{x^2}{2}+\frac{x^3}{3}-\frac{x^4}{4}+\frac{x^5}{5}}$, &c. which was to be found.

Hence it appears, that as theſe areas have the ſame properties as logarithms, this ſeries gives an eaſy method of computing logarithms; and the fluent may be found by means of a table of logarithms, without the trouble of an infinite ſeries: and every fluxion whoſe fluent agrees with any known logarithmic expreſſion, may be found the ſame way. Hence the fluents of fluxions of the following forms are deduced.

The fluent of $\frac{\dot{x}}{\sqrt{x^2\pm a^2}}=$ hyp. log. of $x+\sqrt{x^2\pm a^2}$;

of $\frac{\dot{x}}{\sqrt{2ax+xx}}=$ hyp. log. $a\times x+\sqrt{2ax+x^2}$;

of $\frac{2a\dot{x}}{a^2-x^2}$ hyp. log. of $\frac{a+x}{a-x}$;

and of $\frac{2a\dot{x}}{x\sqrt{a^2\pm x^2}}=$ hyp. log. $\frac{a-\sqrt{a^2\pm x^2}}{a+\sqrt{a^2\pm x^2}}$.

Prob. 2. *To determine the length of curves.*

Fig. 5. Becauſe C*de* is a right-angled triangle, Cd^2 $=$Ce^2+de^2; wherefore the fluxions of the abſciſſa and ordinate being taken in the ſame terms and ſquared, their ſum gives the ſquare of the fluxion of the curve; whoſe root being extracted, and the fluent taken, gives the length of the curve.

Examp To find the length of a circle from its tangent. Make the radius AO (fig. 5.) $=a$, the tangent of AC $=t$, and its ſecant $=s$, the curve $=z$, and its fluxion $=\dot{z}$; becauſe the triangles OTC, OCS, are ſimilar, OT : OC :: OC :: OS; whence OS $=\frac{a^2}{s}$, and SA $=a-\frac{a^2}{s}=a-\frac{a^2}{\sqrt{a^2+t^2}}$; whoſe fluxion is $\frac{a^2t\dot{t}}{\overline{a^2+t^2}|^{\frac{2}{3}}}$; and becauſe the triangles OTC, dCe are ſimilar, TC $(=t)$: TO $(=\sqrt{a^2+t^2})$ :: Ce $=\left(\frac{a^2t\dot{t}}{\overline{a^2+t^2}|^{\frac{3}{3}}}\right)$: C$d=\frac{a^2\dot{t}}{a^2+t^2}=$ fluxion of the curve. Now by converting this into an infinite ſeries, we have the fluxion of the curve $=\dot{t}-\frac{t^2\dot{t}}{a^2}+\frac{t^4\dot{t}}{a^4}-\frac{t^6\dot{t}}{a^6}$, &c. and conſequently $z=t-\frac{t^3}{3a^2}+\frac{t^5}{5a^4}-\frac{t^7}{7a^6}+\frac{t^9}{9a^8}$, &c. $=$AR. Where, if (for example' ſake) AR be ſuppoſed an arch of 30 degrees, and AO (to render the operation more eaſy) be put $=$ unity, we ſhall have $t=\sqrt{\frac{1}{3}}=.5773502$ (becauſe O$b\sqrt{\frac{3}{4}}$: bR $(\frac{1}{2})$ :: OA (1) : AT $(t)=\sqrt{\frac{1}{3}}$) Whence,

$t^3\ \left(=t\times t^2=t\times\frac{1}{3}\right)=.1924500$

$t^5\ \left(=t^3\times t^2=\frac{t^3}{3}\right)=.0641500$

$$t^7 \left(=t^5\times t^2=\frac{t^5}{3}\right)=.0213833$$

$$t^9 \left(=t^7\times t^2=\frac{t^7}{3}\right)=.0071277$$

$$t^{11} \left(=t^9\times t^2=\frac{t^9}{3}\right)=.0023759$$

$$t^{13} \left(=t^{11}\times t^2=\frac{t^{11}}{3}\right)=.0007919$$

$$t^{15} \left(=t^{13}\times t^2=\frac{t^{13}}{3}\right)=.0002639$$

&c.

And therefore $AR = .5773502 - \frac{.1934500}{3} + \frac{.0641500}{5} - \frac{.0213833}{7} \times \frac{0091277}{9} - \frac{.0023759}{11} + \frac{.0007919}{13} - \frac{.0002639}{15} + \frac{.0000879}{17} - \frac{.0000293}{19} + \frac{.0000097}{21} - \frac{.0000032}{23} = .5235987$: for the length of an arch of 30 degrees, which multiplied by 6 gives 3.141592 + for the length of the ſemi-periphery of the circle whoſe radius is unity.

Other ſeries may be deduced from the verſed ſine, ſine and ſecant; and theſe are of uſe for finding fluents which cannot be expreſſed in finite terms. For,

$$\text{the fluent of}\left\{\begin{array}{c}\dfrac{\dot{w}}{\sqrt{2aw-w^2}}\\[2ex] \dfrac{\dot{w}}{\sqrt{a^2-w^2}}\\[2ex] \dfrac{a\dot{w}}{a^2+w^2}\\[2ex] \dfrac{a\dot{w}}{w\sqrt{w^2-a^2}}\end{array}\right\}\text{is equal to the arch whose}\left\{\begin{array}{l}\text{Versed-sine}\\[2ex] \text{Right-sine}\\[2ex] \text{Tangent}\\[2ex] \text{Secant}\end{array}\right\}\text{is } \frac{w}{a}\text{, and Radius Unity.}$$

Prob. 3. *To find the contents of a ſolid.*

Let the ſurface of the generating plane be multiplied by the ſpace it paſſes through in any time, the product will give a ſolid which is the fluxion of the ſolid required: the ſurface muſt therefore be computed in terms of x, which repreſents the line or axis on which it moves, and by its motion on which the fluxion is to be meaſured, and the fluent found will give the contents of the ſolid.

Examp. Let it be propoſed to find the content of a cone ABC, fig. 10.

Put the given altitude (AD) of the cone $=a$, and the ſemi-diameter (BD) of its baſe $=b$, the ſolid $=s$, its fluxion $=\dot{s}$, and the area of a circle, whoſe radius is unity, $=p$: then the diſtance (AF) of the circle EG, from the vertex A, being denoted by x, &c. we have, by ſimilar triangles, as $a : b :: x : \text{EF}\ (y) = \frac{bx}{a}$. Whence in this caſe, $\dot{s}\ (=p\dot{y}^2\dot{x}) = \frac{pb^2x^2\dot{x}}{a^2}$; and conſequently $s = \frac{pb^2x^3}{3a^2}$; which, when $x=a$ (=AD) gives $\frac{pb^2a}{3}$ $(=p\times \text{BD}^2\times \frac{1}{3}\text{AD})$ for the content of the whole cone ABC: which appears from hence to be juſt $\frac{1}{3}$ of a cylinder of the ſame baſe and altitude.

Prob. 4. *To compute the ſurface of any ſolid body.*

The fluxion of the ſurface of the ſolid is equal to the periphery of the ſurface, by whoſe motion the ſolid is generated, multiplied by its velocity on the edge of the ſolid, and the computation is made as in the foregoing.

Examp. Fig. 11. Let it be propoſed to determine the convex ſuperficies of a cone ABC.

Then, the ſemi-diameter of the baſe (BD, or CD) being put $=b$, the ſlanting line, or hypothenuſe AC$=c$, and FH (parallel to DC) $=y$, AG $=z$, the ſurface $=w$, its fluxion $=\dot{w}$, and $p=$ the periphery of a circle whoſe diameter is unity, we ſhall, from the ſimilarity of the triangles ADC and Hmb, have $b : c :: \dot{y}\ (mb : \dot{z}\ (\text{H}b) = \frac{c\dot{y}}{b}$: whence $\dot{w}\ (2py\dot{z}) = \frac{2pcy\dot{y}}{b}$; and conſequently $w = \frac{pcy^2}{b}$. This, when $y=b$, becomes $=pcb=p\times\text{DC}\times\text{AC}=$ the convex ſuperficies of the whole cone ABC: which therefore is equal to a rectangle under half the circumference of the baſe and the ſlanting line.

The method of fluxions is alſo applied to find the centres of gravities, and oſcillation of different bodies; to determine the paths deſcribed by projectiles and bodies acted on by central forces, with the laws of centrepetal force in different curves; the retardates given to motions performed in reſiſting medici; the attractions of bodies under different forms; the direction of wind, which has the greateſt effect on an engine; and to ſolve many other curious and uſeful problems.

FLY

FLY in zoology. See Natural History.

Fly, in mechanics, a croſs with leaden weights at its ends; or rather a heavy wheel at right angles to the axis of a windlaſs, jack, or the like; by means of which the force of the power, whatever it be, is not only preſerved, but equally diſtributed in all parts of the revolution of the machine. See Mechanics.

FLYING, the progreſſive motion of a bird, or other winged animal, in the air.

The parts of birds chiefly concerned in flying are the wings, by which they are ſuſtained or wafted along. The tail, Meſſrs Willughby, Ray, and many others, imagine to be principally employed in ſteering and turning the body in the air, as a rudder: but Borelli has put it beyond all doubt, that this is the leaſt uſe of it, which is chiefly to aſſiſt the bird in its aſcent and deſcent in the air; and to obviate the vacillations of the body and wings: for, as to turning to this or that ſides, it is performed by the wings and inclinations of the body, and but very little by the help of the tail. The flying of a bird, in effect, is quite a different thing from the rowing of a veſſel. Birds do not vibrate their wings towards the tail, as oars are ſtruck towards the ſtern, but waft them downwards; nor does the tail of the bird cut the air at right angles, as the rudder does the water; but is diſpoſed horizontally, and preſerves the ſame ſituation what way ſoever the bird turns.

In effect, as a veſſel is turned about on its centre of gravity to the right, by a briſk application of the oars to the left, ſo a bird in beating the air with its right wing alone, towards the tail, will turn its fore part to the left. Thus pigeons changing their courſe to the left, would labour it with their right wing, keeping the other almoſt at reſt. Birds of a long neck alter their courſe by the inclinations of their head and neck, which altering the courſe of gravity, the bird will proceed in a new direction.

The manner of Flying is thus: the bird firſt bends his legs, and ſprings with a violent leap from the ground; then opens and expands the joints of his wings, ſo as to make a right line perpendicular to the ſides of his body: thus the wings with all the feathers therein, conſtitute one continued lamina. Being now raiſed a little above the horizon, and vibrating the wings with great force and velocity perpendicularly againſt the ſubject air, that fluid reſiſts thoſe ſucceſſions, both from its natural inactivity and elaſticity, by means of which the whole body of the bird is protruded. The reſiſtance the air makes to the withdrawing of the wings, and conſequently the progreſs of the bird, will be ſo much the greater, as the waft or ſtroke of the fan of the wing is longer: but as the force of the wing is continually diminiſhed by this reſiſtance, when the two forces continue to be in equilibrio, the bird will remain ſuſpended in the ſame place; for the bird only aſcends ſo long as the arch of air the wing deſcribes makes a reſiſtance equal to the exceſs of the ſpecific gravity of the bird above the air. If the air, therefore, be ſo rare as to give way with the ſame velocity as it is ſtruck withal, there will be no reſiſtance, and conſequently the bird can never mount. Birds never fly upwards in a perpendicular line, but always in a parabola. In a direct aſcent, the natural and artificial tendency would oppoſe and deſtroy each other, ſo that the progreſs would be very ſlow. In a direct deſcent they would aid one another, ſo that the fall would be too precipitate.

Flying fish, a name given by the Engliſh writers to ſeveral ſpecies of fiſh, which, by means of their long fins, have a method of keeping themſelves out of water a long time. See Exocoetus.

Flying pinion, is part of a clock, having a fly, or fan, whereby to gather air, and ſo bridle the rapidity of the clock's motion, when the weight deſcends in the ſtriking part.

FOAL, or Colt, the young of the horſe kind. The word colt, among dealers, is underſtood of the male kind. See Equus and Horsemanship.

FOCHEN, a town of China, capital of the province of Fokein: E. long. 118°, N. lat. 26° 20′.

FOCUS, in geometry and conic ſections, is applied to certain points in the parabola, ellipſis and hyperbola, where the rays reflected from all parts of theſe curves concur and meet. See Conic Sections.

Focus, in optics, is the point wherein rays are collected after they have undergone reflection or refraction. See Optics.

FOENUGREEK, in botany. See Triconella.

FOETOR, in medicine, ſtinking or fœtid effluvia, ariſing from the body, or any part thereof.

FOETUS, denotes the child while it is contained in the mother's womb, but particularly after it is formed, till which time it is more properly called embryo. See Midwifery.

FOG, or Mist, a meteor, conſiſting of groſs vapours, floating near the ſurface of the earth.

FOIL, among glaſs-grinders, a ſheet of tin, with quickſilver or the like, laid on the backſide of a looking-glaſs, to make it reflect.

Foil, among jewellers, a thin leaf of metal placed under a precious ſtone, in order to make it look tranſparent, and give it an agreeable different colour, either deep or pale: thus, if you want a ſtone to be of a pale colour, put a foil of that colour under it; or if you would have it deep, lay a dark one under it.

FOLIA, among botaniſts, particularly ſignify the leaves of plants; thoſe of flowers being expreſſed by the word petal. See Botany.

FOLIACEUM expansum, in anatomy, a term applied to the extreme part of the Fallopian tube, next the ovary, which is expanded like the mouth of a trumpet, and ſurrounded with a ſort of fringe.

FOLIAGE, a cluſter or aſſemblage of flowers, leaves, branches *&c.*

Foliage is particularly uſed for the repreſentations of ſuch flowers, leaves, branches, rinds, *&c.* whether natural or artificial, as are uſed for enrichments on capitals, friezes, pediments, *&c.*

FOLIO, in merchants books, denotes a page, or rather both the right and left hand pages, theſe being expreſſed by the ſame figure, and correſponding to each other. See Book-keeping.

Folio, among printers and bookſellers, the largeſt form of books, when each ſheet is ſo printed, that it may be bound up in two leaves only.

FOLKSTONE, a market town of Kent, ſix miles weſt of Dover.

FOMAHANT, in aſtronomy, a ſtar of the firſt magnitude, in the conſtellation aquarius.

FOMENTATION, in medicine, the bathing any part of the body with a convenient liquor; which is uſually a decoction of herbs, water, wine, or milk; and the applying of bags ſtuffed with herbs and other ingredients, which is commonly called dry fomentation.

FONDI, a city and biſhop's ſee of Naples, in the province of Lavoro, about thirty-five miles north-weſt of Capua: E. long. 14° 20′, and N. lat. 41° 35′.

FONT, among eccleſiaſtical writers, a large baſon, in which water is kept for the baptizing of infants, or other perſons.

FONTAINE, a town of Hainalt, ſifteen miles eaſt of Mons.

FONTAINEBLEAU, a village of the iſle of France, about thirty miles ſouth-eaſt of Paris; remarkable for an elegant royal palace.

FONTANELLA, in anatomy, the quadrangular aperture, between the os frontis and oſſa ſincipitis, in infants juſt born.

FONTARABIA, a port-town of Spain, in the province of Biſcay, twenty miles weſt of Bayonne: W. long. 1° 35′; and N. lat. 43° 20′.

FONTENAYLE, a town of Orleanois, in France, about forty ſix miles weſt of Poictiers.

FONTENOY, a town of Hainalt, ſituated three miles ſouth eaſt of Tournay.

FONTEVRAUD, or *Order of* Fontevraud, a religious order inſtituted about the latter end of the XIth century. By the rules of this order the nuns were to keep ſilence for ever, and their faces to be always covered with their veils; and the monks wore a leathern girdle, at which hung a knife and ſheath.

FONTICULUS, or Fontanella, in ſurgery, an iſſue, ſeton, or ſmall ulcer made in various parts of the body, in order to eliminate the latent corruption out of it.

FONTINALIS, in botany, a genus of the cryptogamia muſci claſs. The anthera is operculated, and the calyptra is ſeſſile. There are four ſpecies, all natives of Britain, *viz.* the antipyretica, or greater water-moſs; the minor, or leſſer water-moſs; the ſquamoſa, or ſcaly water-moſs; and the pennata, or feathered water-moſs.

FOOD implies whatever aliments are taken into the body, to nouriſh it. See Medicine.

FOOL, according to Mr Locke, is a perſon who makes falſe concluſions from right principles; whereas a madman, on the contrary, draws right concluſions from wrong principles.

Fool's stones, in botany. See Orchis.

FOOT, a part of the body of moſt animals whereon they ſtand, walk, *&c.* See Natural History.

Foot, in anatomy. See Anatomy, part I.

Foot, in the Latin and Greek poetry, a metre or meaſure, compoſed of a certain number of long and ſhort ſyllables.

Theſe feet are commonly reckoned twenty eight, of which ſome are ſimple, as conſiſting of two or three ſyllables, and therefore called diſſyllabic or triſyllabic feet; others are compound, conſiſting of four ſyllables, and are therefore called tetraſyllabic feet.

The diſſylabic feet are four in number, *viz.* the pyrrhichius, ſpondeus, iambus, and trocheus. See Pyrrhichius, *&c.*

The triſyllabic feet are eight in number, *viz.* the dactylus, anapæſtus, tribrachys, moloſſus, amphybrachys, amphimacer, bacchius, and antibacchius. See Dactyl, *&c.*

The tetraſyllabic are in number ſixteen, *viz.* the procleuſmaticus, diſpondeus, choriambus, antiſpaſtus, diiambus, dichoreus, ionicus a majore, ionicus a minore, epitritus primus, epitritus ſecundus, epitritus tertius, epitritus quartus, pæon primus, pæon ſecundus, pæon tertius, and pæon quartus. See Procleusmaticus, *&c.*

Foot is alſo a long meaſure, conſiſting of 12 inches.

Geometricians divide the foot into 10 digits, and the digit into 10 lines.

Foot *ſquare*, is the ſame meaſure both in breadth and length, containing 144 ſquare or ſuperficial inches.

Cubic or *Solid* Foot, is the ſame meaſure in all the three dimenſions, length, breadth, and depth or thickneſs, containing 1728 cubic inches.

Foot *of a horſe*, in the menage, the extremity of the leg, from the coronet to the lower part of the hoof.

Foot-level, among artificers, an inſtrument that ſerves as a foot-rule, a ſquare, and a level. See Level, Rule, and Square.

FORAMEN, in anatomy, a name given to ſeveral apertures or perforations in divers parts of the body; as, 1. The external and internal foramina of the cranium or ſkull. 2. The foramina, in the upper and lower jaw. 3. Foramen lachrymale. 4. Foramen membranæ tympani. See Anatomy.

FORCALQUIER, a town of Provence, in France, thirty miles north of Aix.

FORCE, in mechanics, denotes the cauſe of the change in the ſtate of a body when being at reſt it begins to move, or has a motion which is either not uniform or not direct. See Mechanics.

Central Forces. See Mechanics.

Force, in law, ſignifies any unlawful violence offered to things or perſons.

FORCEPS, in ſurgery, *&c.* a pair of ſciſſars for cutting off, or dividing, the fleſhy membraneous parts of the body, as occaſion requires. See Surgery.

FORE-CASTLE of a ship, that part where the foremaſt ſtands. It is divided from the reſt by a bulkhead.

FOREIGN, ſome thing extraneous, or that comes from abroad.

FOREIGNER, the natural born ſubject to ſome foreign prince.

Foreigners, tho' made denizens, or naturalized, are diſabled to bear any office in the goverment, to be of the privy-council, or members of parliament, *&c.* This is by the acts of the ſettlement of the crown. Such perſons as are not freemen of a city, or corporation, are alſo called foreigners, to diſtinguiſh them from the members of the ſame.

FORELOCKS, in the ſea-language, little flat wedges made with iron, uſed at the ends of bolts, to keep them from flying out of their holes.

FORELORN-HOPE, in the military art, ſignifies men detached from ſeveral regiments, or otherwiſe appointed, to make the firſt attack in day of battle; or, at a ſiege, to ſtorm the counterſcarpe, mount the breach, or the like.

They are ſo called from the great danger they are unavoidably expoſed to; but the word is old, and begins to be obſolete.

FORE-MAST of a ship, a large round piece of timber, placed in her fore-part, or fore-caſtle, and carrying the fore-ſail and fore-top-ſail yards. Its length is uſually $\frac{8}{9}$ of the main-maſt, and the fore top-gallant maſt is $\frac{1}{2}$ the length of the fore-top.

Foremaſt-men, are thoſe on board a ſhip that take in the top-ſails, ſling the yards, furl the ſails, bowſe, trice, and take their turn at the helm, *&c.*

FOREST, in general, a great wood, or a large extent of ground covered with trees.

Foreſt, in law, is defined by Manwood, a certain territory of woody grounds, and fruitful paſtures, privileged for wild beaſts and fowls of foreſt, chace and warren, to reſt and abide under the protection of the king, for his princely delight, bounded with unremoveable marks, and meres, either known by matter of record or preſcription; repleniſhed with wild beaſts of venery, or chaſe, with great coverts of vert for the ſaid beaſts; for preſervation and continuance whereof, with the vert and veniſon, there are certain particular laws, privileges, and officers.

Foreſts are of that antiquity in England, that, excepting the new foreſt in Hampſhire erected by William the Conqueror, and Hampton Court erected by Henry VIII. it is ſaid that there is no record or hiſtory which makes any certain mention of their erection, though they are mentioned by ſeveral writers, and in divers of our laws and ſtatutes.

There are ſixty-nine foreſts in England, thirteen chaſes, and 800 parks. The four principal foreſts are New Foreſt, Sherwood Foreſt, Dean Foreſt, and Windſor Foreſt.

Foreſt-towns, in geography, certain towns of Swabia, in Germany, lying along the Rhine and the confines of Switzerland, and ſubject to the houſe of Auſtria. Their names are Rhinefield, Seckingen, Lauſenburg, and Waldſhut.

FORE-STAFF, or Croſs-staff, an inſtrument uſed at ſea for taking the altitude of the ſun, moon or ſtars.

FORESTALLER, a perſon who is guilty of foreſtalling. See the next article.

FORESTALLING, in law, buying or bargaining for any corn, cattle, victuals, or merchandize, in the way as they come to fairs or markets to be ſold, before they get thither, with an intent to ſell the ſame again at a higher price.

The puniſhment for this offence, upon conviction at the quarter-ſeſſions, by two or more witneſſes, is, for the firſt time, two months impriſonment and the loſs of the goods, or the value; for the ſecond offence, the offender ſhall be impriſoned ſix months, and loſe double the value of the goods; for the third offence, he ſhall ſuffer impriſonment during the king's pleaſure, forfeit all his goods and chattels, and ſtand on the pillory: but the ſtatute does not extend to maltſters buying barley, or to badgers licenſed.

FORESTER, a ſworn officer of the foreſt, appointed by the king's letters-patent, to walk the foreſt at all hours, watch over the vert and veniſon; alſo to make attachments and true preſentments of all treſpaſſes committed within the foreſt.

FORETHOUGHT felony, in Scots law, ſignifies premeditated murder.

FORFAR, the capital of the county of Angus, in Scotland: W. long. 2° 32′, and N. lat. 56° 25′.

It is a parliament town, claſſed with Perth, Dundee, Coupar, and St Andrews, which all together ſend one member.

FORFEITURE, properly ſignifies the effect of tranſgreſſing ſome penal law, and extends to lands or goods.

FORFICULA, the ear-wig, in zoology, a genus of inſects belonging to the order of coleoptera. The antennæ are briſtly; the elytra are dimidiated; the wings are covered; and the tail is forked. There are two ſpecies, *viz.* the auriculata, or common ear-wig, with the tops of the elytra white; and the minor, with teſtaceous and unſpotted elytra.

FORGE, properly ſignifies a little furnace, wherein ſmiths and other artificers of iron or ſteel, *&c.* heat their metals red-hot, in order to ſoften them and render them more malleable and manageable on the anvil.

Forge is alſo uſed for a large furnace, wherein iron-ore, taken out of the mine, is melted down: or it is more properly applied to another kind of furnace, wherein the iron-ore, melted down and ſeparated in a former furnace, and then caſt into ſows and pigs, is heated and fuſed over again, and beaten afterwards with large hammers, and thus rendered more ſoft, pure, ductile, and fit for uſe.

FORGER, in law, one guilty of forgery. See the next article.

FORGERY, in a legal ſenſe, is where a perſon fraudulently makes and publiſhes falſe writings to another's prejudice: or, it ſignifies the writ that lies againſt him who offends that way.

FORISFAMILIATION, in law, when a child, upon receiving a portion from his father, or otherwiſe renounces his legal title to any further ſhare of his father's ſucceſſion, he is ſaid to be *foriſfamiliated*. See Scots Law, title 28

FORLI, a town of Romania, in the pope's territories, fifteen miles ſouth-weſt of Ravenna.

FORM, in phyſics, the eſſential or diſtinguiſhing modification of the matter whereof a natural body is compoſed, ſo as thereby to give it ſuch a particular manner of exiſtence; being that which conſtitutes it ſuch a particular body, and diſtinguiſhes it from every other body.

Form is alſo uſed, in a moral ſenſe, for the manner of being or doing a thing according to rules: thus we ſay, a form of government, a form of argument, *&c.*

Form, in law, the rules eſtabliſhed and requiſite to be obſerved in legal proceedings.

Form, in carpentry, is uſed to denote the long ſeats or benches in the choirs of churches or in ſchools, for the prieſts, prebends, religious, or ſcholars to ſit on. At ſchools, the word form is frequently applied to what is otherwiſe termed a claſs. See Class.

Form alſo denotes the external appearance or ſurface of a body, or the diſpoſition of its parts, as to the length, breadth, and thickneſs.

Form is alſo uſed, among mechanics, for a ſort of mould whereon any thing is faſhioned or wrought: as the hatter's form, the paper-maker's form, *&c.*

Printer's Form, an aſſemblage of letters, words, and lines, ranged in order, and ſo diſpoſed into pages by the compoſitor; from which, by means of ink and a preſs, the printed ſheets are drawn.

Every form is incloſed in an iron-chaſe, wherein it is firmly locked by a number of pieces of wood; ſome long and narrow, and others of the form of wedges. There are two forms required for every ſheet, one for each ſide; and each form conſiſts of more or fewer pages, according to the ſize of the book.

FORMAL, ſomething belonging to, or conſtituting the form of a thing. See Form.

FORMICA, or the Ant, in zoology, a genus of inſects belonging to the order of hymenoptera, the characters of which are theſe: There is a ſmall ſcale betwixt the breaſt and belly, and the joint is ſo deep that the animal appears as if it were almoſt cut through the body. The females, and the neuters or working ants which have no ſexual characteriſtics, are furniſhed with a hidden ſting; and both the males and females have wings, but the neuters have none. There are eighteen ſpecies, moſt of them diſtinguiſhed by their colours.

Theſe inſects keep together in companies like the bees, and maintain a ſort of republic. Their neſt is not exactly ſquare, but longer one way than the other; and in it there are a ſort of paths, which lead to different magazines. Some of the ants are employed in making the ground firm, by mixing it with a ſort of glue, for fear it ſhould crumble, and fall down upon their heads. They may be ſometimes ſeen to gather ſeveral twigs, which ſerve them for rafters, which they place over the paths, to ſupport the covering; they lay others acroſs them, and upon them ruſhes, weeds, and dried graſs, which they heap up into a double declivity, which ſerves to turn off the water from their magazines. Some of theſe ſerve to lay up their proviſions in, and in others they lay their eggs.

As for the proviſions, they lay up every thing that is fit for them to eat; and you may often ſee one loaded with pippin, or grain of fruit, another with a dead flie, and ſeveral together with the carcaſe of a may-bug, or other inſect. If they meet with any they cannot bring away, they eat it upon the ſpot, or at leaſt ſo much of it, as may reduce it to a bulk ſmall enough for them to carry. They do not run about where they pleaſe, at all adventures: for ſome of them are ſent abroad to make diſcoveries; and if they bring back news they have met with a pear, or a ſugar-loaf, or a pot of ſweatmeats, they will run from the bottom of the garden, as high as the third ſtory of a houſe, to come at it. They all follow each other in the ſame path, without wandering to the right or the left; but in the fields they are more at their liberty, and are allowed to run about in ſearch of game. There is a ſort of green fly, that does a great deal of miſchief among the flowers, and which curl up the leaves of peach and pear trees; and theſe are ſurrounded with a ſort of glue, or honey, which the ants hunt after very greedily; for they touch neither the plant nor the flies themſelves.

Next to this, their greateſt paſſion is to lay up hoards of wheat, and other corn; and for fear the corn ſhould ſprout by the moiſture of the ſubterraneous cells, they gnaw off the end which would produce the blade. The ants are often ſeen puſhing along grains of wheat, or barley, much larger than themſelves.

In Africa, and particularly in Guiney, the ants are exceeding troubleſome, and do a great deal of miſchief. They make their neſts of earth in the fields, twice as high as a man; beſides which they build large neſts in high trees, from which places they advance in ſuch prodigious ſwarms to the houſes, that they frequently oblige the inhabitants to quit their beds in the night-time. They will ſometimes attack a living ſheep, which in a night's time they will reduce to a perfect ſkeleton, leaving not the leaſt thing except the bones. It is common for them to ſerve domeſtic fowls in the ſame manner, and even the rats themſelves cannot eſcape them. If you place a worm or a beetle where only one or two ants are, they will immediately depart, and bring with them above an hundred; after which they ſeize their prey, and march off with it in good order. Theſe ants are of various ſorts, ſome great, others ſmall, ſome black, and others red; the ſting of this laſt is very painful, and cauſes an inflammation; the white are as tranſparent as cryſtal, and have ſuch ſtrong teeth, that in a night's time they will eat their way through a thick wooden cheſt, and make it as full of holes as if it had been penetrated by hail-ſhot.

There are alſo ſeveral ſorts of ants in the Eaſt Indies, whoſe numbers are prodigious: ſome of them are exceeding large, and of a ruddy colour, inclining to black; and ſome have wings, but others have none. They are very pernicious to the fruits of the earth, and do a great deal of miſchief in houſes, unleſs great care is taken to prevent them. It is remarkable, that if one ant meets another that is loaden, it always gives way to let it paſs freely.

The ant lays eggs in the manner of the common flies, and from theſe eggs are hatched a ſort of ſmall maggots or worms without legs: theſe are ſharp at one end and blunt at the other; and are white, but ſo tranſparent, that the inteſtines are ſeen through the ſkin. Theſe, after a ſhort time, change into large white aureliæ, which are what are uſually called ants eggs. That end which is to be the tail is the largeſt, and that which is the head is ſomewhat tranſparent.

The ants move theſe about at pleaſure with their forceps. It is well known, that when a neſt of theſe creatures is diſturbed and the aureliæ ſcattered about, the ants are at infinite pains to get together all that are unhurt, and make a neſt for them again: nay, any ants will do this, and thoſe of one neſt will often take care of the aureliæ of another.

The affection of the ant for its offspring is amazing. They carry the young worms about in their mouths, that nothing may injure them; and when the earth of the neſt is dry, they carry them down to a greater depth, but when wet they bring them to the ſurface, that they may not be injured by the damps.

The common ant builds only with ſmall ſmall pieces of dry earth, and there is always found a vaſt quantity either of eggs, worms, or aureliæ, at the bottom of the neſt. The aureliæ are covered only with a thin ſkin; and when carefully opened, they ſhew the worm perfect, and in its ſeveral ſtages of perfection.

The forecaſt of ants in providing againſt the winter is a miſtake. They are ſuppoſed not to eat in the winter, but to ſpend that ſeaſon, like dormice and many other ſorts of animals, in a ſtate of ſleep. What confirms this is, that they have been obſerved, as the cold draws on in the autumn, to move very heavily, and in the vintage-time they can hardly ſtir at all; ſo that the proviſion they make ſeems intended not for themſelves, but for their young.

The care theſe creatures take of their offspring is remarkable. Whenever a hill is diſturbed, all the ants are found buſied in conſulting the ſafety, not of themſelves, but of the eggs or theſe larger bodies encloſing the maggot or young ant; they carry theſe down any way ſo as to get them out of ſight, and will do this over and over as often as they are diſturbed.

They carry away the eggs and vermicles together in their confuſion; but as ſoon as the danger is over, they carefully ſeparate them, and place each ſort in parcels by themſelves under ſhelter of different kinds, and at various depths, according to the different degrees of warmth and coverture the different ſtates require.

In the warm ſeaſon of the year, they every morning bring up the eggs, as they are uſually called, to the ſurface, or nearly ſo; and from ten in the forenoon to five in the afternoon or thereabouts, all theſe will be found juſt under the ſurface; and if the hills be examined toward eight in the evening, they will be found to have carried them all down; and if rainy weather be coming on, it will be neceſſary to dig a foot deep or more, in order to find them.

Theſe little creatures are very troubleſome in gardens, and in paſture-lands; as well by feeding on the fruit, as by making up hills for their habitation. In the hotter countries, as Italy, Spain, and the Weſt Indies, ants are the great peſt of the fields. Trees may be preſerved from them by encompaſſing the ſtem, for four fingers breadth, with a roll of wool, newly pulled from the ſheep's belly; or by laying ſaw-duſt all round the ſtump of it. Some anoint the tree with tar, which has the ſame effect.

The large, black, winged ants of America, to avoid the great rains which fall there at particular ſeaſons, make to themſelves large neſts on trees, with a covered way for them to go up and down on the leeſide of the tree. Theſe neſts are roundiſh on the outſide, made of light brown earth, plaiſtered ſmooth. They are larger than a buſhel; and in the inſide are many ſinous caverns or lodgings communicating with one another. See Plate LXXX. fig. 1. A, The ants neſt; B, The tubular paſſage, made of the ſame materials.

Formica, in medicine, a callous ſort of wart.

Formica-leo, the **Ant-lion**, or **Ant-eater**, in zoology, an inſect ſo called from its devouring great numbers of ants. It is the caterpillar or worm of a fly much reſembling the libellæ or dragon-flies.

The addreſs of this inſect in catching the ant is admirable; it makes a hole of a conical or funnel ſhape, in the looſe ſand; and is ſure to catch all the ants that come within the verge of this hole, by throwing up ſand on them, whereby they are forcibly carried into the power of the enemy at the bottom of the hole.

FORMOSA, an iſland in the pacific ocean, between 119° and 122° of E. long. and between 22° and 25′ N. lat. about 100 miles eaſt of Canton in China. It is ſubject to the Chineſe.

FORMULA, or **Formulary**, a rule or model, or certain terms preſcribed or decreed by authority, for the form and manner of an act, inſtrument, proceeding, or the like.

Formula, in church-hiſtory and theology, ſignifies a profeſſion of faith.

Formula, in medicine, imports the conſtitution of medicines, either ſimple or compound, both with reſpect to their preſcription and conſiſtence.

FORMULARY, a writing containing the form of an oath, declaration, atteſtation, abjuration, *&c.* to be made on certain occaſions.

FORNACALIA, or **Fornicalia**, in Roman antiquity, a feſtival inſtituted by Numa in honour of Fornax, the goddeſs of ovens; wherein certain cakes were made, and offered in ſacrifice before the ovens.

FORNICATION, the act of incontinency between ſingle perſons; for when either of the parties is married, ſuch act is adultery. See Adultery.

FORNIX, in anatomy. See Anatomy, p. 285.

FORRAGE, in the military art, denotes hay, oats, barley, wheat, graſs, clover, *&c.* brought into the camp by the troopers, for the ſuſtenance of their horſes.

It is the buſineſs of the quarter-maſter-general to appoint the method of forrage, and poſt proper guards for the ſecurity of the forragers.

FORRES, a parliament-town of Scotland in the county of Murray, about thirteen miles weſt of Elgin: W. long. 3° 20′, and N. lat. 57° 40′.

It is claſſed with Inverneſs, Fortroſe, and Nairn.

FORT, in the military art, a ſmall fortified place, environed on all ſides with a moat, rampart, and parapet. Its uſe is to ſecure ſome high ground or the paſſage of a river, to make good an advantageous poſt, to defend the lines and quarters of a ſiege, *&c.*

FORTALICE, in Scots law, ſignified anciently a ſmall place of ſtrength, originally built for the defence of the country; and which on that account was formerly reckoned *inter regalia*, and did not go along with the lands upon which it was ſituated without a ſpecial grant from the crown. Now, fortalices are carried by a general grant of the lands; and the word is become ſynonymous with manor place, meſſuage, *&c.*

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Fig. 10.

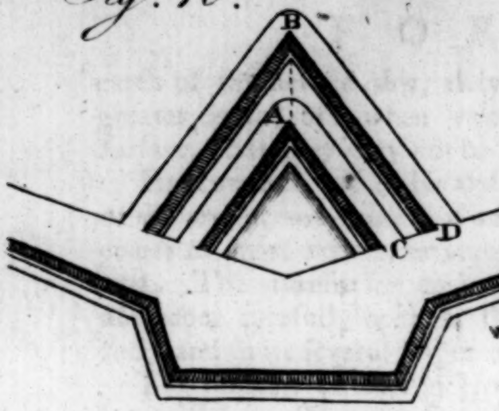

Fig. 3.

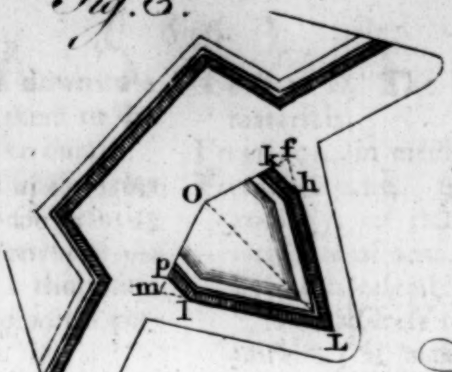

Fig. 2.

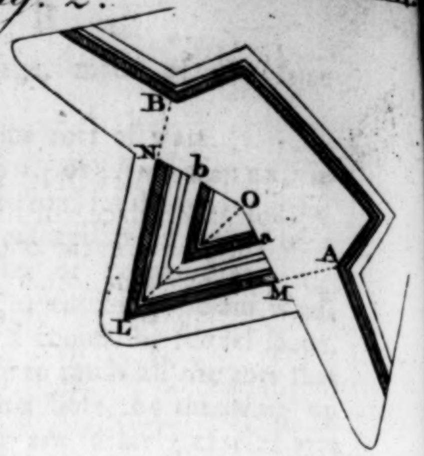

Fig. 1.

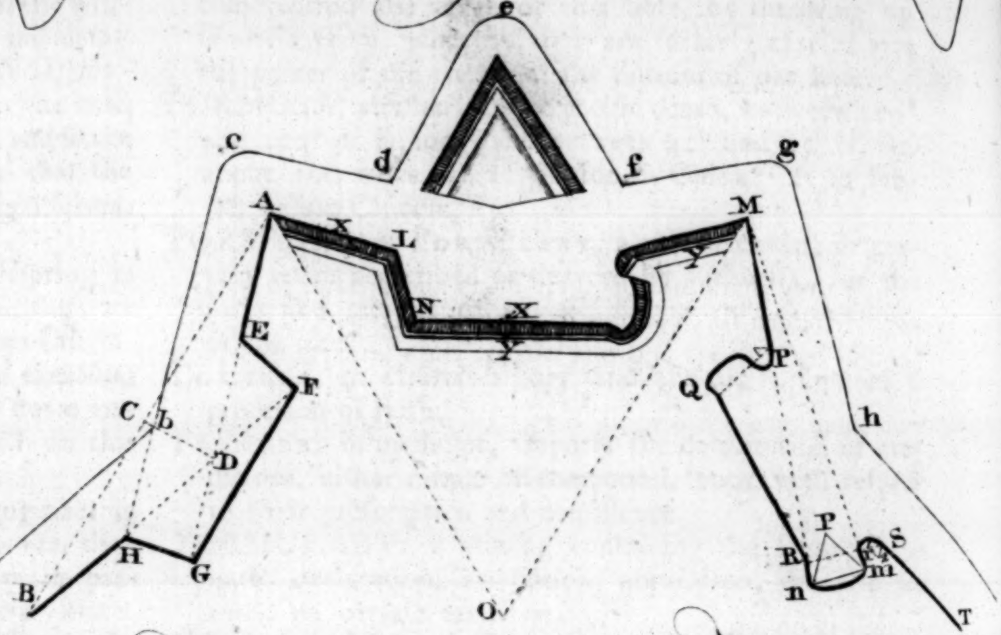
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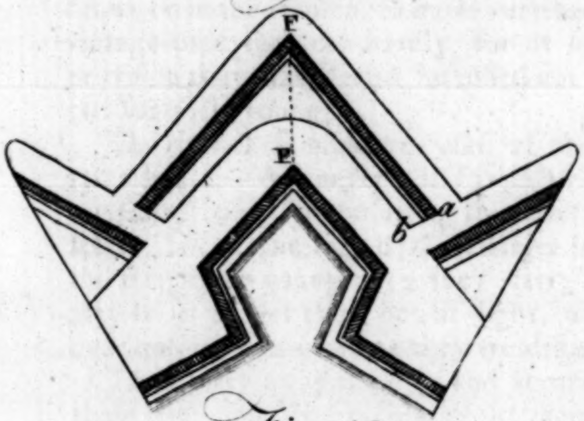
Fig. 11.



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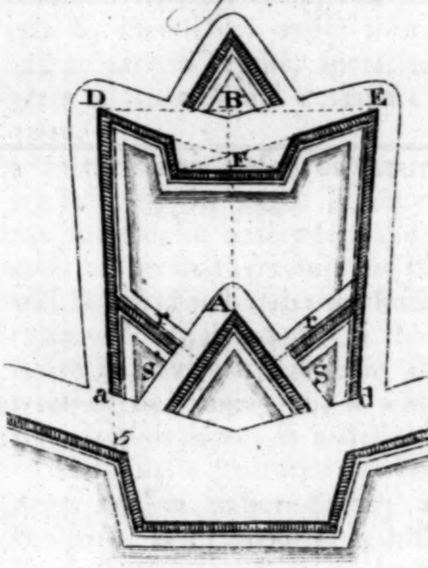
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Fig. 6.

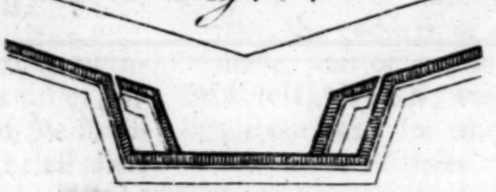


Fig. 9.

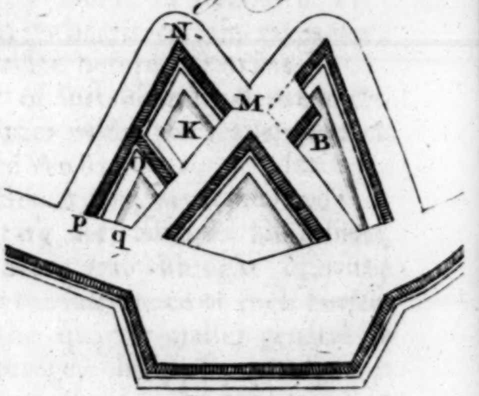


Fig. 7.

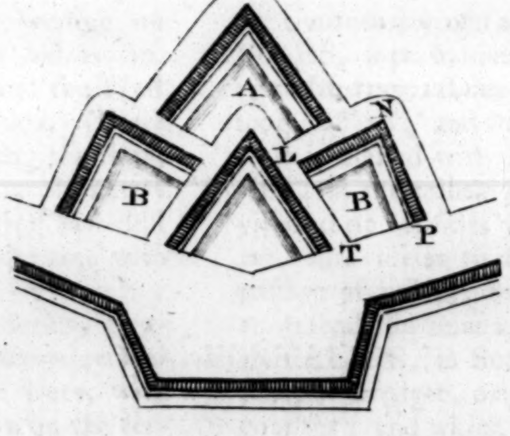


Fig. 8.

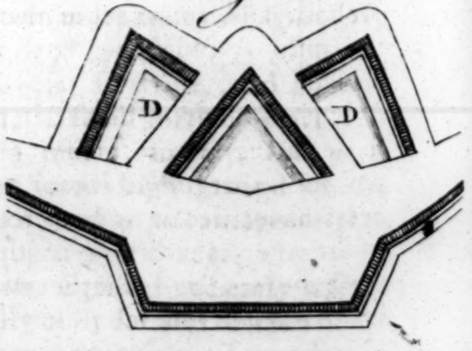


Fig. 13.

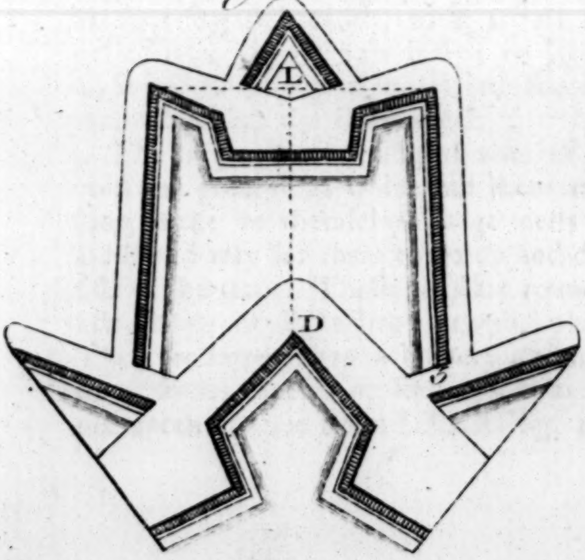


Fig. 4.

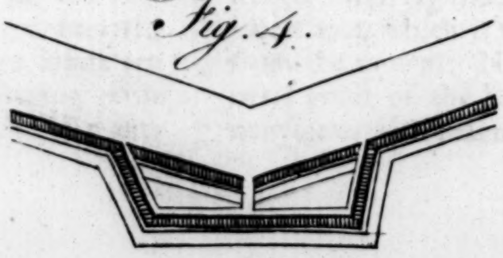
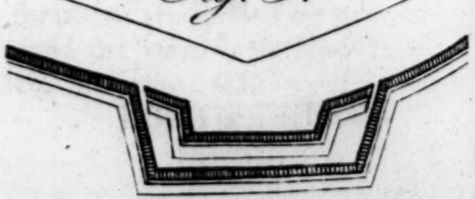


Fig. 5.



A. Bell Sc.

FORTIFICATION.

FORTIFCATION, the art of fortifying a town, or other place; or of putting them in ſuch a poſture of defence, that every one of its parts defends, and is defended by ſome other parts, by means of ramparts, parapets, moats, and other bulwarks; to the end, that a ſmall number of men within, may be able to defend themſelves for a conſiderable time againſt the aſſaults of a numerous army without; ſo that the enemy in attacking them, muſt of neceſſity ſuffer great loſs.

Fortification is either ancient or modern, regular or irregular. Ancient fortification, at firſt, conſiſted of walls or defences made of trunks and other branches of trees mixed with earth, to ſecure them againſt the attacks of the enemy. This was afterwards altered to ſtone walls, on which were raiſed breaſt-works, behind which they made uſe of their darts and arrows in ſecurity. Modern fortification is that which is flanked and defended by baſtions and out works, the ramparts of which are ſo ſolid, that they cannot be beat down but by the continual fire of ſeveral batteries of cannon. Regular fortification, is that built in a regular polygon, the ſides and angles of which are all equal, being commonly about a muſket-ſhot from each other. Irregular fortification, on the contrary, is that where the ſides and angles are not uniform, equidiſtant, or equal; which is owing to the irregularity of the ground, valleys, rivers, hills, and the like.

SECTION I. *Of Regular Fortification.*

THE art of regular fortification may be diſtinguiſhed into two parts, *viz.* the elementary or theoretical, and practical.

The elementary part conſiſts in tracing the plans and profiles of a fortification on paper, with ſcales and compaſſes; and to examine the ſyſtems propoſed by different authors, in order to diſcover their advantages and diſadvantages.

And the practical part conſiſts in forming a project of a fortification, according to the nature of the ground and other neceſſary circumſtances, to trace it on the ground, and to execute the project, together with all the military buildings, ſuch as magazines, ſtore-houſes, bridges, *&c.*

Notwithſtanding all the improvements which have been made in the art of fortifying ſince the invention of gunpowder, that of attacking is ſtill ſuperior to it: engineers have tried in vain to render the advantages of a fortification equal to thoſe of the attack; the ſuperiority of the beſiegers fire, together with the greater number of men, obliges generally, ſooner or later, the beſieged to ſubmit.

The greateſt improvement made in the art of attacking happened in the year 1697, when M. Vauban made firſt uſe of ricochet firing at the ſiege of Ath, whereby the beſieged placed behind the parapets were as much expoſed to the fire of the beſiegers as if there had been none; whereas before, they had been ſecure as long as the parapet was not demoliſhed: and the worſt is, that there can be no remedy found to prevent this enfilading without falling into inconveniencies almoſt as bad as thoſe which we endeavour to avoid.

Although authors agree as to the general form in the preſent manner of fortifying, yet they moſtly differ in particular conſtructions of the parts. As it would be both needleſs and ſuperfluous to treat of all the different methods hitherto propoſed, we ſhall content ourſelves with explaining thoſe only, which are moſt eſteemed by the beſt judges, and have been moſtly put in practice.

Conſtruction of M. VAUBAN's *Method.*

This method is divided into little, mean, and great; the little is chiefly uſed in the conſtruction of citadels, the mean in that of all ſorts of towns, and the great in particular caſes only.

We ſhall give the conſtruction of the mean, as being moſt uſeful, and refer the reader to the table hereafter, for thoſe dimenſions which are different in theſe ſeveral fortifications.

[Plate LXXXIII. fig. 1.] Incribe in a circle a polygon of as many ſides as the fortification is deſigned to have fronts; let AB be one of the ſides of half an exagon, which biſect by the perpendicular CD: divide half AC of it into nine equal parts, and one of theſe into ten others; then theſe diviſions will ſerve as a ſcale to conſtruct all the parts of the fortification, and each of them is ſuppoſed to be a toiſe or fathom, that is ſix French feet; and therefore the whole ſide AB is ſuppoſed to be 180 toiſes.

As the dividing a line into ſo many equal parts, is troubleſome and tedious; it is more convenient to have a ſcale of equal parts by which the works may be conſtructed.

If therefore, in this caſe, the radius is taken equal to 180 toiſes, and the circle deſcribed with that radius being divided into ſix equal parts, or the radius being carried ſix times round, you will have an exagon inſcribed; AB being biſected by the perpendicular CD as before, ſet off 30 toiſes from C to D, and draw the indefinite lines ADG, BDF, in which take the parts AE, BH, each equal to 50 toiſes; from the centre E deſcribe an arc through the point H, meeting AD in G, and from the centre H deſcribe an arc through the point E, meeting BD in F; or which is the ſame, make each of the lines EG HF equal to the diſtance EH; then the lines joining the points A,E,F,G,H,B, will be the principal or outline of the front.

If the ſame conſtruction be performed on the other ſides of the polygon, you will have the principal or outline of the whole fortification.

If, with a radius of 20 toiſes, there be deſcribed circular arcs, from the angular points B,A,M,T, and lines are drawn from the oppoſite angles E, H, *&c.* ſo as to touch theſe arcs, their parts a b, b, c, *&c.* together with theſe arcs will repreſent the outline of the ditch.

DEFINITIONS.

1. The part FEALN, is called the baſtion.
2. AE, AL, the faces of the baſtion.
3. EF, LN, the flanks.
4. FG, the curtain.
5. FN, the gorge of the baſtion.
6. AG, BF, the lines of defence.
7. AB, the exterior ſide of the polygon.
8. CD, the perpendicular.
9. Any line which divides a work into two equal parts, is called the capital of that work.
10. abc, the counterſcarp of the ditch.
11. A,M, the flanked angles.
12. H,E,L, the angles of the ſhoulder, or ſhoulder only.
13. G,F,N, the angles of the flank.
14. Any angle whoſe point turns from the place is called a ſaliant angle, ſuch as A, M; and any angle whoſe point turns towards the place, re-entering angle, ſuch as b, F, N.
15. If there be drawn two lines parallel to the principal or outline, the one at 3 toiſes diſtance, and the other at 8 from it; then the ſpace yx included between the principal one and that fartheſt diſtant, is called the rampart.

And the ſpace xx, contained by the principal line, and that next to it, and which is generally ſtained black, is called the parapet.

16. There is a fine line drawn within four feet of the parapet, which expreſſes a ſtep called banquette.

N. B. All works have a parapet of three toiſes thick, and a rampert of 8 to 10, beſides their ſlopes. The rampart is elevated more or leſs above the level of the place, from 10 to 20 feet, according to the nature of the ground and the particular conſtructions of engineers.

The parapet is a part of the rampart elevated from 6 to 7$\frac{1}{2}$ feet above the reſt, in order to cover the troops which are drawn up there from the fire of the enemy in a ſiege; and the banquette is two or three feet higher than the rampart, or about four feet lower than the parapet; ſo that when the troops ſtand upon it, they may juſt be able to fire over the parapet.

17. The body of the place, is all that which is contained within this firſt rampart; for which reaſon, it is often ſaid to conſtruct the body of the place; which means properly, the conſtruction of the baſtions and curtains.

18. All the works which are conſtructed beyond the ditch before the body of the place are called outworks.

TABLE.

	Forts.						Little Fortif.				Mean		Great.	
Side of Polyg.	80	90	100	110	120	130	140	150	160	170	180	190	200	260
Perpendicul.	10	11	12$\frac{1}{2}$	14	15	16	20	21	23	25	30	31	25	22
Faces baſt.	22	25	28	30	33	35	40	42	45	47	50	53	55	60
Cap of ravel.	25	28	30	35	38	40	45	50	50	52	55	55	60	50

In the firſt vertical column are the numbers expreſſing the lengths of the exterior ſides from 80 to 260.

In the ſecond, the perpendiculars anſwering to theſe ſides.

In the third, the lengths of the faces of baſtions; and in the fourth, the lengths of the capitals of the ravelins.

The forts are moſtly, if not always, ſquares; for which reaſon, the perpendiculars are made one eighth of the exterior ſides; becauſe if they were more, the gorges of the baſtions would become too narrow.

The little fortification is chiefly deſigned for citadels, and are commonly pentagons; the perpendiculars are made one ſeventh of the exterior ſide; the mean is uſed in all kinds of fortifications from an exagon upwards to any number of ſides: and the great is ſeldom uſed but in an irregular fortification, where there are ſome ſides that cannot be made leſs without much expence: or in a town which lies near a great river, where the ſide next the river is made from 200 to 260 toiſes; and as that ſide is leſs expoſed to be attacked than any other, the perpendicular is made ſhorter, which ſaves much expence.

The faces of the baſtions are all $\frac{2}{7}$ths of the exterior ſides, or nearly ſo, becauſe the fractions are neglected.

It may be obſerved in general, that in all ſquares the perpendicular is $\frac{1}{8}$th of the exterior ſide, and all pentagons $\frac{1}{7}$th, and in all the reſt upwards $\frac{1}{6}$th.

1. *Conſtruction of Orillons and retired Flanks.*

Deſcribe the front MPQRST as before, and divide the flank into three equal parts, of which ſuppoſe Sr to be one: from the oppoſite flanked angle M draw a line Mr, in which take the part mr of 5 toiſes; take likewiſe Rn in the line of defence MR, produced, equal to 5 toiſes, and join nm, upon which as a baſe deſcribe the equilateral triangle npm, and from the angle p, oppoſite to the baſe as centre, is deſcribed the circular flank nm.

And if Sr be biſected by the perpendicular 1, 2, and another be erected upon the face ST, at S; the interſection 2 of theſe two perpendiculars, will be the centre of the arc which forms the orillon.

The orillons are very uſeful in covering the retired flanks, which cannot be ſeen but directly in the front; and as theſe orillons are round, they cannot be ſo eaſily deſtroyed as they would be, if they were of any other figure.

2. *Conſtruction of Ravelins or Half-moons.*

Fig. 2. Set off 50 toiſes, from the re-entering angle O of the counterſcarp, on the capital OL of the ravelin, or on the perpendicular produced, and from the point L draw lines to the ſhoulders A B; whoſe parts LM, LN, terminated by the counterſcarp, will be the faces MO, ON, the ſemi-gorges of the ravelin required.

This is Mr Vauban's method of conſtructing ravelins, according to ſome authors; and others will have the faces of the ravelin to terminate on thoſe of the baſtions within 3 toiſes of the ſhoulders; which ſeems to be the beſt way, for the ravelins cover the flanks much better than the others.

The ditch before the ravelin is 12 toiſes, its counterſcarp parallel to the faces of the ravelins, and is made in a circular arc, before the ſaliant angle; as likewiſe all ditches are in general.

When the ravelins are made with flanks, as in fig. 3. the faces ſhould terminate off thoſe of the baſtions, at leaſt 5 toiſes from the ſhoulders.

The flanks are made by ſetting off 10 toiſes from the extremities of the faces, from f to h, and from m to l, fig. 3. and from the points h, l, the flanks hk, lp, are drawn parallel to the capital LO of the ravelin.

There are ſometimes redoubts made in the ravelin, ſuch as in fig. 2. which is done by ſetting off 16 toiſes from the extremities of the faces on the ſemi-gorges from N to b, and from M to a; and from the points b, a, the faces are drawn parallel to thoſe of the ravelin: the ditch before this redoubt is 6 toiſes, and its counterſcarp parallel to the faces.

3. *Conſtruction of Tenailles.*

A tenaille is a work made in the ditch before the curtains, the parapet of which is only 2 or 3 feet higher than the level ground of the ravelin. There are three different ſorts: the firſt are thoſe as in fig. 4. which are made in the direction of the lines of defence, leaving a paſſage of 3 toiſes between their extremities and the flanks of the baſtions, as likewiſe another of 2 in the middle for a bridge of communication to the ravelin.

The ſecond ſort, are thoſe as in fig 5. Their faces are in the lines of defence, and 16 toiſes long, beſides the paſſage of 3 toiſes between them and the flanks of the baſtions; their flanks are found by deſcribing arcs from one ſhoulder of the tenaille as centre thro' the other, on which are ſet off 10 toiſes for the flanks deſired.

And the third ſort, are thoſe as in fig. 6. Their faces are 16 toiſes, as in the ſecond ſort, and the flanks are parallel to thoſe of the baſtions.

The uſe in general of tenailles, is to defend the bottom of the ditch by a grazing fire, as likewiſe the level ground of the ravelin, and eſpecially the ditch before the redoubt within the ravelin, which can be defended from no where elſe ſo well as from them.

The firſt ſort do not defend the ditch ſo well as the others, as being too oblique a defence; but as they are not ſubject to be enfiladed, M. Vauban has generally preferred them in the fortifying of places, as may be ſeen in the citadel of Lille, at Landau, New-Briſac, and in a great many other places.

The ſecond ſort defend the ditch much better than the firſt, and add a low flank to thoſe of the baſtions; but as theſe flanks are liable to be enfiladed, they have not been much put in practice. This defect might however be remedied, by making them ſo as to be covered by the extremities of the parapets of the oppoſite ravelins, or by ſome other work.

As to the third ſort, they have the ſame advantage as the ſecond, and are likewiſe liable to the ſame objections; for which reaſon they may be uſed with the ſame precautions which have been mentioned in the ſecond.

Tenailles are eſteemed ſo neceſſary, that there is hardly any place fortified without them; and it is not without reaſon; for when the ditch is dry, the part behind the tenailles ſerves as a place of arms, from which the troops may ſally, deſtroy the works of the enemy in the ditch, oppoſe their deſcent, and retire with ſafety; and the communication from the body of the place to the ravelin becomes eaſy and ſecure; which is a great advantage; for by that means the ravelin may make a much better defence, as it can be ſupplied with troops and neceſſaries at any time. And if the ditch is wet, they ſerve as harbours for boats, which may carry out armed men to oppoſe the paſſage over the ditch whenever they pleaſe; and the communication from the tenailles to the ravelin, becomes likewiſe much eaſier than it would be without them.

4. *Conſtruction of Lunettes.*

Fig. 7. Lunettes are placed on both ſides of the ravelin, ſuch as B, to increaſe the ſtrength of a place: they are conſtructed, by biſecting the faces of the ravelin with the perpendicular LN; on which is ſet off 30 toiſes from the counterſcarp of the ditch, for one of its faces; the other face PN, is found by making the ſemi-gorge TP of 25 toiſes; the ditch before the lunettes is 12 toiſes, the parapet 3, and the rampart 8; as in the ravelin.

There is ſometimes another work made to cover the ſaliant angle of the ravelin; ſuch as A, called *Bonnet*, whoſe faces are parallel to thoſe of the ravelin, and when produced biſect thoſe of the lunettes; the ditch before it is 10 toiſes.

There are likewiſe lunettes, ſuch as D, in fig. 8, whoſe faces are drawn perpendicular to thoſe of the ravelin, within a third part from the ſaliant angle; and their ſemi-gorges are only 20 toiſes.

Theſe kind of works may make a good defence, and are no very great expence; for as they are ſo near the ravelin, the communication with it is very eaſy, and one cannot well be maintained till they are all three taken.

5. *Conſtruction of Tenaillons.*

Fig. 9. Produce the faces of the ravelin beyond the counterſcarp of the ditch, at a diſtance MN of 30 toiſes, and take on the counterſcarp of the great ditch 15 toiſes from the re entering angle p to q, and draw Nq; then qNMp will be the tenaillon required; its ditch is 12 toiſes, that is, the ſame as that of the ravelin. Sometimes there is made a retired battery in the front of the tenaillons, as in fig. B; this battery is 10 toiſes from the front to which it is parallel, and 15 toiſes long.

There are commonly retrenchments made in the tenaillons, ſuch as O; their parapets are parallel to the fronts MN, or rather perpendicular to the ſide Nq, and biſect the ſide qN; the ditch before this retrenchment is 3 toiſes, and there is a banquette before the parapet next to the ditch of about 8 feet, called *Berm*; it ſerves to prevent the earth of the parapet (which ſeldom has any revetement) from falling into the ditch.

It is to be obſerved, that the ravelin, before which tenaillons are conſtructed, muſt have its ſaliant angle much greater than the former conſtruction makes them; otherwiſe the ſaliant angles of the tenaillons become too acute; for which reaſon we made the capital of this ravelin 45 toiſes, and the faces terminate within 3 toiſes of the ſhoulders.

6. *Conſtruction of Counterguards.*

Fig. 10. 11. When the counterguard is placed before the ravelin, ſet off 40 toiſes on the capital of the ravelin from the ſaliant angle A, to the ſaliant angle B, of the counterguard; and 10 from C to D, on the counterſcarp of the ditch.

When the counterguard is before the baſtion, ſuch as in fig. 2, its ſaliant angle F is 50 toiſes from the ſaliant angle E of the baſtion, and the breadth near the ditch of the ravelin is 10 toiſes as before.

The ditch before the counterguards is 12 toiſes, and its counterſcarp parallel to the faces.

Counterguards are made before the ravelin in ſome particular occaſions only, but are frequently conſtructed before the baſtions, as covering the flanks wonderfully well. Some authors, as Blondel, and Mr Coehorn, will have them much narrower than they are here.

7. *Conſtruction of Hornworks.*

Fig. 12. Produce the capital of the ravelin beyond the ſaliant angle A, at a diſtance AB of about 80 toiſes; draw DBE at right angles to AB; in which take BD, BE, each equal to 55 toiſes; and on the exterior ſide DE, trace a front of a polygon in the ſame manner as that of the body of the place, making the perpendicular BF 18 toiſes, and the faces 30.

The branches Da Eb of the hornwork, when produced, terminate on the faces of the baſtions, within 5 toiſes of the ſhoulders. The ditch of the hornwork is 12 toiſes, and its counterſcarp parallel to the branches; and in the front terminates at the ſhoulders, in the ſame manner as the great ditch before the baſtions.

The capital of the ravelin before the front of the hornwork is 35 toiſes, and the faces terminate on the ſhoulders, or rather 2 or 3 toiſes beyond them: and the ditch before the ravelin is 8 toiſes.

There are ſometimes retrenchments made within the hornwork, ſuch as S, S; which are conſtructed by erecting perpendiculars to the faces of the ravelins, within 25 toiſes of their extremities. This retrenchment, like all others, has a parapet turfed only with a berm of 8 feet before it; as likewiſe, a ditch from 3 to 5 toiſes broad.

Fig. 13. When a hornwork is made before the baſtion, the diſtance DL of the front from the ſaliant angle of the baſtion is 100 toiſes, and the branches terminate on the faces of the adjacent ravelins within 5 toiſes from their extremities; all the reſt is the ſame as before.

8. *Conſtruction of Crownworks.*

Plate LXXXIV. fig. 1. From the ſaliant angle of the ravelin, as a centre, deſcribe an arc of a circle with a radius of about 120 toiſes, cutting the capital of the ravelin produced at C; from the point C, ſet off the cords CB, CF, each of them equal to 110 toiſes; and on each of which, as an exterior ſide, conſtruct a front of a polygon of the ſame dimenſions as in the hornwork; that is, the perpendicular ſhould be 18 toiſes, the faces 30, and the branches terminate on the faces of the baſtions, within 25 toiſes of the ſhoulders.

The ditch is 12 toiſes, the capital of the ravelin 35, and its ditch 8; that is, the ſame as in the hornwork.

Sometimes the crownwork is made before the baſtion, as in fig. 2. the arc is deſcribed from the ſaliant angle A of the baſtion, with a radius of 120 toiſes, as before, and the branches terminate on the faces of the adjacent ravelins within 25 toiſes of their extremities; the reſt of the dimenſions and conſtructions are the ſame as before.

Hornworks, as well as crownworks, are never made but when a large ſpot of ground falls beyond the fortification, which might be advantageous to an enemy in a ſiege, or to cover ſome gate or entrance into a town;

9. *Conſtruction of Covert-ways and Glacis.*

Although we have not hitherto mentioned the covert-way, nevertheleſs all fortifications whatſoever have one; for they are eſteemed to be one of the moſt eſſential parts of a modern fortification; and it is certain, the taking the covert-way, when it is in a good condition and well defended, is generally the moſt bloody action of the ſiege.

After having conſtructed the body of the place, and all the outworks which are thought neceſſary, lines are drawn parallel to the outmoſt counterſcarps of the ditches, at 6 toiſes diſtant from it; and the ſpace mnmn, included between that line and the counterſcarp, will be the covert-way required.

Fig. 3. There is in every re-entering angle of the counterſcarp a place of arms, m; which is found by ſetting off 20 toiſes from the re-entering angle a, on both ſides from a to b, and from a to c; and from the points b, c, as centres, arcs are deſcribed with a radius of 25 toiſes, ſo as to interſect each other in d; then the lines drawn from this interſection to the points b, c, will be the faces of the places of arms.

If lines are drawn, parallel to the lines which terminate the covert way, and the places of arms, at 20 toiſes diſtant from them, the ſpace x, x, x, between theſe lines and thoſe which terminate the covert-way, will be the glacis.

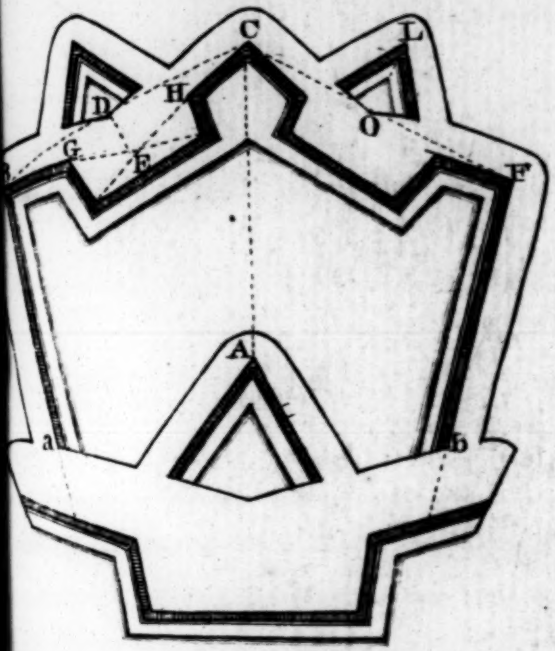
At the extremities of the places of arms, are traverſes made, ſuch as v, v, which ſerves to incloſe them; theſe traverſes are 3 toiſes thick, and as long as the covert-way is broad; and a paſſage is cut in the glacis round them, of about 6 or 8 feet, in order to have a free communication with the reſt of the covert-way.

There are alſo traverſes of the ſame dimenſions before every ſaliant angle of the baſtion and outworks, and are in the ſame direction of the faces of thoſe works produced; and the thickneſs lies at the ſame ſide as the parapets.

The paſſages round theſe laſt traverſes are likewiſe from 6 to 8 feet wide.

Plate LXXXIIII.

Fig. 1.


C
L
D
H
O
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E
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A
a
b

Fig. 2.

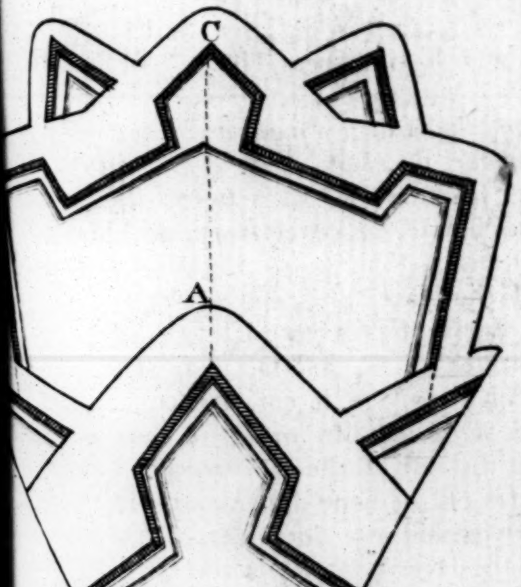

Fig. 3.

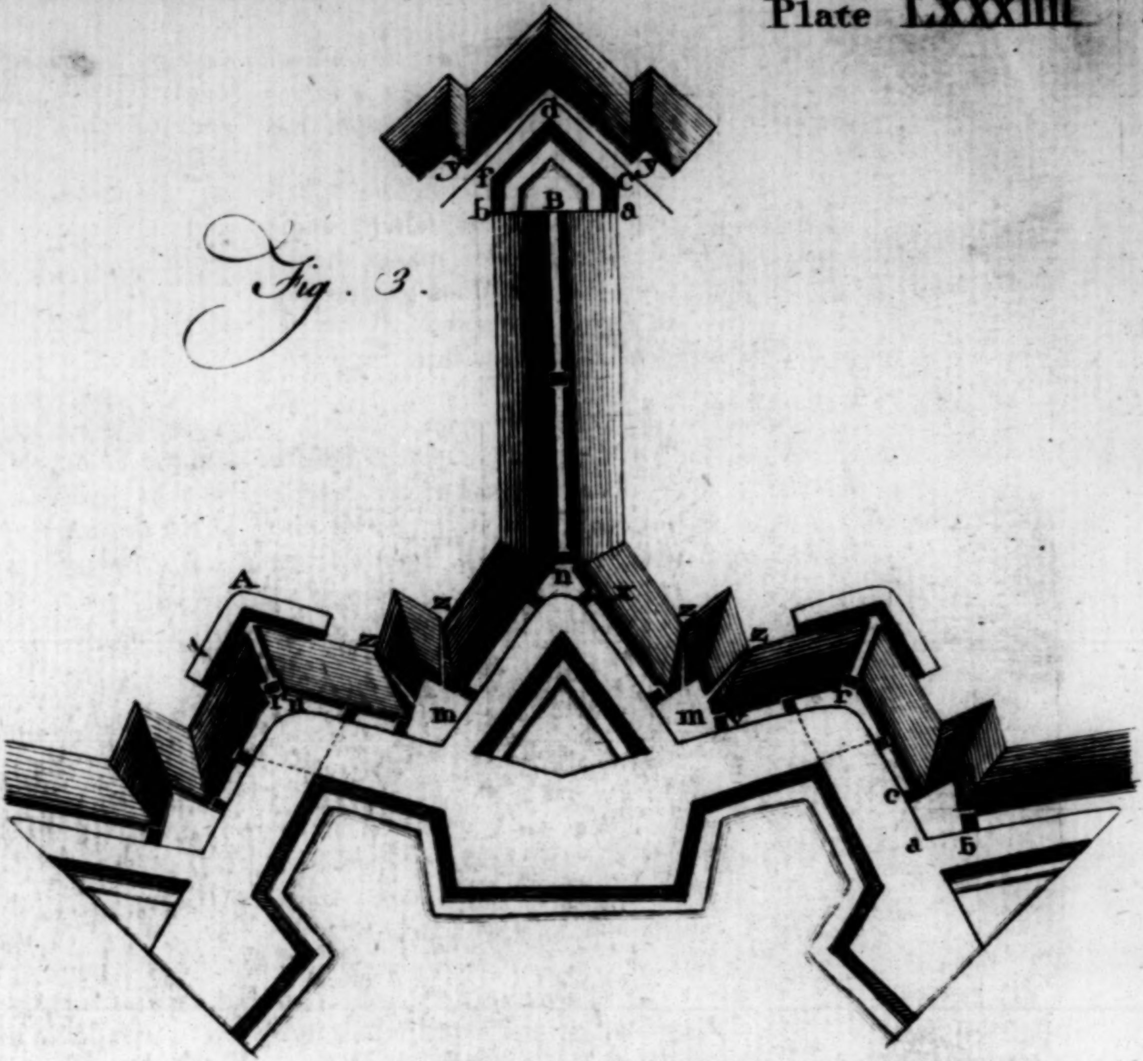
d
y
f
c
y
b
B
a
A
n
x
z
z
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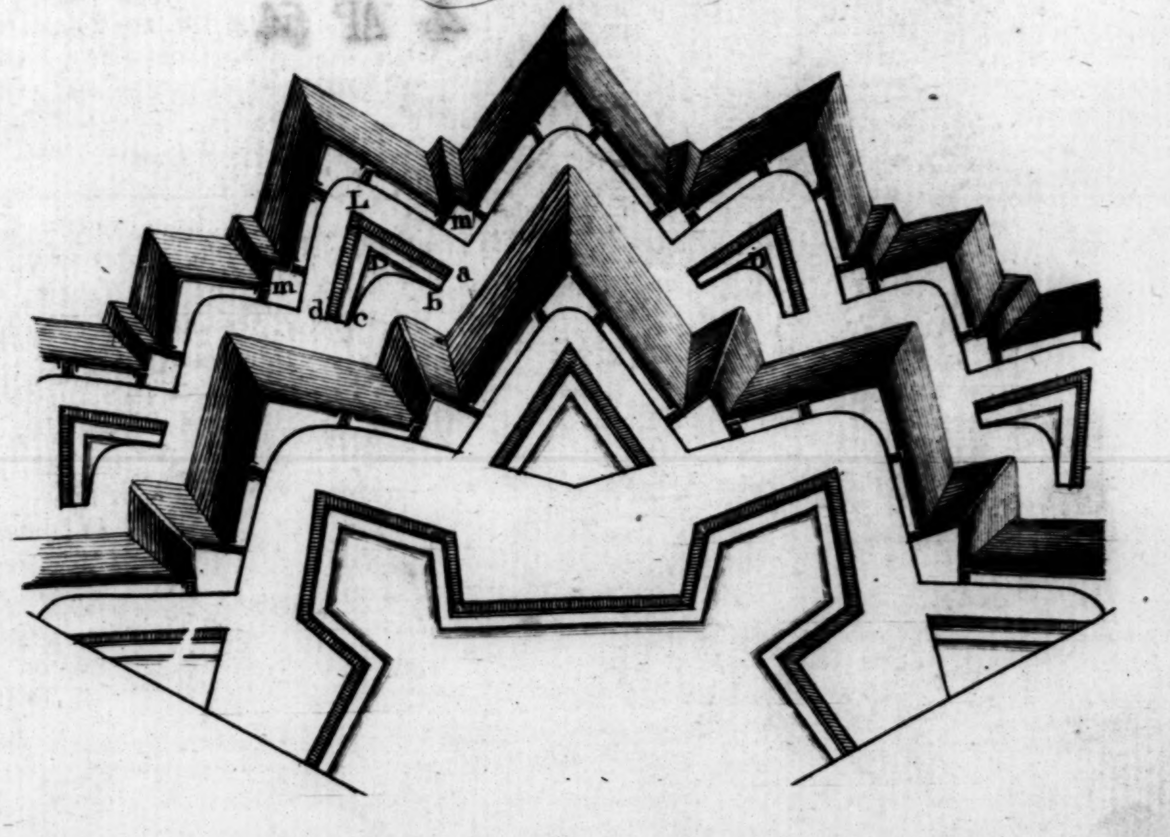
Fig. 4.



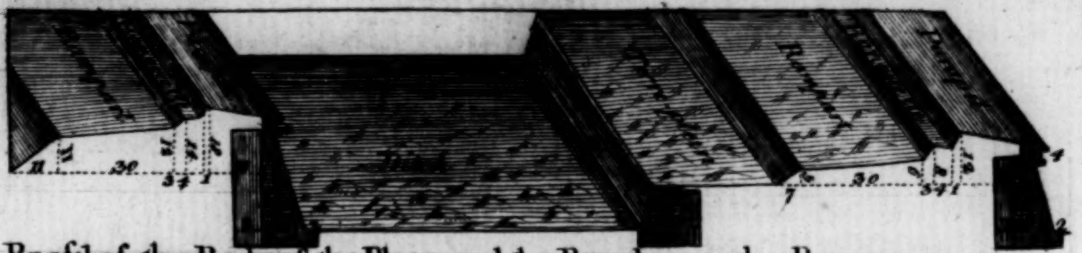
A. Bell Sculpt.

4 AP 54

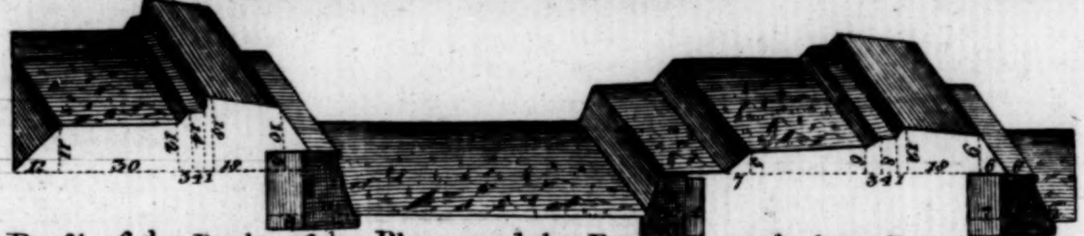
4 AP 54

Plate LXXXV

Fig. 1.


Rampart
Ditch
Rampart
Parapet
11
30
3
4
1
7
30
3
4
1
2

Profil of the Body of the Place and the Ravelin with Revetement


12
30
3
4
1
18
7
3
4
1
18

Profil of the Body of the Place and the Ravelin with demi-Revetement

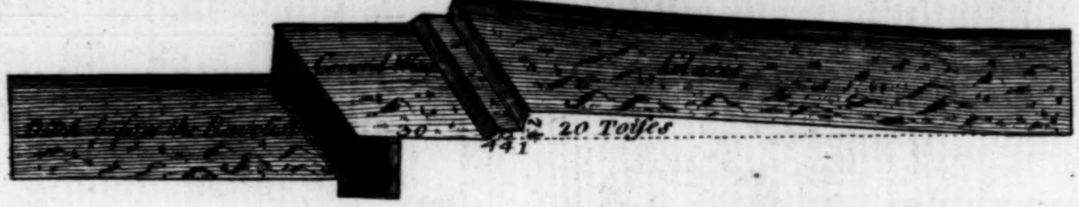

Covered Way
Glacis
Ditch before the Ravelin
30
4
4
1
20 Toises

Fig. 2.

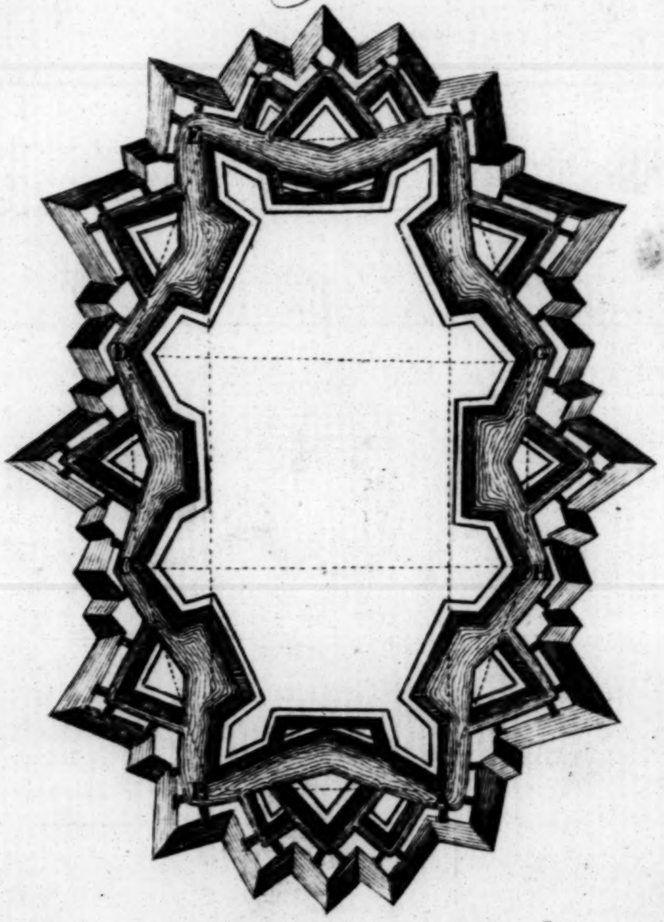
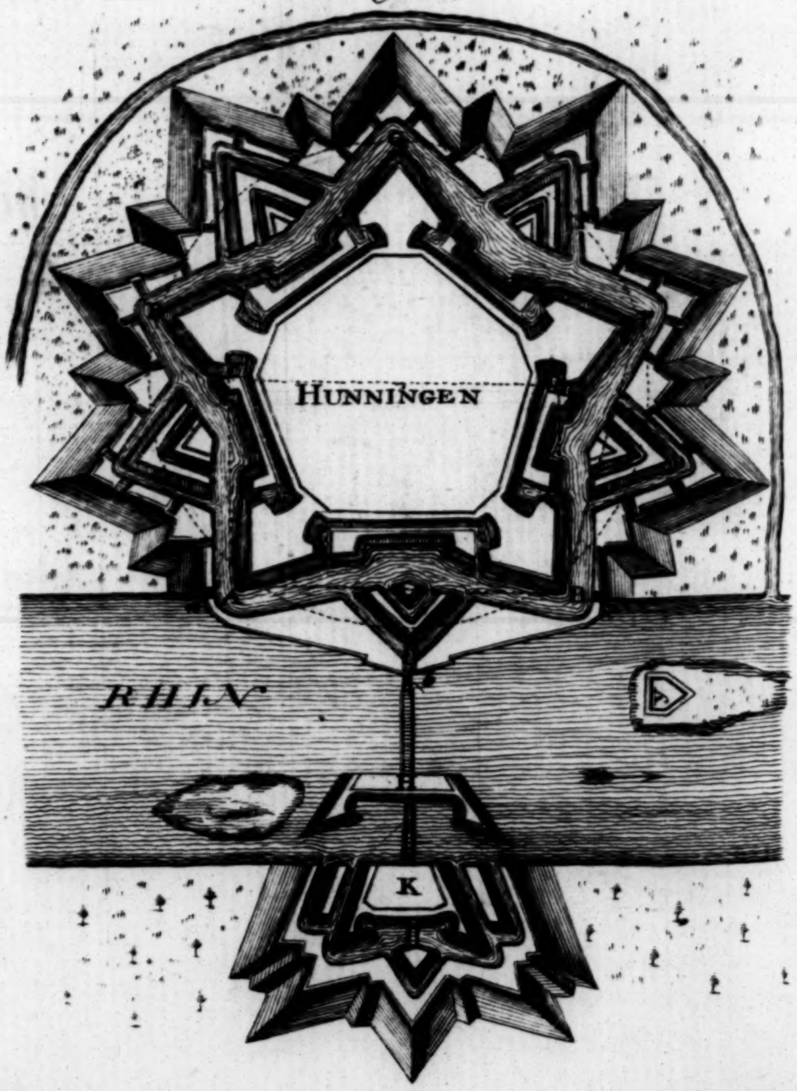


Fig. 3.


HUNNINGEN
RHIN
K

A. Bell Sc.

In each place of arms are two ſally ports z, z, which are 10 or 12 feet wide, for the troops to ſally out; in time of a ſiege they are ſhut up, with barriers or gates.

10. *Conſtruction of Arrows and Detached Redoubts.*

An arrow is a work made before the ſaliant angles of the glacis, ſuch as A, fig. 3.; it is compoſed of a parapet of 3 toiſes thick, and 40 long; and the ditch before it 5 toiſes, terminating in a ſlope at both ends. The communication from the covert way into theſe arrows is 4 or 5 toiſes wide, and there is a traverſe r at the entrance of 3 toiſes thick, with a paſſage of 6 or 8 feet round it.

A detached redoubt is a kind of work much like a ravelin, with the flanks placed beyond the glacis; ſuch as fig. B: they are made in order to occupy ſome ſpot of ground which might be advantageous to the beſiegers; likewiſe to oblige the enemy to open their trenches farther off than they would do otherwiſe.

Their diſtance from the covert-way ought not to exceed 120 toiſes, that it may be defended by muſket ſhot from thence.

The gorge ab is 40 toiſes, the flanks ac, bf, which are perpendicular to the gorge 10, and the faces cd, fd 30; the ditch before it is 6 toiſes, ending in ſlopes at both ends; the covert-way 4; the branches of the covert-way are 42 toiſes long, or thereabouts; the faces of the places of arms y, y, which are perpendicular to the branches, 10; and the other, which is parallel to them, 14.

The communication from the covert-way into the redoubt, is 5 or 6 toiſes wide; and there is a traverſe made juſt at the entrance; and another in the middle when it is pretty long. The parapets of this communication terminate in a ſlope or glacis.

If theſe redoubts are above 50 toiſes diſtant from the covert-way, the beſiegers carry their trenches round, and enter through the gorge; by which the troops that are in them are made priſoners of war, if they do not retire betimes; to prevent this, ſome other outworks ſhould be made to ſupport them.

11. *Conſtruction of Second Ditches, and Covert-ways.*

Fig. 4. When the ground is low, and water to be found, there is often a ditch of about 10 or 12 toiſes made round the glacis; and oppoſite to the places of arms are conſtructed lunettes, beyond the ditch; ſuch as D, whoſe breadth on the counterſcarp of the ditch is 10 toiſes, from b to a, and from c to d; and the faces aL, dL, are parallel to thoſe of the places of arms; the ditch before them is from 8 to ten toiſes wide.

The ſecond covert-way is 4 toiſes, the ſemi-gorges of the places of arms, m, about 15, and the faces perpendicular to the counterſcarp; the ſecond glacis is from 15 to 18 toiſes broad.

This ſecond covert-way has traverſes every where, in the ſame manner as the firſt.

12. *Conſtruction of Profiles.*

Plate LXXXV. fig. 1. A profile is the repreſentation of a vertical ſection of a work; it ſerves to ſhew thoſe dimenſions which cannot be repreſented in plans, and are neceſſary in the building of a fortification; they are generally conſtructed upon a ſcale of 30 feet to an inch. It would be needleſs to deſcribe all their particular dimenſions, ſince they are marked in the ſchemes; we ſhall therefore lay down the principal rules only, given by M. Vauban, on this ſubject.

1. Every work ought to be at leaſt 6 feet higher than that before it, ſo that it may command thoſe before it; that is, that the garriſon may fire from all the works at the ſame time, with great and ſmall arms, at the beſiegers in their approaches: notwithſtanding this ſpecious pretence, there are ſeveral authors, who object againſt it. For they ſay, if you can diſcover the enemy from all the works, they can diſcover, by the ſame reaſon, all the works from their batteries; ſo that they may deſtroy them without being obliged to change their ſituation, and thereby diſmount all the guns of the place before they come near it.

But if all the works were of the ſame height, thoſe within cannot be deſtroyed, till ſuch time as thoſe before them are taken; guns might be placed in the covert-way and outworks to obſtruct the enemy's approach, and when they come near the place, they might be tranſported into the inner-works; and as the body of the place would be much lower, the expence would be conſiderably diminiſhed.

But when works are low, they are eaſily enfiladed by the ricochet batteries, which is a kind of firing with a ſmall quantity of powder, by giving the gun an elevation of 10 or 12 degrees: this might however be partly prevented, by making the parapets near the ſaliant angles, for the ſpace of 8 toiſes on each ſide, 5 or 6 feet higher than the reſt of the works.

2. The covert-way ſhould be lower than the level-ground, otherwiſe the body of the place muſt be raiſed very high, eſpecially when there are ſeveral outworks; this is to be underſtood only when the works exceed each other in height, otherwiſe it need not be below the level.

3. The baſes of all inward ſlopes of earth ſhould be at leaſt equal to the height, if not more.

4. The baſes of all outward ſlopes of earth, two thirds of their heights.

5. The ſlopes of all walls or revetements ſhould be one fifth of their height; but one ſixth would be ſufficient in our opinion: the height of a wall is eſtimated from the bottom of the ditch, and not from the beginning of its foundation.

6. The ſlopes of all parapets and traverſes are one ſixth of their breadth; that is, 3 feet towards the field, or the inſide, where the banquettes ſhould be, 3 feet higher than the outſide.

7. When the revetement of a rampart goes quite up to the top, 4 feet of the upper-part is a vertical wall of 3 feet thick, with a ſquare ſtone at the top of it, projecting 6 inches, and a circular one below, or where the ſlope begins, of 8 or 10 inches diameter; they go quite round the rampart, and the circular projection is called the *cordon*.

Where the ſtraight part of the wall ends and the ſlope begins, the wall is always made 5 feet thick; and the counterforts or buttreſſes reach no higher than that place.

7. When the rampart is partly walled, and partly turf-

ed, then one fifth of the height which is turfed muſt be added to 5 feet, to get the thickneſs of the wall above.

And having the thickneſs of any wall above, by adding one fifth of its height from the bottom of the ditch, the ſum will be the thickneſs of the wall at the bottom; but if a ſixth part is only taken for the ſlope, then a ſixth part muſt be added.

For inſtance, ſuppoſe a rampart of 30 feet high from the bottom of the ditch, and that 10 of which are to be turfed; then the fifth part of 10, which is 2, added to 5, gives 7 for the wall above; and as this wall is 20 feet high, the fifth of which is 4, and 4 added to the thickneſs 7 above, gives 11 for the thickneſs near the foundation.

Plate LXXXV. fig. 1. Repreſents, in military perſpective, the profiles of the body of a place, the ravelin and covert-way; which gives a clear idea of what is meant by a profile, and from which thoſe of all other works may be eaſily conceived.

Sect. II. *Of Irregular Fortification.*

The moſt eſſential principle in fortification, conſiſts in making all the fronts of a place equally ſtrong, ſo that the enemy may find no advantage in attacking either of the ſides; this can happen no otherwiſe but in a regular fortification ſituated in a plain or even ground; but as there are but few places which are not irregular, either in their works or ſituations, and the nature of the ground may be ſuch as makes it impracticable to build them regular, without too great expence; it is ſo much the more neceſſary to ſhew in what conſiſts the ſtrength or weakneſs of a town irregularly fortified, ſo that the weakeſt part may be made ſtronger by additional outworks; as likewiſe if ſuch a place is to be attacked, to know which is the ſtrongeſt or weakeſt.

1. *Conſtruction of an irregular place ſituated in an open country.*

If the place to be fortified is an old town incloſed by a wall or rampart, as it moſt frequently happens, the engineer is to conſider well all the different circumſtances of the figure, ſituation, and nature of the ground, to regulate his plan accordingly, ſo as to avoid the diſadvantages, and gain all the advantages poſſible; he ſhould examine, whether by cutting off ſome parts of the old wall or rampart, and taking in ſome ground, the place cannot be reduced into a regular figure, or nearly ſo; for, if that can be done without increaſing the expence conſiderably, it ſhould by no means be omitted; old towns have often towers placed from diſtance to diſtance, as Douay, Tournay, and many other places, which are generally made uſe of, and mended when it may be done; if there is a rampart without baſtions or towers, it muſt be well conſidered, whether baſtions may not be added, or if it is not better to make only ſome outworks; if the ditch about this rampart is not too wide and deep, it would be advantageous to make detached baſtions, otherwiſe ravelins and counterguards muſt be conſtructed; ſpecial care muſt be taken, to make all ſides of the polygon as nearly equal as poſſible, and that the length of the lines of defence do not exceed the reach of muſketſhot; but if that cannot be done, thoſe ſides which are on the narroweſt part ſhould be made the longeſt.

If it ſhould happen, that ſome of the ſides are inacceſſible or of very difficult approach, either on account of ſome precipice, marſhy ground, or inundation, they may be made much longer than the others, which are of eaſy acceſs, and the flanks need not be ſo large as the reſt; by doing ſo, there will be ſome expences ſaved, which may be uſed in making the other ſides ſtronger by adding more outworks.

There are few ſituations, but what are more advantageous in ſome parts than in others; it is therefore the buſineſs of an engineer to diſtinguiſh them, and to render thoſe ſides ſtrong by art, which are not ſo by nature.

If the ſituation is low and watery, lunettes or tenaillons, and ſuch other ſmall outworks ſhould be conſtructed, becauſe they are not of any great expence, and may make a very good defence; but if one ſide of the place is only low, and running water is to be had, a ſecond ditch and covert-way with lunettes may be made, by obſerving, that if the firſt glacis is made to ſlope, ſo as to become even with the level of the water in the ſecond ditch; or if the water can be ſwelled, by means of dykes or ſluices, ſo as to overflow the beſt part of the firſt glacis, it ſhould be done; for by ſo doing, theſe works will be able to make a very good defence, ſince the beſiegers will find it a difficult matter to lodge themſelves upon this glacis, which cannot be done but within a few toiſes of the firſt covert-way, where the beſieged are ready to receive them, and to deſtroy their works with great advantage; whereas the enemy cannot ſupport their workmen but from the ſecond covert-way, which is too far off to be of any great ſervice to them.

But if the ſituation is of a dry nature, without any water about it, caponiers ſhould be made in the great ditch, from the curtains to the ravelin, and batteries raiſed in the entrance of the ditch before the ravelin, whoſe parapet muſt ſlope off into a glacis, ſo as to afford no cover for the enemy behind them; arrows, and detached redoubts are likewiſe very proper to be uſed in ſuch a caſe, and ſometimes horn or crown-works, if it ſhould be thought convenient; but theſe works ſhould never be conſtructed, without an abſolute neceſſity, either to occupy a ſpot of ground which might be advantageous to the enemy, or to cover ſome gate or entrance into the town, for they are of ſo great expence, that their defence ſeems not to be anſwerable to it.

Moſt of the places in Flanders are fortified with hornworks, ſuch as Ipres, Tournay, Lille, and others.

If the place to be fortified is new, and the ſituation will not admit of a regular conſtruction; particular care muſt be taken in chuſing ſuch a ſpot of ground as is moſt advantageous, and leaſt liable to any diſadvantages, either in the building or in the maintaining of it: all hills or riſing grounds ſhould be avoided, which might command any part of the works; marſhy grounds, becauſe ſuch ſituations are unwholeſome; or lakes and ſtanding waters, for the ſame reaſon, excepting a lake is, or may be made navigable: good water ſhould be had either within the place or near it, for it is abſolutely neceſſary for men and cattle; the air ſhould be wholeſome, otherwiſe the continual ſickneſs that may reign in ſuch a place might prevent people to come and live in it, and the garriſon would not be in a condition to defend themſelves as they ought to do; in ſhort, all the different circumſtances attending ſuch an undertaking ſhould be maturely conſidered, before a reſolution is taken to fortify any place.

When a ſituation is pitched upon, the next thing to be conſidered is, the bigneſs of the town and the number of its outworks, which muſt abſolutely depend upon the conſequence ſuch a place is of to a nation; if it is only to guard a paſs, or entrance into a country, it need not be ſo large; but if it is to be a place either to promote or to protect trade, it ſhould be large and commodious; the ſtreets ſhould be wide, and the buildings regular and convenient: as to what regards the fortification, its conſtruction ſhould depend on the nature of the ſituation, and the number of the works on the funds or expence a prince or a nation will be at; which however ought to be according to the benefit ariſing from ſuch a place: for, as ſuch undertakings are of very great expence, an engineer cannot be too ſparing in his works; on the contrary, the greateſt œconomy ſhould be uſed, both in regard to the number of works, and to their conſtruction. The body of the place may have * revetements quite up to the top, or only in part, and the reſt turfed; but as to the outworks, they ſhould have half revetements, or they may be made with turf only; as being not ſo neceſſary to prevent the place from being ſurpriſed, and may nevertheleſs make a good defence.

On Plate LXXXV. fig. 2. is the plan of an octagon, one half of which is ſimilar and equal to the other half; it being ſuppoſed, that the ſituation would not admit of fortification quite regular; and the exterior ſides are each 180 toiſes, and the works are conſtructed according to our method; but becauſe the ſides AB, EF, are weaker than the reſt, as has been proved before, we have added tenailles, redoubts in the ravelins, and lunettes, to render them nearly equal in ſtrength with the others; and if counter guards were made before the baſtions A and B, it would effectually ſecure that front. Inſtead of lunettes, any other works may be made, as it may be thought convenient and according to the nature of the ground. If it ſhould be judged neceſſary to add other outworks to the ravelins all round the place, care muſt be taken to add likewiſe more to the fronts AB, EF, in order to render the advantages and diſadvantages of attacking on either ſide equal.

2. *Conſtruction of an irregular place, ſituated on a hill or rock.*

In the conſtruction of ſuch places, care muſt be taken that no neighbouring hill commands any part of the works; the town ſhould always be built on the higheſt part; but if it ſhould be thought more convenient to place it lower, then the upper part muſt be fortified with a fort; the ſituation ſhould be made level as near as poſſible, by removing the earth from ſome places to fill up others; and if it cannot well be levelled without extraordinary expence, works muſt be made on the higheſt part, ſo as to command and protect the lower; the works ought to occupy all the upper part of the hill, but if it ſhould be too extenſive to be all incloſed, or ſo irregular as not to be fortified without great inconvenience, the parts which fall without ſhould be fortified with ſome detached works, and a communication with the place muſt be made either above or under ground. There ſhould be no cavity or hollow roads, within cannon-ſhot, round about the place, where the enemy might be able to approach under cover; if there ſhould happen to be a ſpring, near the top of the hill, it ſhould be incloſed in the fortification, or if that cannot be done, by ſome work or other; for there is nothing more neceſſary, and at the ſame time ſcarcer in ſuch ſituations than water, for which reaſon there cannot be too much care taken in providing it; ſeveral ciſterns are to be made to receive the rain-water, and to preſerve it; wells ſhould be dug likewiſe, though ever ſo deep, the water of which will ſerve for common uſe.

Places built on hills or rocks, ſhould never be large, for their uſe is generally to guard paſſes or inlets into a country, and are ſeldom uſeful in traffic, and it is a difficult matter to provide for a large garriſon in ſuch ſituations, neither ſhould any ſuch place be built without ſome very material reaſons; but when it is abſolutely neceſſary, great care and precautions ſhould be taken to render the works as perfect as the ſituation will admit of, and at the ſame time to be as frugal in the expence as poſſible.

3. *Conſtruction of irregular fortifications, ſituated near rivers, lakes, or the ſea.*

As the intent of building theſe kind of places is chiefly to facilitate and protect trade, it is of much more importance than any other kind, eſpecially in maritime countries, where the principal ſtrength and power depends on it; for which reaſon, we ſhall treat of it more largely than any other part.

The firſt thing to be conſidered is their ſituations, which ought to be ſuch as to afford a good harbour for ſhipping, or a ſafe and eaſy entrance in ſtormy weather; but as it is hardly poſſible to find any, where ſhips may go in and lie ſecure with all winds, care ſhould be taken to make them ſafe to enter with thoſe winds which are moſt dangerous: but it is not ſufficient that the harbour is ſafe againſt ſtormy weather, they ſhould likewiſe be ſo againſt an enemy, both by land and water; for it often happens, that ſhips are deſtroyed where it was imagined they were ſecure, which is of too great a conſequence not to be provided againſt; for which reaſon, forts or batteries muſt be built in the moſt convenient places, to prevent the enemy's ſhips from coming too near, ſo as to be able to cannonade thoſe in the harbour, or fling ſhells amongſt them: and if there is any danger of an enemy's approach by land, high ramparts and edifices muſt be built, ſo as to cover them.

When a river is pretty large, and it is not convenient for making a harbour without great expence, the ſhips may ride along the ſhore, which, for that reaſon, muſt be made acceſſible for ſhips of burden; this may be done by advancing the quay into the river, if the water is too ſhallow, or by digging the river ſufficiently deep for that purpoſe.

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* Revetements are chiefly made to prevent a place from being ſurpriſed; outworks do not want to be made ſo, the taking them by ſurpriſe is of no great conſequence, except in a ſiege, when other cautions are uſed to prevent it.

And to prevent any enemy from coming up the river, forts muſt be built on both ſides, eſpecially when there are any turnings or windings. Antwerp is ſuch a place; for the Scheld is ſufficiently deep to carry ſhips of great burden, which may come quite near the town-wall; and ſeveral forts are built below it on both ſides, ſo that it would not be an eaſy matter for an enemy to come up the river.

When the river is but ſmall, ſo that no ſhips of burden can come through it; it is ſufficient to make it run through ſome of the works, where proper landing places are contrived, from whence the goods may be carried into the place; as at Sarrelouis, where a horn-work is built beyond the Sarre, in the gorge of which the goods are landed.

If the breadth of the river does not exceed 200 yards, it commonly paſſes through the middle of the town, and proper quays are made on each ſide; in ſuch a caſe, the fortification is ſo contrived as that the river paſſes through the curtain, in order to have a baſtion on each ſide to defend the coming in and going out.

When M. Vauban fortified near rivers, he made always the exterior ſide near the water much longer than any of the others; ſuch is Hunningen on the Rhine, and Sarrelouis on the Sarre; but for what reaſon he fortified theſe places in that manner, has not been told by any author.

But it is plain, that the ſides which terminate at the river, are the weakeſt; becauſe the beſiegers trenches being ſecured by the river, they may draw moſt of their troops off, and act therefore with more vigour and ſtrength on the other ſide: beſides, as the ſtrength of a ſide increaſes in proportion as the angle of the polygon is greater, by making the ſide next the river longer, the angles at its extremities become wider, and conſequently the adjacent ſides ſtronger.

There are other advantages, beſides theſe mentioned already, which ariſe from the lengthening that ſide; for if the river is pretty deep ſo as not to be fordable, that ſide is not liable to be attacked; and by increaſing its length, the capacity of the place increaſes much more in proportion to the expence, than if more ſides were made; the centre of the place will be likewiſe nearer the river, which makes it more convenient for tranſporting the goods from the water-ſide to any part of the town.

Plate LXXXV. fig. 3. To illuſtrate this method of M. Vauban's we ſhall give the plan of Hunningen; this place was built for the ſake of having a bridge over the Rhine, for which reaſon he made it only a pentagon; the ſide AB next to the river is 200 toiſes, and each of the others but 180.

About the ſpace *a b c*, which lies before the front AB, is a ſtone-wall, and the paſſages *x*, *x*, are ſhut up with ſluices, to retain the water in the ditches in dry ſeaſons, and to prevent an enemy from deſtroying the ſluice near the point c, whereby the water would run out and leave the ditches dry; the redout y was built in the little iſland hard by, in order to cover that ſluice; without this precaution the place might be inſulted from the river-ſide, where the water is ſhallow in dry ſeaſons.

The hornwork K beyond the Rhine was built to cover the bridge; but as this work cannot be well defended croſs the river, the hornwork H was made to ſupport the other.

Before we finiſh the deſcription of this plan, we ſhall ſhew how to find the long ſide AB, as being uſeful in the following work.

After having inſcribed the two ſides GE, GF, in a circle, draw the diameter CD, ſo as to be equally diſtant from the line joining the points E, F, that is parallel to it; on this diameter ſet off 100 toiſes on each ſide of the centre, from theſe points draw two indefinite perpendiculars to the diameter; then if from the points E, F, as centres, two arcs are deſcribed with a radius of 180 toiſes, their interſections A and B, with the ſaid perpendiculars, will determine the long ſide AB, as likewiſe the other two FB and EA. In like manner may be found the long or ſhort ſide of any polygon whatſoever.

When a place near a river is to be fortified, for the ſafety of commerce, particular care ſhould be taken in leaving a good ſpace between the houſes and the water-ſide, to have a key or landing place for goods brought by water; it ſhould alſo be contrived to have proper places for ſhips and boats to lie ſecure in ſtormy weather, and in time of a ſiege; and as water-carriage is very advantageous for tranſporting goods from one place to another, as likewiſe for bringing the neceſſary materials, not only for building the fortification, but alſo the place itſelf, the expences will be leſſened conſiderably, when this convenience can be had; for which reaſon, places ſhould never be built any where elſe but near rivers, lakes, or near the ſea; excepting in extraordinary caſes, where it cannot be avoided.

FOR

FORTISSIMO, in muſic, ſometimes denoted by FFF, or *fff*, ſignifies to ſing or play very loud or ſtrong.

FORT-LEWIS, a fortreſs of Alſace, in Germany, ſituated on the weſtern ſhore of the Rhine, ſubject to France: E. long 8°, and N. lat. 48° 46′.

FORTUNATE-ISLANDS, in ancient geography, certain iſlands, concerning the ſituation of which authors are not agreed, famous for the golden apples of the Heſperides. See HESPERIDES. The common opinion is, that they are the ſame with the Canary iſlands.

FORTUNE, a goddeſs worſhipped with great devotion by the ancient Greeks and Romans, who believed her to preſide over human affairs, and to diſtribute wealth and honour at her pleaſure.

FORUM, in Roman antiquity, a public ſtanding place within the city of Rome, where cauſes were judicially tried, and orations delivered to the people.

Forum, was alſo uſed for a place of traffic, anſwering to our market-place: of theſe there were vaſt numbers, as the *forum piſcarium, olitorium*, &c. Theſe were generally called *fora venalia*, in contradiſtinction to the former, which were called *fora civilia*.

Forum, is alſo uſed, among caſuiſts, *&c.* for juriſdiction; thus they ſay, *In foro legis*, &c.

FOSS, or **Fossa**, in anatomy, a kind of cavity in a bone, with a large aperture, but no exit or perforation.

Foss way, one of the four principal highways of England, that anciently led through the kingdom; ſuppoſed to be made by the Romans, having a ditch upon one ſide thereof.

FOSSIL, in natural hiſtory, denotes, in general, every thing dug out of the earth, whether they be natives thereof, as metals, ſtones, ſalts, earths, and other minerals; or extraneous, repoſited in the bowels of the earth by ſome extraordinary means. See Natural History.

FOSSOMBRONE, a city and biſhop's ſee of Italy, ten miles ſouth-eaſt of Urbino.

FOUMART, in zoology. See Mustela.

FOUNDATION, in architecture, is that part of a building which is under ground. See Building.

The foundation is properly ſo much of the maſonry as reaches as high as the ſurface of the ground, and ought always to be proportioned to the load or weight of the building that it is to bear. Sometimes the foundation is maſſive, and continued under the whole building, as in the antique arches and aqueducts, and ſome amphitheatres; but it is more uſually in ſpaces or intervals, either to avoid expence, or becauſe the vacuities are at too great a diſtance, in which latter caſe they make uſe of inſulated pillars bound together by arches.

Palladio allows a ſixth part of the height of the whole building for the hollowing or under-digging; unleſs there be cellars under gronnd, in which caſe he would have it ſomewhat lower; and as to thickneſs, double the width of the wall is no bad rule.

Foundation *of Bridges*, is laid after different manners. The firſt is by incloſing all round the ſpace of ground you would build upon, by dams made with piles ſet deep in the ground in double rows, well ſtrengthened and bound together with croſs pieces and cords, and filling the vacant ſpaces between them with chalk or other earthy matter. This being done, the water muſt be emptied out, and the foundation dug according to the quality of the ground, driving down piles, if it be neceſſary, upon which the walls of the foundation muſt be laid. But this method is only practicable in building on ſuch rivers, where the water is neither very rapid, nor very deep. The ſecond is done by laying the foundation on grate-work, rafts of ſtout oak well bound together, and made faſt at the ſurface of the water with cables or machines, and building upon them large quarters of ſtone, cramped together, and joined with good mortar, or cement, and afterwards letting them deſcend ſoftly by theſe cables and machines perpendicularly to the bottom of the water. This was the method practiſed in laying the foundation of Weſtminſter Bridge, the grating being made of the bottom of a frame called by the French Caiſſon, the ſides of which were ſo contrived, that they might be taken off, after a pier was finiſhed. The third is by drawing off all, or the greateſt part of the water of the river into ſome other place.

FOUNDER, in a general ſenſe, the perſon who lays a foundation, or endows a church, ſchool, religious-houſe, or other charitable inſtitution.

Founder alſo implies an artiſt who caſts metals, in various forms, for different uſes, as guns, bells, ſtatues, printing characters, candleſticks, buckles, *&c.* whence they are denominated gun-founders, bell-founders, figure-founders, letter-founders, founders of ſmall works, *&c.* See Foundery.

Founder, in the ſea language: A ſhip is ſaid to founder, when by an extraordinary leak, or by a great ſea breaking in upon her, ſhe is ſo filled with water, that ſhe cannot be freed of it; ſo that ſhe can neither veer nor ſteer, but lie like a log; and not being able to ſwim long, will at laſt ſink.

FOUNDERY, or **Foundry**, the art of caſting all ſorts of metals into different forms. It likewiſe ſignifies the work-houſe or ſmelting-hut wherein theſe operations are performed.

Foundery *of ſmall-works, or caſting in ſand.* The ſand uſed for caſting ſmall works, is, at firſt, of a pretty ſoft, yellowiſh, and clammy nature: but it being neceſſary to ſtrew charcoal duſt in the mould, it at length becomes of a quite black colour. This ſand is worked over and over, on a board, with a roller, and a ſort of knife; being placed over a trough to receive it, after it is by theſe means ſufficiently prepared.

This done, they take a wooden board of a length and breadth proportional to the things to be caſt, and putting a ledge round it, they fill it with ſand, a little moiſtened, to make it duly cohere. Then they take either wood or metal models of what they intend to caſt, and apply them ſo to the mould, and preſs them into the ſand, as to leave their impreſſion there. Along the middle of the mould is laid half a ſmall braſs cylinder, as the chief canal for the metal to run through, when melted, into the models or patterns; and from this chief canal are placed ſeveral others, which extend to each model or pattern placed in the frame. After this frame is finiſhed, they take out the patterns, by firſt looſening them all round, that the ſand may not give way.

Then they proceed to work the other half of the mould with the ſame patterns in juſt ſuch another frame, only that it has pins, which, entering into holes that correſpond to it in the other, make the two cavities of the pattern fall exactly on each other.

The frame thus moulded, is carried to the melter, who, after extending the chief canal of the counterpart, and adding the croſs canals to the ſeveral models in both, and ſtrewing mill-duſt over them, dries them in a kind of oven for that purpoſe.

Both parts of the mould being dry, they are joined together by means of the pins; and to prevent their giving way, by reaſon of the melted metal paſſing through the chief cylindrical canal, they are ſcrewed or wedged up like a kind of a preſs.

While the moulds are thus preparing, the metal is fuſing in a crucible of a ſize proportionate to the quantity of metal intended to be caſt.

When the moulds are cooliſh, the frames are unſcrewed, or unwedged, and the caſt work taken out of the ſand, which ſand is worked over again for other caſtings.

FOUNDERY *of ſtatues*. The caſting of ſtatues depends on the due preparation of the pit, the core, the wax, the outer mould, the inferior furnace to melt off the wax, and the upper to fuſe the metal. The pit is a hole dug in a dry place ſomething deeper than the intended figure, and made according to the prominence of certain parts thereof. The inſide of the pit is commonly lined with ſtone, or brick; or when the figure is very large, they ſometimes work on the ground, and raiſe a proper fence to reſiſt the impulſion of the melted metal.

The inner mould, or core, is a rude maſs to which is given the intended attitude and contours. It is raiſed on an iron grate, ſtrong enough to ſuſtain it, and is ſtrengthened within by ſeveral bars of iron. It is generally made either of potter's clay, mixed with hair, and horſe dung; or of plaſter of Paris mixed with brick duſt. The uſe of the core is to ſupport the wax, the ſhell, and leſſen the weight of the metal. The iron bars and the core are taken out of the braſs figure through an aperture left in it for that purpoſe, which is ſoldered up afterwards. It is neceſſary to leave ſome of the iron bars of the core, that contribute to the ſteadineſs of the projecting part, within the braſs figure.

The wax is a repreſentation of the intended ſtatue. If it be a piece of ſculpture, the wax ſhould be all of the ſculptor's own hand, who uſually forms it on the core; though it may be wrought ſeparately in cavities, moulded on a model, and afterwards arranged on the ribs of iron over the grate; filling the vacant ſpace in the middle with liquid plaſter and brick duſt, whereby the inner core is proportioned as the ſculptor carries on the wax.

When the wax, which is the intended thickneſs of the metal, is finiſhed, they fill ſmall waxen tubes perpendicular to it from top to bottom, to ſerve both as canals for the conveyance of the metal to all parts of the work; and as vent-holes, to give paſſage to the air, which would otherwiſe occaſion great diſorder, when the hot metal came to encompaſs it.

The work being brought thus far, muſt be covered with its ſhell, which is a kind of cruſt laid over the wax, and which being of a ſoft matter, eaſily receives the impreſſion of every part, which is afterwards communicated to the metal upon its taking the place of the wax, between the ſhell and the mould. The matter of this outer mould is varied according as different layers are applied. The firſt is generally a compoſition of clay, and old white crucibles well ground and ſifted, and mixed up with water, to the conſiſtence of a colour fit for painting: accordingly they apply it with a pencil, laying it ſeven or eight times over, and letting it dry between whiles. For the ſecond impreſſion, they add horſe dung, and natural earth to the former compoſition. The third impreſſion is only horſe-dung and earth. Laſtly, the ſhell is finiſhed by laying on ſeveral more impreſſions of this laſt matter, made very thick with the hand.

The ſhell, thus finiſhed, is ſecured by ſeveral iron girts, bound round it, at about half a foot diſtance from each other, and faſtened at the bottom to the grate under the ſtatue, and at top to a circle of iron where they all terminate.

If the ſtatue be ſo big that it would not be eaſy to move the moulds with ſafety, they muſt be wrought on the ſpot where it is to be caſt. This is performed two ways: in the firſt, a ſquare hole is dug under ground, much bigger than the mould to be made therein, and its inſide lined with walls of free-ſtone, or brick. At the bottom is made a hole of the ſame materials with a kind of furnace, having its aperture outwards: in this is a fire made to dry the mould, and afterwards melt the wax. Over this furnace is placed the grate, and upon this the mould, *&c.* formed as above. Laſtly, at one of the edges of the ſquare pit, is made another large furnace to melt the metal. In the other way, it is ſufficient to work the mould above ground, but with the like precaution of a furnace and grate underneath. When finiſhed, four walls are to be run around it, and by the ſide thereof a maſſive made for a melting-furnace. For the reſt, the method is the ſame in both. The mould being finiſhed, and incloſed as deſcribed, whether under ground or above it, a moderate fire is lighted in the furnace under it, and the whole covered with planks, that the wax may melt gently down, and run out at pipes contrived for that purpoſe, at the foot of the mould, which are afterwards exactly cloſed with earth, ſo ſoon as the wax is carried off. This done, the hole is filled up with bricks thrown in at random, and the fire in the furnace augmented, till ſuch time as both the bricks and mould become red hot. After this, the fire being extinguiſhed, and every thing cold again, they take out the bricks and fill up their place with earth moiſtened, and a little beaten to the top of the mould, in order to make it the more firm and ſteady. Theſe preparatory meaſures being duly taken, there remains nothing but to melt the metal, and run it into the mould. This is the office of the furnace above deſcribed, which is commonly made in the form of an oven with three apertures, one to put in the wood, another for a vent, and a third to run the metal out at. From this laſt aperture, which is kept very cloſe, while the metal is in fuſion, a ſmall tube is laid, whereby the melted metal is conveyed into a large earthen baſon, over the mould, into the bottom of which all the big branches of the jets, or caſts, which are to convey the metal into all the parts of the mould, are inſerted.

Theſe caſts, or jets, are all terminated with a kind of plugs, which are kept cloſe, that, upon opening the furnace, the braſs, which guſhes out with violence, may not enter any of them, till the baſon be full enough of matter to run into them all at once. Upon which occaſion they pull out the plugs, which are long iron rods with a head at one end, capable of filling the whole diameter of each tube. The whole of the furnace is opened with a long piece of iron fitted at the end of each pole, and the mould filled in an inſtant. This completes the work in relation to the caſting part; the reſt being the ſculptor's or carver's buſineſs, who, taking the figure out of the mould and earth wherewith it is encompaſſed, ſaws off the jets with which it appears covered over, and repairs it with chiſſels, gravers, puncheons, *&c.*

FOUNDERY *of bells.* The metal, it is to be obſerved, is different for bells, from what it is for ſtatues; there being no tin in the ſtatue-metal: but there is a fifth, and ſometimes more, in the bell-metal.

The dimenſions of the core and the wax for bells, if a ring of bells eſpecially, are not left to chance, but muſt be meaſured on a ſcale, or diapaſon, which gives the height, aperture, and thickneſs neceſſary for the ſeveral tones required. See DIAPASON.

It is on the wax that the ſeveral mouldings and other ornaments are formed to be repreſented in relievo, on the outſide of the bell.

The buſineſs of bell-foundery is reducible to three particulars. 1. The proportion of a bell. 2. The forming of the mould; and, 3. The melting of the metal.

The proportions of our bells differ much from thoſe of the Chineſe: in ours, the modern proportions are, to make the diameter fifteen times the thickneſs of the brim, and twelve times the height.

There are two kinds of preparations, *viz.* the ſimple and the relative: the former are thoſe proportions only that are between the ſeveral parts of a bell, to render it ſonorous; the relative proportions eſtabliſh a requiſite harmony between ſeveral bells.

The particulars neceſſary for making the mould of a bell are, 1. The earth; the moſt coheſive is the beſt: it muſt be well ground and ſifted, to prevent any chinks. 2. Brick-ſtone; which muſt be uſed for the mine, mould, or core, and for the furnace. 3. Horſe-dung, hair, and hemp, mixed with the earth, to render the cement more binding. 4. The wax for inſcriptions, coats of arms, *&c.* 5. The tallow equally mixed with the wax, in order to put a ſlight lay of it upon the outer mould, before any letters are applied to it. 6. The coals to dry the mould.

For making the mould, they have a ſcaffold conſiſting of four boards, ranged upon treſſels. Upon this they carry the earth, groſsly diluted, to mix it with horſe-dung, beating the whole with a large ſpatula.

The compaſſes of conſtruction is the chief inſtrument for making the mould, which conſiſt of two different legs joined by a third piece. And laſt of all, the founders ſhelves, on which are the ingravings of the letters, cartridges, coats of arms, *&c.*

They firſt dig a hole of a ſufficient depth to contain the mould of the bell, together with the caſe, or cannon, under ground; and about ſix inches lower than the terreplain, where the work is performed. The hole muſt be wide enough for a free paſſage between the mould and walls of the hole, or between one mould and another, when ſeveral bells are to be caſt. At the centre of the hole is a ſtake erected, that is ſtrongly faſtened in the ground. This ſupports an iron peg, on which the pivot of the ſecond branch of the compaſſes turns. The ſtake is encompaſſed with a ſolid brick-work, perfectly round, about half a foot high, and of the propoſed bell's diameter. This they call a mill-ſtone. The parts of the mould are, the core, the model of the bell, and the ſhell. When the outer ſurface of the core is formed, they begin to raiſe the core, which is made of bricks that are laid in courſes of equal height upon a lay of plain earth. At the laying each brick, they bring near it the branch of the compaſſes, on which the curve of the core is ſhaped, ſo as that there may remain between it and the curve the diſtance of a line, to be afterwards filled up with layers of cement. The work is continued to the top, only leaving an opening for the coals to bake the core. This work is covered with a layer of cement, made of earth and horſe dung, on which they move the compaſſes of conſtruction, to make it of an even ſmoothneſs every where.

The firſt layer being finiſhed, they put the fire to the core, by filling it half with coals, through an opening that is kept ſhut, during the baking, with a cake of earth, that has been ſeparately baked. The firſt fire conſumes the ſtake, and the fire is left in the core half or ſometimes a whole day: the firſt layer being thoroughly dry, they cover it with a ſecond, third, and fourth; each being ſmoothed by the board of the compaſſes, and thoroughly dried before they proceed to another.

The core being completed, they take the compaſſes to pieces, with intent to cut off the thickneſs of the model, and the compaſſes are immediately put in their place to begin a ſecond piece of the mould. It conſiſts of a mixture of earth and hair, applied with the hand on the core, in ſeveral cakes that cloſe together. This work is finiſhed by ſeveral layers of a thinner cement of the ſame matter, ſmoothed by the compaſſes, and thoroughly dried, before another is laid on. The firſt layer of the model is a mixture of wax and greaſe ſpread over the whole. After which are applied the inſcriptions, coats of arms, *&c.* beſmeared with a pencil dipped in a veſſel of wax in a chaffing-diſh: this is done for every letter. Before the ſhell is begun, the compaſſes are taken to pieces, to cut off all the wood that fills the place of the thickneſs to be given to the ſhell.

The firſt layer is the ſame earth with the reſt, ſifted very fine; whilſt it is tempering in water, it is mixed with cow's hair, to make it cohere. The whole being a thin cullis, is gently poured on the model, that fills exactly all the ſinuoſities of the figures, *&c.* and this is repeated till the whole is two lines thick over the model. When this layer is thoroughly dried, they cover it with a ſecond of the ſame matter, but ſomething thicker: when this ſecond layer becomes of ſome conſiſtence, they apply the compaſſes again, and light a fire in the core, ſo as to melt off the wax of the inſcriptions, &c.

After this, they go on with other layers of the ſhell, by means of the compaſſes. Here they add to the cow's hair a quantity of hemp, ſpread upon the layers, and afterwards ſmoothed by the board of the compaſſes. The thickneſs of the ſhell comes to four or five inches lower than the mill-ſtone before obſerved, and ſurrounds it quite cloſe, which prevents the extravaſation of the metal. The wax ſhould be taken out before the melting of the metal.

The ear of the bell requires a ſeparate work, which is done during the drying of the ſeveral incruſtations of the cement. It has ſeven rings; the ſeventh is called the bridge, and unites the others, being a perpendicular ſupport to ſtrengthen the curves. It has an aperture at the top, to admit a large iron peg, bent at the bottom; and this is introduced into two holes in the beam, faſtened with two ſtrong iron keys. There are models made of the rings, with maſſes of beaten earth, that are dried in the fire, in order to have the hollow of them. Theſe rings are gently preſſed upon a layer of earth and cow's hair, one half of its depth; and then taken out, without breaking the mould. This operation is repeated twelve times for twelve half-moulds, that two and two united may make the hollows of the ſix rings: the ſame they do for the hollow of the bridge, and bake them all, to unite them together.

Upon the open place left for the coals to be put in, are placed the rings that conſtitute the ear. They firſt put into this open place the iron-ring to ſupport the clapper of the bell; then they make a round cake of clay, to fill up the diameter of the thickneſs of the core. This cake, after baking, is clapped upon the opening, and ſoldered with a thin mortar ſpread over it, which binds the cover cloſe to the core.

The hollow of the model is filled with an earth, ſufficiently moiſt to fix on the place, which is ſtrewed at ſeveral times upon the cover of the core; and they beat it gently with a peſtle, to a proper height; and a workman ſmooths the earth at top with a wooden trowel dipped in water.

Upon this cover, to be taken off afterwards, they aſſemble the hollows of the rings. When every thing is in its proper place, they ſtrengthen the outſide of the hollows with mortar, in order to bind them with the bridge, and keep them ſteady at the bottom, by means of a cake of the ſame mortar, which fills up the whole aperture of the ſhell. This they let dry, that it may be removed without breaking. To make room for the metal, they pull off the hollows of the rings, through which the metal is to paſs, before it enters into the vacuity of the mould. The ſhell being unloaded of its ear, they range under the mill-ſtone five or ſix pieces of wood, about two feet long, and thick enough to reach almoſt the lower part of the ſhell; between theſe and the mould they drive in wooden wedges with a mallet, to ſhake the ſhell of the model whereon it reſts, ſo as to be pulled up, and got out of the pit.

When this and the wax are removed, they break the model and the layer of earth, through which the metal muſt run, from the hollow of the rings, between the ſhell and the core. They ſmoke the inſide of the ſhell, by burning ſtraw under it, that helps to ſmooth the ſurface of the bell. Then they put the ſhell in the place, ſo as to leave the ſame interval between that and the core; and before the hollows of the rings or the cap are put on again, they add two vents, that are united to the rings, and to each other, by a maſs of baked cement. After which they put on this maſs of the cap, the rings, and the vent over the ſhell, and ſolder it with thin cement, which is dried gradually by covering it with burning coals. Then they fill up the pit with earth, beating it ſtrongly all the time, round the mould.

The furnace has a place for the fire, and another for the metal. The fire-place has a large chimney with a ſpacious aſh-hole. The furnace which contains the metal, is vaulted, whoſe bottom is made of earth, rammed down; the reſt is built with brick. It has four apertures; the firſt, through which the flame revibrates; the ſecond is cloſed with a ſtopple that is opened for the metal to run; the others are to ſeparate the droſs, or ſcoriæ, of the metal by wooden rakes: through theſe laſt apertures paſſes the thick ſmoke. The ground of the furnace is built ſloping, for the metal to run down.

FOUNDERY *of great guns and mortar pieces*. The method of caſting theſe pieces is little different from that of bells: they are run maſſy, without any core, being determined by the hollow of the ſhell; and they are afterwards bored with a ſteel trepan, that is worked either by horſes, or a water-mill.

For the metal, parts, proportions, &c. of theſe pieces, ſee CANNON.

Letter **FOUNDERY**, or *caſting of printing letters*. The firſt thing requiſite is to prepare good ſteel-punches, on the face of which is drawn the exact ſhape of the letter with pen and ink, if the letter be large, or with a ſmooth blunted point of a needle, if ſmall; and then, with proper gravers, the cutter digs deep between the ſtrokes, letting the marks ſtand on the punch; the work of hollowing being generally regulated by the depth of the counter-punch. then he files the outſide, till it is fit for the matrice.

They have a mould to juſtify the matrices by, which conſiſts of an upper and under part, both which are alike, except the ſtool and ſpring behind, and a ſmall roundiſh wire in the upper part, for making the nick in the ſhank of the letter. Theſe two parts are exactly fitted into each other, being a male and female gage, to ſlide backwards and forwards. See GAGE.

Then they juſtify the mould, by caſting about twenty ſamples of letters, which are ſet in a compoſing-ſtick, with the nicks towards the right hand; and comparing theſe every way with the pattern-letters, ſet up in the ſame manner, they find the exact meaſure of the body to be caſt.

Next they prepare the matrix, which is of braſs or copper, an inch and a half long, and of a proportionable thickneſs to the ſize of the letter it is to contain.

In this metal is ſunk the face of the letter, by ſtriking the letter-punch the depth of an *n*. After this, the ſides and face of the matrice are juſtified, and cleared, with files, of all bunchings that have been made by ſinking the punch.

Then it is brought to the furnace, which is built upright of brick with four ſquare ſides, and a ſtone at top, in which is a hole for the pan to ſtand in.

Printing letters are made of lead, hardened with iron or ſtub-nails. To make the iron run, they mingle an equal weight of antimony, beaten ſmall in an iron mortar, and ſtub-nails together. They charge a proper number of earthen pots, that bear the fire, with the two ingredients, as full as they can hold, and melt it in an open furnace, built for that purpoſe.

When it bubbles, the iron is then melted, but it evaporates very much. This melted compoſt is ladled into an iron-pot, wherein is melted lead, that is fixed on a furnace cloſe to the former, 3 ℔ of melted iron to 25 ℔ of lead; this they incorporate according to art.

The caſter taking the pan off the ſtone, and having kindled a good fire, he ſets the pan in again, and metal in it to melt. If it be a ſmall-bodied letter, or a thin letter with great bodies, that he intends to caſt, his metal muſt be very hot, and ſometimes red hot, to make the letter come. Then taking a ladle, of which he has ſeveral ſorts, that will hold as much as will make the letter and break, he lays it at the hole where the flame burſts out: then he ties a thin leather, cut with its narrow end againſt the face, to the leather groove of the matrice, by whipping a brown thread twice about the leather groove, and faſtening the thread with a knot. Then he puts both pieces of the mould together, and the matrice into the matrice-cheek; and places the foot of the matrice on the ſtool of the mould, and the broad end of the leather on the wood of the upper haft of the mould, but not tight up, leſt it hinder the foot of the matrice from ſinking cloſe down upon the ſtool, in a train of work. Afterwards laying a little roſin on the upper part of the mould, and having his caſting-ladle hot, he, with the boilling ſide, melts the roſin, and preſſes the broad end of the leather hard down on the wood, and ſo faſtens it thereto. Now he comes to caſting, when placing the under half of the mould in his left hand, with the hook or jag forward, he holds the ends of its wood between the lower part of the ball of his thumb and his three hinder fingers; then he lays the upper half of the mould upon the under half, ſo as the male gages may fall into the female; and, at the ſame time, the foot of the matrice places itſelf upon the ſtool, and claſping his left hand thumb ſtrongly over the upper half, he nimbly catches hold of the bow or ſpring, with his right hand fingers at the top of it, and his thumb under it, and places the point of it againſt the middle of the notch in the backſide of the matrice, preſſing it forwards as well towards the mould, as downwards, by the ſhoulder of the notch, cloſe upon the ſtool, while, at the ſame time, with his hinder fingers, as aforeſaid, he draws the under half of the mould towards the ball of his thumb, and thruſts, by the ball of his thumb, the upper part towards his fingers, that both the regiſters of the mould may preſs againſt both ſides of the matrice, and his thumb and fingers preſs both ſides of the mould cloſe together.

Then he takes the handle of his ladle in his right hand, and with the ball of it gives two or three ſtrokes outwards upon the ſurface of the melted metal, to clear it of the ſcum; then he takes up the ladle full, and having the mould in the left hand, turns his left ſide a little from the furnace, and brings the geat of his ladle to the mouth of his mould; and turns the upper part of his right hand towards him, to pour the metal into it, while, at the ſame inſtant, he puts the mould in his left hand forwards, to receive the metal with a ſtrong ſhake, not only into the bodies of the mould, but, while the metal is yet hot, into the very face of the matrice, to receive its perfect form there as well as in the ſhank. Then he takes the upper half of the mould off, by placing his right thumb on the end of the wood next his left thumb, and his two middle fingers at the other end of the wood: he toſſes the letter, break and all, out upon a ſheet of waſte paper, laid on a bench, a little beyond his left hand, and then is ready to caſt another letter, as before, and likewiſe the whole number in that matrix.

Then boys, commonly employed for this purpoſe, ſeparate the breaks from the ſhanks, and rub them on a ſtone, and afterwards a man cuts them all of an even height, which finiſhes the fount for the uſe of the printer. See next article.

A workman will ordinarily caſt 3000 of theſe letters in a day. The perfection of letters thus caſt, conſiſts in their being all ſeverally ſquare and ſtraight on every ſide; and all generally of the ſame height, and evenly lined, without ſtooping one way or other; neither too big in the foot, nor the head; well grooved, ſo as the two extremes of the foot contain half the body of the letter; and well ground, barbed, and ſcrapped, with a ſenſible notch, *&c.* See PRINTING.

FOUNT, or FONT, among printers, a ſet or quantity of letters, and all the appendages belonging thereto, as numeral characters, quadrates, points, *&c.* caſt by a letter-founder, and ſorted.

FOUNTAIN, in philoſophy, a ſpring or ſource of water riſing out of the earth. Among the ancients, fountains were held ſacred, and even worſhipped as a kind of divinities. For the phænomena, theory, and origin of fountains, ſee HYDROSTATICS.

FOUNTAIN, or *Artificial* FOUNTAIN, called alſo a *jet d'eau*, is a contrivance by which water is violently ſpouted upwards. See HYDROSTATICS.

FOURCHE'E, or FOURCHY, in heraldry, an appellation given to a croſs forked at the ends. See Plate LXXX. fig. 8.

FOWEY, a borough-town of Cornwall, which ſends two members to parliament: W. long. 5°, and N. lat. 50° 26'.

FOWL, among zoologiſts, denotes the larger ſorts of birds, whether domeſtic or wild: ſuch as geeſe, pheaſants, partridges, turkey, ducks, *&c.*

FOX, in zoology. See CANIS.

FOX-GLOVE, in botany. See DIGITALIS.

FOY, or ST FOY, a town in Guienne, in France, thirty-two miles eaſt of Bourdeaux; it is ſituated under the meridian of London, in 44°, 50′, N. lat.

FRACTION, in arithmetic and algebra. See ARITHMETIC, p. 387. and ALGEBRA, p. 83.

Decimal FRACTIONS. See ARITHMETIC, p. 395.

FRACTURE, in ſurgery, a rupture of a bone, or a ſolution of continuity in a bone, when it is cruſhed or broken by ſome external cauſe. See SURGERY.

FRÆNUM, in anatomy, a term applied to ſome membranous ligaments of the body.

FRÆNUM LINGUÆ. See ANATOMY, p. 305.

FRÆNUM PENIS. See ANATOMY, p. 274.

FRAGA, a town of Arragon, in Spain, ſituated under the meridian of London: N. lat. 41° 16′.

FRAGARIA, the STRAWBERRY, in botany, a genus of the icoſandria polygynia claſs. The calix is divided into ten ſegments; the petals are five; and the receptacle is an oval deciduous berry. There are three ſpecies, two of them natives of Britain, *viz.* the veſca, or common ſtrawberry; and the ſterilis, or barren ſtrawberry.

FRANCE, a large kingdom of Europe, ſituated between 5° W. and 7° E. long. and between 43° and 51° N. lat. being bounded by the Engliſh channel and the Auſtrian Netherlands, on the north; by Germany, Switzerland, Savoy, and Piedmont, in Italy, on the eaſt; by the Mediterranean ſea, and the Pyrenean mountains, which ſeparate it from Spain, on the ſouth; and, by the bay of Biſcay, on the weſt. This kingdom was formerly divided into twelve provinces; but at preſent it is divided into twenty-five general governments, over every one of which is an officer, called an intendant, appointed by the king, who has a power of controlling the governor, and all other officers of juſtice; and preſides over the receivers-general of his generality.

FRANCFORT, a city of Germany, ſituated on the confines of Heſſe and Franconia, on both ſides of the river Maine: E. lon. 7° 30′, N. lat. 50° 10′.

FRANCFORT *on the Oder*, a city of Germany, in the circle of Upper Saxony, and marquiſate of Brandenburgh, ſituated in E. long. 15°, N. lat. 52° 22′.

FRANCHE-COMTE, the ſame with the county of Burgundy. See BURGUNDY.

FRANCHE-COMTE, a province of France bounded by Lorrain on the north; by Alſace and Switzerland, on the eaſt; by La Breſs and Bugey, on the ſouth; by the dukedom of Burgundy, on the weſt.

FRANCHISE, in a general ſenſe, a privilege or exemption from ordinary juriſdiction; as that for a corporation to hold pleas among themſelves to ſuch a value, or the like.

FRANCISCAN MONKS, FRIARS MINOR, or GREY FRIARS, religious of the order of St Francis, founded by him in the year 1709.

The rule of the Franciſcans, as eſtabliſhed by St Francis himſelf, is briefly this: they are to live in common, to obſerve chaſtity, and to pay obedience to the pope and their ſuperiors.

Before they can be admitted into the order, they are obliged to ſell all they have, and give it to the poor: they are to perform a year's noviciate, and when admitted never to quit the order upon any account. They are to faſt from the feaſt of All-ſaints, to the Nativity. This order has produced four popes, forty-two cardinals, and an infinite number of patriarchs.

FRANCOLINI, a town of Italy, ſituated on the river Po, about nine miles north-eaſt of Ferrara.

FRANCONIA, a circle of the German empire, lying between Bohemia on the eaſt, and the electorate of Mentz on the weſt. Its capital is Nuremburg; and from this county the Franks, who conquered and gave name to the kingdom of France, are ſaid to have come.

FRANGULA, in botany. See RHAMNUS.

FRANGULÆ SPECIES, in botany. See MAUROCENIA.

FRANK LANGUAGE, or LINGUA FRANCA, a kind of jargon ſpoken on the Mediterranean, and particularly throughout the coaſts and parts of the Levant, compoſed of Italian, Spaniſh, French, vulgar Greek, and other languages.

FRANK, or FRANC, an ancient coin, either of gold or ſilver, ſtruck and current in France. The value of the gold frank was ſomewhat more than that of the gold crown; the ſilver frank was a third of the gold one: this coin is long out of uſe, though the term is ſtill retained as the name of a money of account; in which ſenſe it is equivalent to the livre, or twenty ſols.

FRANKENDAL, a city of Germany, in the palatinate of the Rhine, ſituated on the weſt ſide of the river Rhine, in E. long. 8° 15′, N. lat. 49° 30′.

FRANCENIA, SEA-HEATH, or SEA-CHICKWEED, a genus of the hexandria monogynia claſs. The calix is tunnel ſhaped, and divided into five ſegments; the petals are five; the ſtigma has ſix diviſions; and the capſule conſiſts of one cell, with three valves. There are three ſpecies, two of them natives of Britain, *viz.* the lævis, or ſmooth ſea-heath; and the pulverulenta, or broad leaved ſea-heath.

FRANKENSTEIN, a town of Germany, in the palatinate of the Rhine, and dutchy of Zuebruggen, ſituated twelve miles north-weſt of Landau.

FRANKER, a town of the United Provinces in the province of Weſt Frieſland, nine miles weſt of Lewarden.

FRANKS, FRANKIS, or FRANQUIS, an appellation given by the Turks, and other nations of Aſia, to all the people of the weſtern parts of Europe, to which they give the name of *Frankiſtan*.

FRANSTAT, or FRAUSTAT, a town of Sileſia, ſituated twenty-five miles north-eaſt of Glogaw, ſubject to Pruſſia.

FRASCATI, or FRESCATI, a town of Italy, in the campania of Rome, thirteen miles eaſt of that city; near which place is the Tuſculum of Cicero, called Grotto Ferrate.

FRATERNITY, in the Roman-catholic countries, ſignifies a ſociety for the improvement of devotion.

Of theſe there are ſeveral ſorts; as, 1. The fraternity of the roſary, founded by St Dominic: it is divided into two branches, called the common roſary, and the perpetual roſary; the former of whom are obliged to confeſs and communicate every firſt Sunday in the month, and the latter to repeat the roſary continually. See ROSARY.

2. The fraternity of the ſcapulary, whom the bleſſed Virgin, according to the ſabbatin bull of pope John XXII. has promiſed to deliver out of hell the firſt Sunday after their death. See SCAPULARY.

3. The fraternity of St Francis's girdle, are cloathed with a ſack of a grey colour, which they tie with a cord; and, in proceſſions, walk bare-footed, carrying in their hands a wooden croſs.

4. That of St Auſtin's leathern girdle, comprehends a great many devotees.

Italy, Spain, and Portugal, are the countries where one ſees the greateſt number of theſe fraternities; ſome of which aſſume the name of arch-fraternities. Pope Clement VII. inſtituted the arch-fraternity of charity, which diſtributes bread every Sunday among the poor, and gives portions to forty poor girls on the feaſt of St Jerom their patron. The fraternity of death, buries ſuch dead as are abandoned by their relations, and cauſes maſſes to be celebrated for them.

FRATRICELLI, LITTLE BROTHERS, in church hiſtory, a ſect of heretics who appeared in Italy about the year 1298, and afterwards ſpread all over Europe. They wore the habit of the Franciſcan order, and pretended that eccleſiaſtics ought to have no poſſeſſions of their own.

FRATRIAGE, the partition among brothers or coheirs, coming to the ſame inheritance or ſucceſſion.

FRATRES ARVALES. See ARVALES.

FRATRICIDE, the crime of murdering one's brother. See PARRICIDE.

FRAUD, in law, ſignifies deceit in grants, or conveyances of lands, *&c.* or in bargains and ſales of goods, *&c.* to the damage of another perſon.

FRAXINUS, the ASH, in botany, a genus of trees, belonging to the polygamia diœcia claſs. The calix of the hermaphrodite is divided into four parts; it has no corolla; the ſtamina are two; and it has but one piſtil: the female has one piſtil, and one lanceolated ſeed. There are three ſpecies, only one of which, *viz.* the excelſior or common aſh, is a native of Britain.

The wood of this tree is in great uſe among ſeveral artificers, as wheel-wrights, cart-wrights, carpenters, turners, *&c.* alſo for making ploughs, harrows, axle-trees, oars, balls, *&c.* It is ſaid to be as laſting for building as oak, and often preferred before it: though the timber of the trunk greatly excells that of a bough.

FRAY, among ſportſmen. A deer is ſaid to fray its head, when it rubs it againſt a tree, to cauſe the pills of the new horns to come off.

FREAM, a name given by farmers to plowed lands worn out of heart, and laid fallow till it recover.

FREDENBERG, a town of Germany, in the circle of Weſtphalia, fifty miles weſt of Caſſel.

FREDERICA, a town of Georgia, in North America, ſituated in W. long. 81° 30′, N. lat. 31°, on the iſland of St Simons, in the mouth of the river Alatamaha.

FREDERICKSBURG, a caſtle and palace of the king of Denmark, ſituated in the iſle of Zeland, twenty miles north-weſt of Copenhagen, built upon piles in the middle of a lake.

FREDERICKSBURG, a fort upon the gold coaſt of Guinea, near cape Three-points, ſubject to the Danes. It lies in W. long. 2° N. lat 5°.

FREDERICKSHALL, a ſtrong town of Norway, in the province of Agerhuys, ſituated on the frontiers of Sweden, thirty miles north of Frederickſtat.

FREDERICKSODE, a town of Jutland, in the province of Reypen, ſituated on the little belt in the Baltick ſea, twenty miles weſt of Odenſee.

FREDERICKSTAT, a town of Sleſwick, or ſonth Jutland, ſituated on the river Eyder, near the German ocean, thirty-one miles weſt of Sleſwick.

FREDERICKSTAT, a town of Norway, in the principality of Agerhuys, ſituated on a bay of the ſea, called the Schaggerrack, near the ſrontiers of Sweden: E. long. 11° 24′, N. lat. 59°.

FREE, in a general ſenſe, is uſed in oppoſition to whatever is conſtrained or neceſſitated. When applied to things endowed with underſtanding, it more peculiarly relates to the liberty of the will.

FREE-HOLD, ſignifies lands or tenements which a perſon holds in fee-ſimple, fee-tail, or for term of life.

FREE-STONE, a whitiſh ſtone, dug up in many parts of Britain, that works like alabaſter, but is more hard and durable; being of excellent uſe in building, *&c.* It is a kind of the grit ſtone, but finer ſanded, and a ſmoother ſtone; and is called free, from its being of ſuch a conſtitution as to cut freely in any direction.

FREE-THINKER. See DEIST.

FREEDOM, in general, the ſtate or quality of being free.

FREEDOM *of the will*, that power or faculty of the mind, whereby it is capable of acting or not acting, chuſing or rejecting whatever it judges proper. Of this every man muſt be ſenſible, who finds in himſelf a power to begin or forbear, continue or end ſeveral actions, barely by a thought or preference of the mind.

FREEZE, or FRIEZE, in commerce, a coarſe kind of woollen ſtuff, or cloth, for winter wear; ſo called, as being freezed or naped on each ſide.

FREEZING, in philoſophy, the ſame with congelation. See CONGELATION and FROST.

Philoſophers are by no means agreed as to the cauſe of this phænomenon. The Carteſians account for it by the receſs or going out of the etherial matter from the pores of the water. The corpuſcularians, on the other hand, attribute it to the ingreſs of frigorific particles, as they call them; and Hobbes aſſerts, that theſe particles are nothing elſe but common air, which entangling itſelf with the particles of water, prevents their motion. Others will have a kind of nitrous ſalt to be the cauſe of congelation, by inſinuating itſelf between the particles of water, and fixing them together, like nails. And, indeed, it ſeems probable that cold and freezing do ariſe from ſome ſubſtance of a ſaline nature floating in the air; ſince all ſalts, and particularly nitrous ones, when mixed with ice and ſnow, greatly increaſe their cold, and even bulk.

Boerhave obſerves, that it is extremely difficult to exhibit to the eye the preciſe degree of cold wherein ice begins to form; ſince heat and cold, once given to a body, adhere long to it before they quit it. When the air, therefore, is in ſuch a ſtate as keeps Fahrenheit's thermometer at 32 degrees, water will not freeze; becauſe water being 800 times denſer than air, retains the warmth conſiderably longer than air. If any perſon, therefore, is curious to know in what degree of cold water begins to freeze, let him firſt ſuſpend a thermometer in a free open air on all ſides; and then wetting a thin linen cloth with clear water, and hanging it likewiſe in the open air, it will grow ſtiff upon the firſt acceſs of the freezing cold, and thereby ſhew when water is beginning to turn to ice. See Thermometer.

By means of freezing, wine, vinegar, and malt-liquors may be reduced to a fourth part of their quantity, without any conſiderable loſs of their eſſential parts; ſince only the aqueous parts freeze, leaving the vinous parts concentrated or brought into leſs compaſs, and capable of being tranſported with leſs expence, and keeping for ſeveral years.

Freezing mixture. Mr Boyle ſhews in his hiſtory of cold, that not only all kinds of ſalts, but likewiſe ſpirits, ſugar, and ſaccharum ſaturni, mixed with ſnow, are capable of freezing moſt fluids; and the ſame effect was alſo produced by the mixture of oil of vitriol, or ſpirit of nitre with ſnow.

FREIGHT, or **Fraight**, in navigation and commerce, the hire of a ſhip, or a part thereof, for the conveyance and carriage of goods from one port or place to another; or the ſum agreed on between the owner and the merchant, for the hire and uſe of a veſſel.

FRENCH, in general, ſomething belonging to France: thus we ſay, the French language, French cuſtoms, polity, *&c.*

The French language is made up of Latin, Greek, Teutonic, and the language ſpoken by the old Gauls. It is natural, and eaſily pronounced, and therefore uſed by moſt nations of Europe in converſing with foreigners. There are very few compound words in French, which is acknowledged to be its diſadvantage. It has alſo few diminutives; but as to purity, eaſineſs, and flexibility, it yields to none.

FRESCO, a method of painting in relievo on walls, ſo as to endure the weather.

It is performed with water-colours on freſh plaſter; or on a wall laid with mortar not yet dry. This ſort of painting has a great advantage by its incorporating with the mortar, and, drying along with it, becomes very durable.

The compoſt ſhould be made of rubbiſh ſtones mixt with well-burnt flint, or lime, and water: but the ſaltneſs of the lime muſt be waſhed out, by pouring water frequently on it. But this ſhould not be done in moiſt weather.

To prevent the plaſter from peeling, ſtrike into the joints of the wall ſtumps of horſe-nails ſix inches diſtant from each other. Firſt plaſter the walls pretty thick; then let it dry for ſome time, the deſign and colours being firſt ready prepared. This painting is chiefly performed on walls and vaults newly plaſtered with lime and ſand; and the plaſter is only to be put on in proportion as the painting proceeds.

Plaſter the wall a ſecond time, about the thickneſs of half a crown, only ſo much as you intend to work upon; and while it is wet, work the colours therein, which will incorporate with the plaſter ſo as never to waſh out.

The painting muſt be worked with a free hand, and your colours made high enough at firſt, as there can be no alteration made after the firſt painting.

In this work ſcarce any thing elſe is uſed but earths, which ſtill retain their colour, defending it from the burning and ſalt of the lime. The colours are white, made of lime ſlacked ſome time, and white marble duſt, red and yellow oker, violet red, verditer, lapis lazuli, ſmalt, black Spaniſh brown, Spaniſh white, *&c.* all which are grounded and worked up with water.

The bruſhes and pencils for this work muſt be long and ſoft, or elſe they will rake and raze the painting: the colours muſt be full and flowing from the bruſh, and the deſign or cartoon muſt be perfect in the paper-copy.

FRESH, in general, ſomething that is new, pure, and good; or, that has little or no ſalt in it.

FRET, or **Frette**, in architecture, a kind of knot or ornament, conſiſting of two liſts or ſmall fillets variouſly interlaced or interwoven, and running at parallel diſtances equal to their breadth.

Fret, in heraldry, a bearing compoſed of ſix bars, croſſed, and variouſly interlaced, as repreſented in plate LXXX. fig. 9.

Some call it the true lover's knot.

Fret, in muſic, ſignifies a kind of ſtop on ſome inſtruments, particularly baſs-viols and lutes. Frets conſiſt of ſtrings tied round the neck of the inſtrument, at certain diſtances, within which ſuch and ſuch notes are to be found.

Fret-work, that adorned with frets. It is ſometimes uſed to fill up and enrich flat empty ſpaces; but is moſtly practiſed in roofs, which are fretted over with plaſter work.

FREYSTAT, a town of Sileſia, in Germany, E. long. 17° 55′, N. lat. 50°.

FRIABLE, among naturaliſts, an appellation given to bodies that are eaſily crumbled to pieces: ſuch are the free-ſtone, pumice-ſtone, *&c.*

FRIAR, a term common to monks of all orders, founded ed on this, that there is a kind of fraternity, or brotherhood, between the ſeveral religious perſons of the ſame convent or monaſtery.

Friars are generally diſtinguiſhed into theſe four principal branches, *viz.* 1. Minors, grey friars, or franciſcans. 2. Auguſtines. 3 Dominicans, or black friars. 4. White friars, or carmelites. From theſe four the reſt of the orders deſcend. See FRANCISCANS, AUGUSTINES, *&c.*

FRIBURG, the capital of a canton of the ſame name in Switzerland, ſituated eighteen miles ſouth-weſt of Bern: E. long. 6° 55′, N. lat. 46° 50′.

FRIBURGH, a city of Swabia, in Germany, twenty-eight miles ſouth of Straſburg.

FRICENTO, a town and biſhop's ſee of Italy, forty-three miles eaſt of the city of Naples.

FRICTION, in mechanics, the rubbing of the parts of engines and machines againſt each other, by which means a great part of their effect is deſtroyed. See MECHANICS.

FRIDBURG, an imperial city of Bavaria, in Germany: E. long. 10°, and N lat. 48° 30′.

FRIDBURG is alſo the name of two other towns in Germany, both ſituated in the circle of Upper Saxony, the one nine miles ſouth-weſt of Dreſden, and the other thirty miles weſt of Leipſic.

FRIEDBURG, an imperial city of Germany, ſixteen miles north of Francfort on the main.

FRIESLAND, one of the moſt northern provinces of the united Netherlands, bounded by the German ocean on the north, by Groningen and Overyſſel on the eaſt, by the Zuider-ſea and Overyſſel on the ſouth, and by the ſame ocean on the weſt: its chief town is Lewarden.

Eaſt-**FRIESLAND**, a province of Weſtphalia, in Germany, being the north-weſt part of Germany, bordering on Groningen.

FRIEZE, FREEZE, or FRISE, in architecture, a large flat face, or member, ſeparating the architrave from the corniche, being that part of the entablature between the architrave and the corniche. See ARCHITECTURE.

FRIGAT, among ſeamen, a ſhip of war, light built, and that is a good ſailer.

A frigat has commonly two decks; whence that called a light frigat, is a frigat with only one deck.

FRIGID, is applied to a jejune ſtyle, that is unanimated by any ornaments, and conſequently without any force or vigour.

FRIGORIFIC, in phyſiology, ſmall particles of matter, which, according to Gaſſendus and others, being actually and eſſentially cold, and penetrating other bodies, produce in them that quality which we call cold.

FRILL, in falconry. When a hawk trembles, or ſhivers, they ſay ſhe frills.

FRINGILLA, in ornithology, a genus belonging to the order of paſſeres. The bill is conical, ſtrait, and ſharp-pointed. There are no leſs than thirty ſpecies comprehended under this genus, diſtinguiſhed principally by varieties in their colour.

1. The brown fringilla with a tawny neck, and white ſpots on the wings and hinder part of the back. It is the Carolina ortolan of Cateſby, and is a bird of the iſland of Cuba; only the hens paſs into Carolina in the autumn. 2. The fringilla with black limbs, and the wings white on both ſides; the three firſt feathers of the tail are without ſpots, but two of the chief are obliquely ſpotted. It is the chaffinch of Engliſh authors, and is a bird of Europe. 3. The fringilla, with the baſe of the wings underneath of a deep yellow colour. It is the brambling or mountain finch of Engliſh authors, and is a bird of Europe. 4. The brown fringilla, with a reddiſh breaſt and ſhoulders, and the black wings marked with a reddiſh ſpot: It is an inhabitant of Sweden. 5. The fringilla with a blackiſh ſpotted head, and a white ſpot behind the eyes. It is the greater chaffinch of Albin, and is found in Lapland. 6. The fringilla with the limbs, wings, and tail black, only the outermoſt from the middle externally white. It is a bird of Sweden. 7. The grey fringilla, ſpotted with black, has a ſpace running from the bill to the ſides of the neck black. It is the ſhomburgher, a-kin to the lark of Edwards, and is a bird of South America. 8. The black fringilla, with a reddiſh gloſs, and a reddiſh belly, with a white ſpot on the wings, is the American black ſparrow with red eyes, of Cateſby. 9. The fringilla, with the quill-feathers red forwards, and the outermoſt without any ſpots; the two outermoſt are white in the middle, as the reſt are at the point. This is the goldfinch of Engliſh authors 10. The fringilla with a red face and tail, the belly undulated with white and black, and the back green. It is the green goldfinch of Edwards, and is a Chineſe bird. 11. The fringilla with purple tail-feathers, with the hinder halves black. It is the amaduvad of Albin, and an inhabitant of the Eaſt Indies. The cock is all over purple; but the hen is aſh-coloured, except the bill and tail. 12. The green fringilla with a red head, a yellow collar, and a blue breaſt. It is the red headed green finch of Edwards. 13. The fringilla all over red, is the red fly-catcher of Cateſby, and is a bird of America. 14. The yellow fringilla, with a black forehead and brown wings, is the American goldfinch of Cateſby. 15. The fringilla with a black head, a tawny breaſt, and a white ſtreak on the wings and above and below the eyes, is the Bahama finch of Cateſby. 16. The fringilla with a wedge-like tail, a reddiſh body, a red bill, and the temples, rump and belly of a violet colour, is the red and blue Braſilian finch of Edwards. 17. The green fringilla, with the ſupercilia, breaſt and belly yellow, but the prime feathers of the wings are white on the outer edge. It is the Indian green finch of Edwards, and is found in Madera 18. The fringilla with a whitiſh body and bill, and the prime feathers of the wings and tail greeniſh. This is the Canary bird of Engliſh authors, and is found in the Canary iſlands. 19. The fringilla with the prime feathers of the wings yellow in the middle, and the fore firſt chief tail-feathers without ſpots; but they are yellow at the baſe, and black at the points. It is the ſiſkin of Engliſh authors, and haunts places where juniper-buſhes grow. 20. The brown fringilla, with a flame coloured creſt,

is the brown linnet of Klein. 21. The brown fringilla, with a yellowiſh bill, is an European bird, as are alſo the two former. 22. The fringilla, with the prime feathers of the wings, and the chief feathers of the tail black, but white on the edges. It is the greater red-headed linnet of Ray, and is a bird of Europe. 24. The fringilla, with a brown back, and a blue belly and tail, is the blue bellied finch of Edwards, and is found in Africa. 25. The violet-coloured fringilla, with the forehead and under part of the body of a deep yellow colour; the back, neck, prime feathers of the wings, and upper part of the tail are of a bluiſh black colour; but the forehead, breaſt, belly, and under part of the neck are of a deep yellow. The bill is exceeding ſhort, triangular, black and crooked at the point. 26. The fringilla with the chief feathers of the tail brown, and the outermoſt marked with a wedge-like ſpot; the body is variegated with grey and black, and the head is black. It is the reed ſparrow of Engliſh authors, and is a bird of Europe. 27. The fringilla with the prime feathers of the wings and tail brown, the body variegated with grey and black, and a ſingle white ſtreak on the wings. This is the houſe-ſparrow of Engliſh authors, and is an European bird. 28. The fringilla with the prime feathers of the wings and tail brown, the body variegated with grey and black, and a double white ſtreak on the wings. This is the mountain-ſparrow of Ray, and is a bird of Europe. 29. The ferruginous fringilla, with a black head and a blue bill, is the Chineſe ſparrow of Edwards. 30. The black fringilla, with a white belly, is the American ſnow-ſparrow of Cateſby.

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FRISONE, in ornithology. See LOXIA.

FRIT, in the glaſs-manufacture, the matter or ingredients whereof glaſs is to be made, when they have been calcined or baked in a furnace; or it is the calcined matter to be run into glaſs. See GLASS.

FRITH, in its moſt uſual acceptation, ſignifies an arm of the ſea: ſuch are the frith of Forth or of Edinburgh, the frith of Clyde, Murray frith, *&c.*

FRITILLARIA, in botany, a genus of the hexandria monogynia claſs. The corolla conſiſts of ſix bell-ſhaped petals, with a hollow nectarium above the unguis of each petal; and the ſtamina are of an equal length with the petals. There are five ſpecies, only one of which is a native of Britain, *viz.* the meleagris or common checkered daffodil.

FRIULI, a province of Italy, ſubject to Venice, and bounded by Carinthia in Germany on the north, by Carniola on the eaſt, by the gulph of Venice on the ſouth, and by the Belluneſe and Feltrin on the weſt.

FRIZING *of cloth*, a term, in the woollen manufactory, applied to the forming of the nap of a cloth, or ſtuff, into a number of little hard burrs or prominences, covering almoſt the whole ground thereof.

Some cloths are only frized on the back ſide, as black cloths; others on the right ſide, as coloured and mixed cloths, rateens, bays, freezes, *&c.*

Frizing may be performed two ways; one with the hand, that is, by means of two workmen, who conduct a kind of plank that ſerves for a frizing inſtrument.

The other way is by a mill, worked either by water, or a horſe, or ſometimes by men. This latter is eſteemed the better way of frizing, by reaſon the motion being uniform and regular, the little knobs of the frizing are formed more equally and regularly.

FROBISHER's STRAITS, in weſt Greenland, lie a little to the northward of Cape Farewel: W. long. 48°, and N. lat. 63°.

FRODINGHAM, a market-town of Yorkſhire, thirty miles eaſt of York.

FRODSHAM, a market-town of Cheſter, fourteen miles north eaſt of Cheſter.

FROG, in zoology. See RANA.

FRONTEIRA, a town of Portugal, in the province of Alentejo: W. long. 8° 6′, and N. lat. 38° 50′.

FRONTIER, the border, confine, or extremity of a kingdom or province, which the enemies find in front, when they would enter the ſame: thus we ſay, a frontier town, a frontier province, *&c.*

Frontiers were anciently called marches.

FRONTIS OS, in anatomy. See ANATOMY, p. 152.

FRONTIGNIAC, a town of Languedoc in France, ſituated ſixteen miles ſouth-weſt of Montpelier, and remarkable for producing excellent wine.

FROST, in phyſiology, ſuch an exceſſively cold ſtate of the air as converts watery fluids into ice.

In very cold ſnowy weather, not only water, but urine, beer, ale, milk, vinegar, and even wine, are either wholly or in part converted into ice, though the laſt but ſlowly. As to the freezing of expreſſed oils, a very intenſe cold may deprive them of their fluidity, ſo as to be capable of being cut into portions of any figure; but whether they are convertible into real ice, is not yet determined. In Ruſſia oil freezes much harder than with us, but does not even there become perfect ice. Common anniſeed-water, and the like weak ſpirits, are ſaid to be converted into an imperfect ice in Muſcovy; and the ſtrong ſpirits into a ſubſtance like that of oil. When brandy freezes, a liquid part, much ſtronger than common brandy, retires to the centre of the veſſel.

Even ſolid bodies are liable to be affected by froſt: timber is often apparently frozen, and rendered exceedingly difficult to ſaw. Marle, chalk, and other leſs ſolid terreſtrial concretions, will be ſhattered by ſtrong and durable froſts. Metals are contracted by froſt: thus, an iron tube, twelve foot long, upon being expoſed to the air in a froſty night, loſt two lines of its length. On the contrary, it ſwells or dilates fluids near one tenth of their bulk. Mr Boyle made ſeveral experiments with metalline veſſels, exceeding thick and ſtrong; which being filled with water cloſe ſtopped, and expoſed to the cold, burſt by the expanſion of the frozen fluid within them. Trees are frequently burnt up with froſt, as with the moſt exceſſive heat; and in very ſtrong froſts, walnut-trees, aſhes, and even oaks, are ſometimes miſerably ſplit and cleft, ſo as to be ſeen through, and this with a terrible noiſe, like the exploſion of fire arms.

Froſt naturally proceeds from the upper parts of bodies downwards; but how deep it will reach in earth or water, is not eaſily known, becauſe this depth may vary with the degree of coldneſs in the air, by a longer or ſhorter duration of the froſt, the texture of the earth, the nature of the juices wherewith it is impregnated, the conſtitution of its more internal parts as to heat and cold, the nature of its effluvia, *&c.* Mr Boyle, in order to aſcertain this depth, after four nights of hard froſt, dug in an orchard, where the ground was level and bare, and found the froſt had ſcarce reached three inches and a half; and in a garden nearer the houſe, only two inches below the ſurface. Nine or ten ſucceſſive froſty nights froze the bare ground in the garden ſix inches and a half deep; and in the orchard, where a wall ſheltered it from the ſouth ſun, to the depth of eight inches and a half. He alſo dug in an orchard, near a wall, about a week afterwards, and found the froſt to have penetrated to the depth of fourteen inches. In a garden at Moſcow, the froſt in a hard ſeaſon only penetrates to two feet: and the utmoſt effect that capt. James mentions the cold to have had upon the ground of Charlton iſland, was to freeze it to ten feet deep: whence may appear the different degrees of cold of that iſland and Ruſſia. And as to the freezing of water at the above-mentioned iſland, the captain tells us, it does not naturally congeal above the depth of ſix feet, the reſt being by accident. Water alſo, expoſed to the cold air in large veſſels, always freezes firſt at the upper ſurface, the ice gradually increaſing and thickening downwards; for which reaſon frogs retire in froſty weather to the bottom of ditches: and it is ſaid, that ſhoals of fiſh retire in winter to thoſe depths of the ſea and rivers, where they are not to be found in ſummer. Water, like the earth, ſeems not diſpoſed to receive any very intenſe degree of cold at a conſiderable depth or diſtance from the air. The vaſt maſſes of ice found in the northern ſeas being only many flakes and fragments, which, ſliding under each other, are, by the congelation of the intercepted water, cemented together.

In cold countries, the froſt proves often fatal to mankind; not only producing cancers, but even death itſelf. Thoſe who die of it have their hands and feet firſt ſeized, till they grow paſt feeling it; after which the reſt of their bodies is ſo invaded, that they are taken with a drowſineſs, which if indulged, they awake no more, but die inſenſibly. But there is another way whereby it proves mortal, *viz.* by freezing the abdomen and viſcera, which on diſſection are found to be mortified and black.

Hoar-Frost, a cold moiſt vapour, that is drawn up a little way into the air, and in the night falls again on the earth, where it is congealed into icy cryſtals of various figures. Hoar-froſt therefore is nothing but dew, turned into ice by the coldneſs of the air.

FROTH, a white, light ſubſtance, formed on the ſurface of fluids, by vehement agitation, conſiſting of little ſpherules, or globules.

Froth-spit, or Cuckow-spit, a name given to a white froth, or ſpume, very common, in the ſpring and firſt months of the ſummer, on the leaves of certain plants, particularly on thoſe of the common white field lychnis or catch fly, thence called by ſome ſpatling poppy.

All writers on vegetables have taken notice of this froth, though few have underſtood the cauſe or origin of it till of late; being formed by a little leaping animal, called by ſome the flea graſs-hopper, by applying its anus cloſe to the leaf, and diſcharging thereon a ſmall drop of a white viſcous fluid, which containing ſome air in it, is ſoon elevated into a ſmall bubble: before this is well formed, it depoſites ſuch another drop, and ſo on, till it is every way overwhelmed with a quantity of theſe bubbles, which form the white froth which we ſee.

FRUCTIFEROUS, ſignifies properly any thing that produces fruit.

FRUCTIFICATION, among botaniſts, in a more lax ſenſe, includes the flower and fruit, with their ſeveral coverings. See Botany.

FRUIT, in general, includes whatever the earth produces for the nouriſhment and ſupport of man, and other animals; as herbs, grain, hay, corn, *&c.*

Fruit, more properly, ſignifies the production of a tree, or plant, for the propagation or multiplication of its kind; in which ſenſe the word takes in all kinds of ſeeds with their furniture. But botaniſts uſually underſtand by it that part of a plant wherein the ſeeds are contained.

Fruit alſo implies an aſſemblage of ſeeds in a head; as in a ranunculus, *&c.* and all kinds of ſeeds, or grains, whether incloſed in a cover, capſule, or pod; and whether bony, fleſhy, ſkinny, membranous, or the like. See Agriculture, Part I.

FRUMENTACEOUS, a term applied by botaniſts to all ſuch plants as have a conformity with wheat, in reſpect of their fruits, leaves, ears, or the like.

FRUMENTARII, a kind of ſoldiers, or archers, under the weſtern empire.

The firſt time we read of theſe officers is in the time of the emperor Adrian, who made uſe of them to inform himſelf of whatever paſſed. They did not make any particular corps diſtinct from the reſt of the forces, but there was a certain number of them in each legion. It is ſuppoſed, that they were at firſt a number of young perſons diſpoſed by Auguſtus throughout the provinces, particularly on all the grand roads, to acquaint the emperor, with all expedition, of every thing that happened.

Afterwards they were incorporated into the troops themſelves, where they ſtill retained their ancient name. As their principal office was the giving intelligence, they were often joined with the curioſi, with whom they agreed in this part of their office.

Their name of frumentarii is derived from their being alſo a ſort of purveyors to the armies, cities, *&c.* col-is the brown linnet of Klein. 21. The brown fringilla, with a yellowiſh bill, is an European bird, as are alſo the two former. 22. The fringilla, with the prime feathers of the wings, and the chief feathers of the tail black, but white on the edges. It is the greater red-headed linnet of Ray, and is a bird of Europe. 24. The fringilla, with a brown back, and a blue belly and tail, is the blue bellied finch of Edwards, and is found in Africa. 25. The violet-coloured fringilla, with the forehead and under part of the body of a deep yellow colour; the back, neck, prime feathers of the wings, and upper part of the tail are of a bluiſh black colour; but the forehead, breaſt, belly, and under part of the neck are of a deep yellow. The bill is exceeding ſhort, triangular, black and crooked at the point. 26. The fringilla with the chief feathers of the tail brown, and the outermoſt marked with a wedge-like ſpot; the body is variegated with grey and black, and the head is black. It is the reed ſparrow of Engliſh authors, and is a bird of Europe. 27. The fringilla with the prime feathers of the wings and tail brown, the body variegated with grey and black, and a ſingle white ſtreak on the wings. This is the houſe-ſparrow of Engliſh authors, and is an European bird. 28. The fringilla with the prime feathers of the wings and tail brown, the body variegated with grey and black, and a double white ſtreak on the wings. This is the mountain-ſparrow of Ray, and is a bird of Europe. 29. The ferruginous fringilla, with a black head and a blue bill, is the Chineſe ſparrow of Edwards. 30. The black fringilla, with a white belly, is the American ſnow-ſparrow of Cateſby.

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In very cold ſnowy weather, not only water, but urine, beer, ale, milk, vinegar, and even wine, are either wholly or in part converted into ice, though the laſt but ſlowly. As to the freezing of expreſſed oils, a very intenſe cold may deprive them of their fluidity, ſo as to be capable of being cut into portions of any figure; but whether they are convertible into real ice, is not yet determined. In Ruſſia oil freezes much harder than with us, but does not even there become perfect ice. Common anniſeed-water, and the like weak ſpirits, are ſaid to be converted into an imperfect ice in Muſcovy; and the ſtrong ſpirits into a ſubſtance like that of oil. When brandy freezes, a liquid part, much ſtronger than common brandy, retires to the centre of the veſſel.

Even ſolid bodies are liable to be affected by froſt: timber is often apparently frozen, and rendered exceedingly difficult to ſaw. Marle, chalk, and other leſs ſolid terreſtrial concretions, will be ſhattered by ſtrong and durable froſts. Metals are contracted by froſt: thus, an iron tube, twelve foot long, upon being expoſed to the air in a froſty night, loſt two lines of its length. On the contrary, it ſwells or dilates fluids near one tenth of their bulk. Mr Boyle made ſeveral experiments with metalline veſſels, exceeding thick and ſtrong; which being filled with water cloſe ſtopped, and expoſed to the cold, burſt by the expanſion of the frozen fluid within them. Trees are frequently burnt up with froſt, as with the moſt exceſſive heat; and in very ſtrong froſts, walnut-trees, aſhes, and even oaks, are ſometimes miſerably ſplit and cleft, ſo as to be ſeen through, and this with a terrible noiſe, like the exploſion of fire arms.

Froſt naturally proceeds from the upper parts of bodies downwards; but how deep it will reach in earth or water, is not eaſily known, becauſe this depth may vary with the degree of coldneſs in the air, by a longer or ſhorter duration of the froſt, the texture of the earth, the nature of the juices wherewith it is impregnated, the conſtitution of its more internal parts as to heat and cold, the nature of its effluvia, *&c.* Mr Boyle, in order to aſcertain this depth, after four nights of hard froſt, dug in an orchard, where the ground was level and bare, and found the froſt had ſcarce reached three inches and a half; and in a garden nearer the houſe, only two inches below the ſurface. Nine or ten ſucceſſive froſty nights froze the bare ground in the garden ſix inches and a half deep; and in the orchard, where a wall ſheltered it from the ſouth ſun, to the depth of eight inches and a half. He alſo dug in an orchard, near a wall, about a week afterwards, and found the froſt to have penetrated to the depth of fourteen inches. In a garden at Moſcow, the froſt in a hard ſeaſon only penetrates to two feet: and the utmoſt effect that capt. James mentions the cold to have had upon the ground of Charlton iſland, was to freeze it to ten feet deep: whence may appear the different degrees of cold of that iſland and Ruſſia. And as to the freezing of water at the above-mentioned iſland, the captain tells us, it does not naturally congeal above the depth of ſix feet, the reſt being by accident. Water alſo, expoſed to the cold air in large veſſels, always freezes firſt at the upper ſurface, the ice gradually increaſing and thickening downwards; for which reaſon frogs retire in froſty weather to the bottom of ditches: and it is ſaid, that ſhoals of fiſh retire in winter to thoſe depths of the ſea and rivers, where they are not to be found in ſummer. Water, like the earth, ſeems not diſpoſed to receive any very intenſe degree of cold at a conſiderable depth or diſtance from the air. The vaſt maſſes of ice found in the northern ſeas being only many flakes and fragments, which, ſliding under each other, are, by the congelation of the intercepted water, cemented together.

In cold countries, the froſt proves often fatal to mankind; not only producing cancers, but even death itſelf. Thoſe who die of it have their hands and feet firſt ſeized, till they grow paſt feeling it; after which the reſt of their bodies is ſo invaded, that they are taken with a drowſineſs, which if indulged, they awake no more, but die inſenſibly. But there is another way whereby it proves mortal, *viz.* by freezing the abdomen and viſcera, which on diſſection are found to be mortified and black.

Hoar-Frost, a cold moiſt vapour, that is drawn up a little way into the air, and in the night falls again on the earth, where it is congealed into icy cryſtals of various figures. Hoar-froſt therefore is nothing but dew, turned into ice by the coldneſs of the air.

FROTH, a white, light ſubſtance, formed on the ſurface of fluids, by vehement agitation, conſiſting of little ſpherules, or globules.

Froth-spit, or Cuckow-spit, a name given to a white froth, or ſpume, very common, in the ſpring and firſt months of the ſummer, on the leaves of certain plants, particularly on thoſe of the common white field lychnis or catch fly, thence called by ſome ſpatling poppy.

All writers on vegetables have taken notice of this froth, though few have underſtood the cauſe or origin of it till of late; being formed by a little leaping animal, called by ſome the flea graſs-hopper, by applying its anus cloſe to the leaf, and diſcharging thereon a ſmall drop of a white viſcous fluid, which containing ſome air in it, is ſoon elevated into a ſmall bubble: before this is well formed, it depoſites ſuch another drop, and ſo on, till it is every way overwhelmed with a quantity of theſe bubbles, which form the white froth which we ſee.

FRUCTIFEROUS, ſignifies properly any thing that produces fruit.

FRUCTIFICATION, among botaniſts, in a more lax ſenſe, includes the flower and fruit, with their ſeveral coverings. See Botany.

FRUIT, in general, includes whatever the earth produces for the nouriſhment and ſupport of man, and other animals; as herbs, grain, hay, corn, *&c.*

Fruit, more properly, ſignifies the production of a tree, or plant, for the propagation or multiplication of its kind; in which ſenſe the word takes in all kinds of ſeeds with their furniture. But botaniſts uſually underſtand by it that part of a plant wherein the ſeeds are contained.

Fruit alſo implies an aſſemblage of ſeeds in a head; as in a ranunculus, *&c.* and all kinds of ſeeds, or grains, whether incloſed in a cover, capſule, or pod; and whether bony, fleſhy, ſkinny, membranous, or the like. See Agriculture, Part I.

FRUMENTACEOUS, a term applied by botaniſts to all ſuch plants as have a conformity with wheat, in reſpect of their fruits, leaves, ears, or the like.

FRUMENTARII, a kind of ſoldiers, or archers, under the weſtern empire.

The firſt time we read of theſe officers is in the time of the emperor Adrian, who made uſe of them to inform himſelf of whatever paſſed. They did not make any particular corps diſtinct from the reſt of the forces, but there was a certain number of them in each legion. It is ſuppoſed, that they were at firſt a number of young perſons diſpoſed by Auguſtus throughout the provinces, particularly on all the grand roads, to acquaint the emperor, with all expedition, of every thing that happened.

Afterwards they were incorporated into the troops themſelves, where they ſtill retained their ancient name. As their principal office was the giving intelligence, they were often joined with the curioſi, with whom they agreed in this part of their office.

Their name of frumentarii is derived from their being alſo a ſort of purveyors to the armies, cities, *&c.*

collecting all the corn from the ſeveral provinces to furniſh the common-wealth.

FRUMENTATION, in Roman antiquity, a largeſs of corn beſtowed on the people. This practice of giving corn to the people was very ancient among the Romans; and frequently uſed to ſooth the turbulent humour of the populace. At firſt the number of thoſe to whom this largeſs was given, was indeterminate, till Auguſtus fixed it at two hundred thouſand.

FRUSH, or **FROG**, among farriers, a ſort of tender horn which ariſes in the middle of a horſe's ſole; and, at ſome diſtance from the toe, divides into two branches, running towards the heel in the form of a fork.

FRY, in zoology, ſignifies the ſpawn, or rather young, of fiſh.

FUCUS, in botany, a genus of ſubmarine plants, belonging to the cryptogamia claſs.

The fucus conſiſts of a tough matter, formed into a kind of leaves, which are flat and variouſly divaricated; and which have ſome appearance of fructification, in punctated tubercles, covering oblong veſicles, ſuppoſed by Linnæus to be male flowers; and ſmooth roundiſh veſicles, hollow and interwoven with filaments, which appear to him to be female flowers. There are thirty-four ſpecies of fucus, or ſea wrack, many of them to be found on our coaſts.

FUEL, whatever is proper to burn or make a fire; as, wood, turfs, peats, bituminous earths, coals, *&c.*

FUGALIA, in Roman antiquity, a feaſt ſuppoſed by ſome to be the ſame with the refugium, held on the 24th of February, in memory of the expulſion of the kings, and the aboliſhing of the monarchial government. Others again diſtinguiſh the fugalia from the regifuge. And others think, that the Fugalia was the ſame with the poplifugia, or the feaſt of Fugia, the goddeſs of joy, occaſioned by the rout of an enemy, which was the reaſon the people abandoned themſelves to riot and debauchery.

FUGITIVE, a perſon obliged to fly his country, or remove from a place where he had ſome abode, or eſtabliſhment, on account of his crimes, debts, or other occaſions.

FUGUE, in muſic, is when different parts of a muſical compoſition follow each other; each repeating what the firſt had performed.

FULCRUM, in mechanics, the prop or ſupport by which a lever is ſuſtained. See MECHANICS.

FULD, a town and abbey of Germany, the abbot of which is a prince of the empire: E. long. 9° 35′, N. lat. 50° 34′.

FULICA, the COOT, in ornithology, a genus of birds, of the order of grallæ. It has a convex bill, with the upper mandible fornicated over the lower at the edge; the lower mandible is gibbous behind the tip. The forehead is bald, and the feet have four toes a little lobated. There are four ſpecies.

1. The Fulica with a bald forehead, a black body, and lobated toes. It is the coot of Ray, and an inhabitant of Europe, and feeds upon ſeeds and herbs, and runs as well as ſwims upon the water. 2. The fulica with a bald forehead, and toes without webs. It is the water-hen, or moor-hen of Ray, and is ſound in Europe. 3. The fulica with a bald forehead, a violet-coloured body, and toes without webs, is the purple water-hen of Edwards, and it inhabits Aſia and America. 4. The fulica with a caruncul ated forehead, a variegated body, ſpinous ſhoulders, and toes without webs; but the nail on the hinder toe is exceeding long. It is the ſpur-winged water-hen of Edwards, and is an inhabitant of South America. The nail on the hind toe is ſtrait, and longer than a man's finger. The pollex reſts upon one joint, and the wings are green.

FULIGINOUS, whatever proceeds from a thick, ſooty ſmoke, ſuch as litharge and lamp black.

FULIGNO, a city of Italy, in the pope's territories, ten miles north of Spoletto.

FULIGO, in natural hiſtory, a ſpecies of pumice-ſtone. See PUMICE.

FULLER, a workman employed in the woollen manufactories, to mill or ſcour cloths, ſerges, and other ſtuffs, in order to render them more thick, compact, and durable. See CLOTH.

FULLER'S EARTH, in natural hiſtory, a ſoft, greyiſh, brown, denſe, and heavy marle: when dry, it is of a greyiſh aſh-coloured brown, in all degrees from very pale to almoſt black, and it has generally ſomething of a greeniſh caſt: it is very hard and firm, of a compact texture, of a rough and ſomewhat duſty ſurface that adheres ſlightly to the tongue: it is very ſoft to the touch, not ſtaining the hands, nor breaking eaſily between the fingers: it has a little harſhneſs between the teeth, and melts freely in the mouth: thrown into water, it makes no ebullition, or hiſſing, but ſwells gradually in bulk, and falls into a fine ſoft powder. It makes no efferveſcence with aqua fortis.

It is of great uſe in ſcouring cloths, ſtuffs, *&c.* imbibing all the greaſe and oil uſed in preparing, dreſſing, *&c.* of the wool, for which reaſon it is made a contraband commodity, and is not to be exported under the penalty of 1 s. for every pound weight. See FULLING.

FULLER'S WEED, in botany. See DIPSACUS.

FULLERY, a place where cloths, *&c.* are fulled. See the next article.

FULLING, the art or act of ſcouring and preſſing cloths, ſtuffs, ſtockings, *&c.* to cleanſe, thicken, and render them more firm and ſtrong, which is done by means of a water mill.

Fuller's earth is uſed with ſome proportion of ſoap; but ſoap alone would do much better, was it not dearer than fuller's earth.

Fulling of ſtockings, caps, *&c.* is performed either with the hands or feet, or a kind of wooden machine, either armed with wooden teeth, or thoſe of horſes or bullocks. The ingredients generally uſed on this occaſion are fuller's earth, urine, white ſoap and green ſoap. But water ſoftened with chalk is far preferable.

FULMINATING, ſomething that thunders, or reſembles thunder.

FULMINATION, in chemiſtry, is uſed in a ſynonymous ſenſe with detonation.

Fulmination in the depuration of the more perfect metals, is, when, upon infuſing them with lead, a brighter colour ſucceeds a kind of ſulphureous cloud, before appearing in the metals, during the fuſion.

Fulmination, in the Romiſh canon law, a ſentence of a biſhop, official, or other eccleſiaſtic appointed by the pope, by which it is decreed, that ſome bull ſent from the pope ſhall be executed.

FUMARIA, in botany, a genus of the diadelphia hexandria claſs. The calix conſiſts of two leaves; and the corolla is ringent. There are 11 ſpecies, three of them natives of Britain, *viz.* the officinalis, or fumitory; the capreolata, or ramping fumitory; and the claviculata, or climbing fumitory.

The whole plant of the officinalis is uſed in medicine, being accounted good in the ſcurvy, jaundice, and diſorders of the meſentery and ſpleen.

FUMIGATION, in chemiſtry, a kind of calcination, when metals, or other hard bodies, are corroded, or ſoftened, by receiving certain fumes for that purpoſe.

Fumigation, in medicine, the application of fumes to particular parts of the body; as thoſe of factitious cinnabar, to venereal ulcers.

FUMITORY, in botany. See Fumaria.

FUNCHAL, the capital of the Madeira iſlands, ſubject to Portugal: W. long. 16°, N. lat. 32° 33′.

FUNCTION, the act of fulfilling the duties of any employment.

Function, being alſo applied to the actions of the body, is by phyſicians divided into vital, animal, and natural. The vital functions are thoſe neceſſary to life, and without which the individual cannot ſubſiſt; as the motion of the heart, lungs, *&c.* The natural functions are ſuch as it cannot ſubſiſt any conſiderable time without them, as the digeſtion of the aliment, and its converſion into blood. Under animal functions are included the ſenſes of touching, taſting, *&c.* memory, judgment, and voluntary motion, without any, or all of which an animal may live, but not very comfortably.

The animal functions perform the motion of the body by the action of the muſcles, and this action conſiſts chiefly in the ſhortening the fleſhy fibres, which is called contraction, the principal agents of which are the arteries and nerves diſtributed in the fleſhy fibres.

In ſhort, all parts of the body have their own functions, or actions peculiar to themſelves. Life conſiſts in the exerciſe of theſe functions, and health in the free and ready exerciſe of them.

FUND, in commerce, ſignifies the ſtocks of the great trading and monied companies. See Stocks.

FUNDAMENT, in anatomy. See Anus

FUNDI-BAY, that ſituated between New England and New Scotland, in which there is ſaid to be an excellent fiſhery.

FUNEN, the ſecond iſland for magnitude belonging to the king of Denmark, ſituated at the entrance of the Baltic ſea, and ſeparated from Jutland by the ſtrait called the leſſer Belt, and from the iſland of Zeland by the ſtrait called the great Belt. Its chief town is Odenſee.

FUNERAL rites, ceremonies accompanying the interment or burial of any perſon.

Theſe rites differed among the ancients according to the different genius and religion of each country. The Egyptians, among the reſt of their funeral rites, embalmed their dead.

Among the ancient Greeks it was uſual ſometimes, before the interment, to put a piece of money into the mouth of the deceaſed, which was thought to be Charon's fare for wafting the departed ſoul over the infernal river. This ceremony was not uſed in thoſe countries which were ſuppoſed to be ſituated in the neighbourhood of the infernal regions, and to lead thither by a ready and direct road. The corpſe was likewiſe furniſhed with a cake, compoſed of flour, honey, *&c.* which was deſigned to appeaſe the fury of Cerberus, the door-keeper of hell, and to procure the ghoſt a ſafe and quiet entrance.

During the time the corpſe continued in the houſe, there ſtood before the door a veſſel of water, the deſign of which was, that thoſe concerned about the body might purify themſelves by waſhing; it being the opinion of the Greeks, as well as of the Jews, that pollution was contracted by touching a dead body.

The ceremonies by which they expreſſed their ſorrow for the death of their friends, were various; but it ſeems to have been a conſtant rule to recede as much as poſſible in habit and behaviour from their ordinary cuſtoms. For this reaſon they abſtained from banquets and entertainments; they diveſted themſelves of all ornaments; they tore, cut off, or ſhaved their hair, which they caſt into the funeral pile, to be conſumed with the body of their deceaſed friend. Sometimes they threw themſelves on the ground, and rolled in the duſt, or covered their head with aſhes; they beat their breaſts, and even tore their fleſh with their nails, upon the loſs of a perſon they much lamented. When perſons of rank, ſuch as public magiſtrates, or great generals, died, the whole city put on a face of mourning: all public meetings were intermitted; the ſchools, baths, ſhops, temples, and all places of concourſe were ſhut up.

Interring or laying the dead in the ground, ſeems to have been the moſt ancient practice among the Greeks; though burning came afterwards to be generally uſed among them. It was cuſtomary to throw into the funeral pile thoſe garments the deceaſed uſually wore. The pile was lighted by one of the dead perſon's neareſt relations or friends, who made prayers and vows to the winds to aſſiſt the flames, that the body might quickly be reduced to aſhes; and during the time the pile was burning, the dead perſon's friends ſtood by it, pouring libations of wine, and calling upon the deceaſed.

When Numa reformed the religion of Rome, he ordered that the pontiffs ſhould have the care of the funeral ceremonies; which, in moſt reſpects, were like thoſe of the Greeks already deſcribed.

The funeral rites among the Hebrews, were ſolemn and magnificent: when any perſon was dead, his relations and friends rent their cloaths; which cuſtom is but faintly imitated by the modern Jews, who only cut off a bit of their garment, in token of affliction. It was uſual to bend the dead perſon's thumb into the hand, and faſten it in that poſture with a ſtring; becauſe the thumb then having the figure of the name of God, they thought the devil would not dare to approach it. When they came to the burying place, they made a ſpeech to the dead in the following terms: "Bleſſed be God, who has formed thee, fed thee, maintained thee, and taken away thy life. O dead! he knows your numbers, and ſhall one day reſtore your life, &c." Then they ſpoke the elogium, or funeral oration, of the deceaſed; after which they ſaid a prayer, called the righteouſneſs of judgment; then turning the face of the deceaſed towards heaven, they called out, "Go in peace."

The ancient Chriſtians teſtified their abhorrence of the Pagan cuſtom of burning the dead; and always depoſited the body entire in the ground: and it was uſual to beſtow the honour of embalming upon the martyrs at leaſt, if not upon others. They prepared the body for burial, by waſhing it with water, and dreſſing it in a funeral attire. The exportation, or carrying forth of the body, was performed by near relations, or perſons of ſuch dignity as the circumſtances of the deceaſed required. Pſalmody, or ſinging of Pſalms, was the great ceremony uſed in all funeral proceſſions among the ancient Chriſtians.

In the Romiſh church, when a perſon is dead, they waſh the body, and put a crucifix in its hand. At its feet ſtands a veſſel full of holy water, and a ſprinkler, that they who come in may ſprinkle both themſelves and the deceaſed. In the mean time ſome prieſt ſtands by the corpſe, and prays for the deceaſed till it is laid in the earth. In the funeral proceſſion, the exorciſt walks firſt, carrying the holy water; next the croſs-bearer, afterwards the reſt of the clergy, and laſt of all the officiating prieſt. They all ſing the *miſerere*, and ſome other pſalms; and at the end of each pſalm a *requiem*. We learn from Alet's ritual, that the faces of deceaſed laymen muſt be turned towards the altar, when they are placed in the church; and thoſe of the clergy, towards the people. The corpſe is placed in the church ſurrounded with lighted tapers: after the office for the dead, maſs is ſaid; then the officiting prieſt ſprinkles the corpſe thrice with holy water, and as often throws incenſe on it. The body being laid in the grave, the friends and relations of the deceaſed ſprinkle the grave with holy water.

The funeral ceremonies of the Greek church, are much the ſame with thoſe of the Latin. It needs only be obſerved, that after the funeral ſervice, they kiſs the crucifix, and ſalute the mouth and forehead of the deceaſed: after which each of the company eats a bit of bread, and drinks a glaſs of wine in the church, wiſhing the ſoul a good repoſe, and the afflicted family all conſolation.

Funeral games, a part of the ceremony of the ancient funerals.

It was cuſtomary for perſons of quality, among the ancient Greeks and Romans, to inſtitute games with all ſorts of exerciſes, to render the death of their friends more remarkable. This practice was generally received, and is frequently mentioned by ancient writers. Patroclus's funeral games, take up the greateſt part of one of Homer's iliads; and Agamemnon's ghoſt is introduced by the ſame poet telling the ghoſt of Achilles, that he had been a ſpectator at a great number of ſuch ſolemnities.

The celebration of theſe games among the Greeks, moſtly conſiſted of horſe-races; the prizes were of different ſorts and value, according to the quality and magnificence of the perſon that celebrated them. The garlands, given to victors on this occaſion, were uſually of parſly, which was thought to have ſome particular relation to the dead.

Thoſe games, among the Romans, conſiſted chiefly of proceſſions; and ſometimes of mortal combats of gladiators around the funeral pile. They, as well as the Greeks, had alſo a cuſtom, though very ancient, of cutting the throats of a number of captives before the pile, as victims to appeaſe the manes of the deceaſed. Cæſar relates, that the Gauls had this cuſtom.

The funeral games were aboliſhed by the emperor Claudius.

Funeral oration, a diſcourſe pronounced in praiſe of a perſon deceaſed, at the ceremony of his funeral.

FUNGIBLES, in Scots law, are ſuch things as are eſtimated by number, weight, or meaſure; as, coin, butter, ale, &c.

FUNGITÆ, in natural hiſtory, a kind of foſſile coral, of a conic figure, though ſometimes flatted and ſtriated longitudinally.

FUNGUS, in ſurgery, denotes any ſpongy excreſcence. See SURGERY.

Fungus, in botany, See BOTANY, p. 636.

FURCA, in antiquity, a piece of timber reſembling a fork, uſed by the Romans as an inſtrument of puniſhment.

The puniſhment of the furca was of three kinds: the firſt only ignominious, when a maſter, for ſmall offences, forced his ſervant to carry a furca on his ſhoulders about the city. The ſecond was penal, when the party was led about the circus, or other place, with the furca about his neck, and whipped all the way. The third was capital, when the malefactor, having his head faſtened to the furca, was whipped to death.

FURCHE', in heraldry, a croſs forked at the ends.

FURIES, in Pagan antiquity, certain goddeſſes whoſe office it was to puniſh the guilty after death. Theſe were three in number; Alecto, Megæra, and Tiſiphone, who were deſcribed with ſnakes inſtead of hair, and eyes like lightening, carrying iron-chains and whips in one hand, and in the other flaming torches; the latter to diſcover, and the former to puniſh the guilty; and they were ſuppoſed to be conſtantly hovering over ſuch perſons as had been guilty of any enormous crime.

Mythologiſts ſuppoſe, that Tiſiphone puniſhed the crimes which ſprang from hatred or anger; Megæra, thoſe from envy; and Alecto, thoſe from an inſatiable purſuit after riches and pleaſure. They were worſhipped at Caſina in Arcadia, and at Carmia in Peloponneſus.

ſus. They had a temple at Athens, near the Areopagus, and their prieſts were choſen from amongſt the judges of that court. At Telphuſia, a city in Arcadia, a black ewe was ſacrificed to them.

FURLING, in the ſea language, ſignifies the wrapping up and binding any ſail cloſe to the yard; which is done by hauling upon the clew-lines, bunt-lines, *&c.* which wraps the ſail cloſe together, and being bound faſt to the yard, the ſail is furled.

FURLONG, a long meaſure, equal to one eighth of a mile, or forty poles.

It is alſo uſed, in ſome law-books, for the eighth part of an acre.

FURLOUGH, in the military language, a licence granted by an officer to a ſoldier, to be abſent for ſome time from his duty.

FURNACE, an utenſil, or veſſel, proper to contain fire; or to raiſe and maintain a vehement fire in, whether of coal or wood. See CHEMISTRY, p. 110.

FURNES, a town of Flanders, ten miles eaſt of Dunkirk: E. long. 2° 25′, and N. lat. 51° 10′.

FUROR UTERINUS, a diſorder peculiar to women. See MEDICINE.

FURR, in commerce, ſignifies the ſkin of ſeveral wild beaſts, dreſſed in alum with the hair on, and uſed as a part of dreſs by princes, magiſtrates, and others. The kinds moſt in uſe are, thoſe of the ermine, ſable, caſtor, hare, coney, *&c.*

FURSTENBURGH, a town and caſtle of Germany, the capital of a county of the ſame name, thirty miles north-weſt of Conſtance: E. long. 8° 30′, and N. lat. 47° 50′.

FURSTENFIELD, a town of Auſtria and dutchy of Stiria, thirty-ſix miles eaſt of Gratz: E. long. 16° 46′, N. lat. 47° 26′.

FURTHCOMING, in law, the name of an action competent to any perſon who has uſed arreſtment in the hands of his debtor's creditor, for having the ſubject arreſted declared his property. See SCOTS LAW, title 25.

FURUNCLE, or BOIL, in ſurgery, a ſmall reſiſting tumour, with inflammation, redneſs, and great pain, ariſing in the adipoſe membrane, under the ſkin.

FURZE, in botany. See ULEX.

FUSANUS, in botany. See EUONYMUS.

FUSAROLE, in architecture, a moulding or ornament placed immediately under the echinus, in the Doric, Ionic, and Compoſite capitals.

FUSEE, in clock-work, is that conical part drawn by the ſpring, and about which the chain or ſtring is wound; for the uſe of which, ſee WATCH.

FUSEE, or FIRELOCK. See MUSQUET.

FUSIBILITY, in natural philoſophy, that quality of bodies which renders them fuſible.

FUSIL, in heraldry, a bearing of a rhomboidal figure, longer than the lozenge, and having its upper and lower angles more acute and ſharp than the other two in the middle. It is called in Latin *fuſus*, a ſpindle, from its ſhape. See Plate LXXX. fig. 10.

FUSILIERS, or FUSILEERS, in the military art, are foot-ſoldiers, armed with fuſees, or firelocks.

FUSION, the melting of metals, minerals, *&c.* by means of fire. See CHEMISTRY.

FUSTIAN, in commerce, a kind of cotton ſtuff, which ſeems as it were whaled on one ſide.

Right fuſtians ſhould be altogether made of cotton-yarn, both woof and warp; but a great many are made, of which the warp is flax, or even hemp.

There are fuſtians made of ſeveral kinds, wide, narrow, fine, coarſe; with ſhag or nap, and without it.

FUSTICK, or FUSTOCK, a yellow wood, that grows in all the Caribbee iſlands, uſed in dying yellow. It pays no duty on importation.

FUTTOCKS, in a ſhip, the timbers raiſed over the keel, or the encompaſſing timbers that make her breadth.

FUTURE, in general, denotes whatever regards futurity, or the time to come.

* * *

G

GABARA, or GABBARA, in antiquity, the dead bodies which the Egyptians embalmed, and kept in their houſes, eſpecially thoſe of ſuch of their friends as died with the reputation of great piety and holineſs, or as martyrs. See EMBALMING, and MUMMY.

GABEL, according to the French duties or cuſtoms, a tax upon ſalt, which makes the ſecond article in the king's revenue, and amounts to about one fourth part of the whole revenue of the kingdom.

GABIN, a town of great Poland, forty-ſix miles north-weſt of Warſaw: E. long. 20°, N. lat. 52° 35′.

GABIONS, in fortification, baſkets made of ozier-twigs, of a cylindrical form, ſix feet high, and four wide; which being filled with earth, ſerve as a ſhelter from the enemies fire.

GABLOCKS, the artificial ſpurs of game-cocks.

GAD, among miners, a ſmall punch of iron, with a long wooden handle, uſed to break up the ore.

One of the miners holds this in his hand, directing the point to a proper place, while the other drives it into the vein, by ſtriking it with a ſledge-hammer.

GAD-FLY. See OESTRUS.

GADUS, in ichthyology, a genus of fiſhes belonging to the order of jugulares. The head is ſmooth; there are ſeven cylindrical rays in the branchioſtege membrane; the body is oblong, with deciduous ſcales; the whole fins are covered with the common ſkin of the fiſh; the rays of the back-fins are blunt, and thoſe of the breaſt are ſharp. There are ſeventeen ſpecies, principally diſtinguiſhed by their cirri, and the number of back-fins.

GAGE, in the ſea-language. When one ſhip is to windward of another, ſhe is ſaid to have the weather-gage of her. They likewiſe call the number of feet that a veſſel ſinks in the water, the ſhip's gage: this they find by driving a nail into a pike near the end, and putting it down beſide the rudder till the nail catch hold under it; then as many feet as the pike is under water, is the ſhip's gage.

GAGE, among letter-founders, a piece of box, or other hard wood, variouſly notched; the uſe of which is to adjuſt the dimenſions, ſlopes, *&c.* of the different ſorts of letters. See FOUNDERY.

***Sliding*-GAGE**, a tool uſed by mathematical inſtrument-makers, for meaſuring and ſetting off diſtances.

***Sea* GAGE**, an inſtrument invented by Dr Hales and Dr Deſaguliers, for finding the depth of the ſea, the deſcription whereof is this. AB (Plate LXXXVI. fig. 1. N° 1.) is the gage bottle, in which is cemented the gage-tube *Ff* in the braſs cap at G. The upper end of tube F is hermetically ſealed, and the open lower end *f* is immerſed in mercury, marked C, on which ſwims a ſmall thickneſs or ſurface of treacle. On the top of the bottle is ſcrewed a tube of braſs HG, pierced with ſeveral holes, to admit the water into the bottle AB. The body K is a weight hanging by its ſhank L, in a ſocket N, with a notch on one ſide at *m*, in which is fixed the catch *l* of the ſpring S, and paſſing through the hole L, in the ſhank of the weight K, prevents its falling out when once hung on. On the top, in the upper part of the braſs tube at H, is fixed a large empty ball, or full-blown bladder I, which muſt not be ſo large, but that the weight K may be able to ſink the whole under water.

The inſtrument, thus conſtructed, is uſed in the following manner: The weight K being hung on, the gage is let fall into deep water, and ſinks to the bottom; the ſocket N is ſomewhat longer than the ſhank L, and therefore, after the weight K comes to the bottom, the gage will continue to deſcend, till the lower part of the ſocket ſtrikes againſt the weight; this gives liberty to the catch to fly out of the hole L, and let go the weight K; when this is done, the ball or bladder I, inſtantly buoys up the gage to the top of the water. While the gage is under water, the water having free acceſs to the treacle and mercury in the bottle, will by its preſſure force it up into the tube *Ff*, and the height to which it has been forced by the greateſt preſſure, *viz.* that at the bottom, will be ſhewn by the mark in the tube which the treacle leaves behind it, and which is the only uſe of the treacle. This ſhews into what ſpace the whole air in the tube *Ff* is compreſſed; and conſequently the height or depth of the water, which by its weight produced that compreſſion, which is the thing required.

If the gage-tube *Ff* be of glaſs, a ſcale might be drawn on it with the point of a diamond, ſhewing, by inſpection, what height the water ſtands above the bottom. But the length of 10 inches is not ſufficient for fathoming depths at ſea, ſince that, when all the air in ſuch a length of tube is compreſſed into half an inch, the depth of water is no more than 634 feet, which is not half a quarter of a mile.

If, to remedy this, we make uſe of a tube fifty inches long, which for ſtrength may be a muſket barrel, and ſuppoſe the air compreſſed into an hundredth part of half an inch; then by ſaying, as 1 : 99 :: 400 : 39600 inches, or 3300 feet; even this is but little more than half a mile, or 2640 feet. But ſince it is reaſonable to ſuppoſe the cavities of the ſea bear ſome proportion to the mountainous parts of the land, ſome of which are more than three miles above the earth's ſurface; therefore, to explore ſuch great depths, the Doctor contrived a new form for his ſea-gage, or rather for the gage-tube in it, as follows: BCDF (*ibid.* N° 2.) is a hollow metalline globe communicating on the top with a long tube AB, whoſe capacity is a ninth part of that globe. On the lower part at D, it has alſo a ſhort tube DE, to ſtand in the mercury and treacle. The air contained in the compound gage-tube is compreſſed by the water as before; but the degree of compreſſion, or height to which the treacle has been forced, cannot there be ſeen through the tube; therefore, to anſwer that end, a ſlender rod of metal or wood, with a knob on the top of the tube AB, will receive the mark of the treacle, and ſhew it, when taken out.

If the tube AB be 50 inches long, and of ſuch a bore that every inch in length ſhould be a cubic inch of air, and the contents of the globe and tube together 500 cubic inches; then, when the air is compreſſed within an hundredth part of the whole, it is evident the treacle will not approach nearer than 5 inches of the top of the tube, which will agree to the depth of 3300 feet of water as above. Twice this depth will compreſs the air into half that ſpace nearly, *viz.* $2\frac{1}{2}$ inches, which correſpond to 6600 which is a mile and a quarter. Again, half that ſpace, or $1\frac{1}{4}$ inch, will ſhew double the former depth, *viz.* 13200 feet, or $2\frac{1}{2}$ miles, which is probably very nearly the greateſt depth of the ſea.

GAIETA, a ſtrong fortified town of the kingdom of Naples in Italy, thirty-five miles north-weſt of the city of Naples: E. long. 14° 30′, and N. lat. 41° 20′.

GAINSBOROUGH, a market-town of Lincolnſhire, fourteen milles north-weſt of Lincoln; which gives the title of earl to the noble family of Noel.

GAIOPHRAGMIA, in natural hiſtory, a genus of ſeptariæ, divided by ſeptæ or partitions of earthy matter, of which there are ſeveral ſpecies. See SEPTARIÆ.

GALACTITES, in natural hiſtory, the name by which the ancients called a ſmooth, aſh-coloured, indurated kind of clay, ſaid to have been uſed with ſucceſs for defluxions and ulcers of the eyes, and as an aſtringent.

GALANGALS, in the materia medica, the name of a root kept in the ſhops, but now moſtly out of uſe in practice.

GALANTHUS, the Snow-drop, in botany, a genus of the hexandria monogynia claſs. It has three concave petals, a ſimple ſtigma, and a nectarium compoſed of three ſmall petals. There is but one ſpecies, a native of Germany.

GALATA, a great ſuburb belonging to Conſtantinople, oppoſite to the ſeraglio, on the other ſide of the harbour. It is here the Greeks, Armenians, Franks, Chriſtians, and Jews inhabit, and are allowed the exerciſe of their reſpective worſhips.

GALATIA, the ancient name of Amaſia, a province of Leſſer Aſia.

GALAX, in botany, a genus of the pentandria monogynia claſs. The calix conſiſts of ten leaves; and the capſule has one cell and two elaſtic valves. There is but one ſpecies, a native of Virginia.

GALAXY, in aſtronomy. See Astronomy, p. 487.

GALBANUM, in pharmacy, a gum iſſuing from the ſtem of an umbelliferous plant, growing in Perſia and many parts of Africa.

It is ſometimes met with in the ſhops in looſe granules, called drops or tears; and ſometimes in large maſſes, formed of a number of theſe blended together; but in theſe maſſes ſome accidental foulneſs is often mixed with the gum. The ſingle drops uſually approach to a roundiſh, oblong, pear-like form. Galbanum is ſoft like wax, and, when freſh drawn, white; but it afterwards becomes yellowiſh or reddiſh: it is of a ſtrong ſmell, of an acrid and bitteriſh taſte; it is inflammable in the manner of a reſin, and ſoluble in water like a gum.

It attenuates and diſſolves tough phlegm, and is therefore of ſervice in aſthmas and inveterate coughs.

GALEGA, in botany, a genus of the diadelphia decandria claſs. The calix conſiſts of equal ſubulated teeth; and the pod has oblique ſtriæ, with a ſeed between each. There are eight ſpecies, none of them natives of Britain.

GALENISTS, in church-hiſtory, a branch of anabaptiſts, who are ſaid to have adopted ſeveral Arian opinions concerning the divinity of our Saviour.

GALEOBDOLON, in botany. See Leonurus.

GALERITA, in ichthyology, a ſpecies of blennius. See Blennius.

GALICIA, the moſt north-weſt province of Spain, bounded by the ocean on the north-weſt, by the provinces of Aſturias and Leon on the eaſt, and by Portugal on the ſouth.

Galicia, or **Guadalajara**, a province of Mexico, bounded by new Mexico on the north, by the gulph of Mexico on the eaſt, by Mexico Proper on the ſouth, and by the Pacific Ocean and gulph of California on the weſt.

GALILE, or **Galilee**, once a province of Judea, now of Turky in Aſia, was bounded by mount Lebanon on the north, by the river Jordan and the ſea of Galilee on the eaſt, by the river Chiſon on the ſouth, and by the Mediterranean on the weſt. It was the ſcene of many of our Saviour's miracles.

GALILEANS, a ſect of the Jews. Their founder was one Judas, a native of Galilee, from which place they derived their name. Their chief, eſteeming it an indignity for the Jews to pay tribute to ſtrangers, raiſed up his countrymen againſt the edict of the emperor Auguſtus, which had ordered a taxation or inrollment of all the ſubjects of the Roman empire.

They pretended that God alone ſhould be owned as Maſter and Lord; and in other reſpects were of the opinion of the Phariſees; but, as they judged it unlawful to pray for infidel princes, they ſeparated themſelves from the reſt of the Jews, and performed their ſacrifices apart.

GALL, in the animal œconomy. See Bile.

Gall-bladder. See Anatomy, p. 269.

Gall, in natural hiſtory, denotes any protuberance or tumour produced by the puncture of inſects on plants and trees of different kinds.

Theſe galls are of various forms and ſizes, and no leſs different with regard to their internal ſtructure. Some have only one cavity, and others a number of ſmall cells communicating with each other. Some of them are as hard as the wood of the tree they grow on, whilſt others are ſoft and ſpongy; the firſt being termed gall-nuts, and the latter berry-galls, or apple-galls.

The general hiſtory of galls is this: an inſect of the fly kind is inſtructed by nature to take care for the ſafety of her young, by lodging her eggs in a woody ſubſtance, where they will be defended from all injuries: ſhe for this purpoſe wounds the leaves or tender branches of a tree; and the lacerated veſſels, diſcharging their contents, ſoon form tumours about the holes thus made. The hole in each of theſe tumours, through which the fly has made its way, may for the moſt part be found; and when it is not, the maggot inhabitant or its remains are ſure to be found within, on breaking the gall. However, it is to be obſerved, that in thoſe galls which contain ſeveral cells, there may be inſects found in ſome of them, though there be a hole by which the inhabitant of another cell has eſcaped.

Oak galls put, in a very ſmall quantity, into a ſolution of vitriol in water, though but a very weak one, give it a purple or violet colour; which, as it grows ſtronger, becomes black; and on this property depends the art of making our writing ink, as alſo a great deal of thoſe of dying and dreſſing leather, and other manufactures.

In medicine, galls are found to be very aſtringent, and good, under proper management, in diarrhœas, dyſentries, and hæmorrhages of all kinds; they have alſo a very eminent virtue as a febrifuge.

GALLERY, in architecture, a covered place in a houſe, much longer than broad, and uſually in the wings of a building; its uſe being chiefly to walk in.

Gallery, in fortification, a covered walk acroſs the ditch of a town, made of ſtrong beams, covered over head with planks, and loaded with earth: ſometimes it is covered with raw hides to defend it from the artificial fires of the beſieged.

Gallery *of a mine*, is a narrow paſſage, or branch of a mine carried on under ground to a work deſigned to be blown up.

Gallery, in a ſhip, that beautiful frame, which is made in the form of a balcony, at the ſtern of a ſhip without board; into which there is a paſſage out of the admiral's or captain's cabbin, and is for the ornament of the ſhip.

GALLEY, in naval affairs, a low-built veſſel, uſing both ſails and oars, and commonly carrying only a main-maſt and fore maſt, which may be ſtruck or lowered at pleaſure. Such veſſels are much uſed in the Mediterranean, eſpecially by the king of France. See Ship.

GALLI, in antiquity, the prieſts of the goddeſs Cybele, who were eunuchs, and took their name from Gallus, a river in Phrygia.

When a youth was to be initiated into this order, the cuſtom was to throw off his cloaths, to run crying aloud into the midſt of the troop, and then drawing a ſword to caſtrate himſelf; after this, he ran about the ſtreets, carrying in his hands the marks of his mutilation, which he was to throw into a houſe, and in that houſe to put on a woman's dreſs.

GALLICIAN, any thing belonging to France: thus the term Gallician church denotes the church of France, or the aſſembly of the clergy of that kingdom.

GALLICISM, a mode of ſpeech peculiar to the French language, and contrary to the rules of grammar in other languages.

GALLINÆ, in ornithology, an order of birds. See Natural History.

GALLINACIOUS, an appellation given to the birds of the order of the gallinæ.

GALLINULA, in ornithology. See Scolopax.

GALLION, or Galleon, in naval affairs, a ſort of ſhips employed in the commerce of the Weſt Indies. The Spaniards ſend annually two fleets; the one for Mexico, which they call the flota, and the other for Peru, which they call the gallions. Se Flota.

GALLIOT, a ſmall galley deſigned only for chace, carrying only one maſt, and two or three pattereroes; it can both ſail and row, and has ſixteen or twenty oars. All the ſeamen on board are ſoldiers, and each has a muſket by him on quitting his oar.

GALLIPAGO-islands, are ſituated in the Pacific Ocean on both ſides the equator, between 85° and 90°, W. long. and about four hundred miles weſt of Peru.

GALLIPOLI, a port town of European Turky, ſituated at the entrance of the Propontis, or Sea of Marmora, about 100 miles ſouth-weſt of Conſtantinople: E. long. 28°, and N. lat. 40° 45′.

Gallipoli is alſo a port town of the kingdom of Naples, ſituated on the gulph of Otranto, about twenty-three miles weſt of that city: E. long. 19°, and N. lat. 40° 25′.

GALLIUM, ladies-bedstraw, in botany, a genus of the tetrandria monogynia claſs. The corolla conſiſts of one plane petal; and the ſeeds are two, and round. There are 23 ſpecies, 11 of them natives of Britain, *viz.* the verum, or yellow ladies-bedſtraw; the mollugo, or wild madder; the montanum, or mountain ladies-bedſtraw; the uliginoſum, or marſh gooſe-graſs; the erectum, or ſmall mountain baſtard madder; the puſillum, or leaſt ladies-bedſtraw; the paluſtre, or white ladies-bedſtraw; the ſpurium, or gooſe-graſs with ſmoother ſeeds; the aparine, cleavers, or gooſe-graſs; the pariſienſe, or leaſt gooſe-graſs; and the boreale, or croſſwood madder.

GALLO, an iſland on the Pacific Ocean near the coaſt of Peru, about 200 miles weſt of Popayan: W. long. 80°, and N. lat. 2° 15′.

Gallo is alſo a town of Italy, ten miles ſouth of Ancona.

Gallo, or Punto gallo, a ſea-port of Ceylon, ſubject to the Dutch: E. long. 78°, and N lat. 6°.

GALLON, a meaſure of capacity both for dry and liquid things, containing four quarts; but theſe quarts, and conſequently the gallon itſelf, are different, according to the quality of the thing meaſured: for inſtance, the wine gallon contains 231 cubic inches, and holds eight pounds averdupois, of pure water: the beer and ale gallon contains 282 ſolid inches, and holds ten pounds three ounces and a quarter averdupois, of water: and the gallon for corn, meal, *&c.* 272¼ cubic inches, and holds nine pounds thirteen ounces of pure water.

GALLOPAVO, in zoology. See Meleagris.

GALLOWAY, a county of Scotland, which gives the title of earl to a branch of the noble family of Stuart.

It is divided into two diſtricts; the weſtern, called Upper Galloway, being the ſame with Wigtonſhire; and the eaſtern, or ſtewartry of Kirkudbright, called Lower Galloway.

Galloway is alſo the capital of a county of the ſame name, in the province of Connaught, in Ireland: W. long. 9° 12′, and N. lat. 53° 12′.

It has a good port, and is advantageouſly ſituated for foreign trade.

GALLUS, in ornithology. See Phasianus.

GALLY, in printing, a frame into which the compoſitor empties the lines out of his compoſing ſtick, and in which he ties up the page when it is compleated.

The gally is formed of an oblong ſquare board, with a ledge on three ſides, and a grove to admit a falſe bottom, called a gally-ſlice.

GAMBIA, a great river of Africa, which, running from eaſt to weſt falls into the Atlantic ocean, 14° N. lat. and 15° W. lon.

GAMBOGE, is a concreted vegetable juice, the produce of two trees, both called by the Indians caracapulli, and is partly of a gummy, and partly of a reſinous nature. It is brought to us either in form of orbicular maſſes, or of cylindrical rolls of various ſizes; and is of a denſe, compact, and firm texture, and of a beautiful yellow. It is chiefly brought to us from Cambaja, in the Eaſt Indies, called alſo Cambodja, and Cambogia; and from thence it has obtained its names of cambadium, cambogium, and gambogium.

It is a very rough and ſtrong purge; it operates both by vomit and ſtool, and both ways with much violence, almoſt in the inſtant in which it is ſwallowed; but yet without griping. It requires caution and judgment in adminiſtring it; but thoſe who know how to give it properly, ſind it an excellent remedy in dropſies, cachexies, jaundice, aſthmas, catarrhs, and in the worſt cutaneous eruptions.

GAME, in general, ſignifies any diverſion, or ſport, that is performed with regularity, and reſtrained to certain rules. See GAMING.

GAMES, in antiquity, were public diverſions, exhibited on ſolemn occaſions. Such, among the Greeks, were the Olympic, Pythian, Iſthmian, Nemean, *&c.* games; and, among the Romans, the Apollinarian, Circenſian, Capitoline, *&c.* games. See OLYMPIC, PYTHIAN, *&c.*

GAME, in law, ſignifies birds or prey, taken or killed by fowling, or hunting. There are ſeveral ſtatutes for puniſhing offences committed by perſons not qualified by law to take or deſtroy the game.

GAME-COCK, a fighting cock, or one kept for ſport; a barbarous practice, which is a diſgrace to any civilized nation.

GAMELIA, in Grecian antiquity, a nuptial feaſt, or rather ſacrifice, held in the ancient Greek families on the day before a marriage; thus called, from a cuſtom they had of ſhaving themſelves on this occaſion, and preſenting their hair to ſome deity to whom they had particular obligations.

GAMELION, in the ancient chronology, was the eighth month of the Athenian year, containing twenty-nine days, and anſwering to the latter part of our January and beginning of February. It was thus called, as being, in the opinion of the Athenians, the moſt proper ſeaſon of the year for marriage.

GAMING, the art of playing or practiſing any game, particularly thoſe of hazard, as cards, dice, tables, *&c.*

Mr de Moivre, in a treatiſe de Menſura Sortis, has computed the variety of chances in ſeveral caſes that occur in gaming, the laws of which may be underſtood by what follows.

Suppoſe p the number of caſes in which an event may happen, and q the number of caſes wherein it may not happen, both ſides have the degree of probability, which is to each other as p to q.

If two gameſters, A and B, engage on this footing, that, if the caſes p happen, A ſhall win; but if q happen, B ſhall win, and the ſtake be a; the chance of A will be $\frac{pa}{p+q}$, and that of B $\frac{qa}{p+q}$; conſequently, if they ſell the expectancies, they ſhould have that for them reſpectively.

If A and B play with a ſingle die, on this condition, that, if A throw two or more aces at eight throws, he ſhall win; otherwiſe B ſhall win; what is the ratio of their chances? Since there is but one caſe wherein an ace may turn up, and five wherein it may not, let $a=1$. and $b=5$. And, again, ſince there are eight throws of the die, let $n=8$; and you will have $\overline{a+b}|^n - b^n - nab^n - 1$, to $b^n + nab^n - 1$: that is, the chance of A will be to that of B, as 663991 to 10156525, or nearly as 2 to 3.

A and B are engaged at ſingle quoits; and, after playing ſome time, A wants 4 of being up, and B 6; but B is ſo much the better gameſter, that his chance againſt A upon a ſingle throw would be as 3 to 2; what is the ratio of their chances? Since A wants 4, and B 6, the game will be ended at nine throws; therefore, raiſe $a+b$ to the ninth power, and it will be $a^9+9a^8b+36a^7bb+84a^6b^3+126a^5b^4+126a^4b^5$, to $84a^3b^6+36aab^7+6ab^3+b^9$: call a 3, and b 2, and you will have the ratio of chances in numbers, *viz.* 1759077 to 194048.

A and B play at ſingle quoits, and A is the beſt gameſter, ſo that he can give B 2 in 3, what is the ratio of their chances at a ſingle throw? Suppoſe the chances as z to 1, and raiſe $z+1$ to its cube, which will be z^3+3z^2+3z+1. Now ſince A could give B 2 out of 3, A might undertake to win three throws running; and, conſequently, the chances in this caſe will be as z^3 to $3z^2+3z+1$. Hence $z^3=3z^2+3z+1$; or, $2z^3=z^3+3z^2-3z+1$. And, therefore, $z\sqrt[3]{2}=z+1$; and, conſequently, $z=\frac{1}{\sqrt[3]{2}-1}$. The chances, therefore, are $\frac{1}{\sqrt[3]{2}-1}$, and 1, reſpectively.

Again, ſuppoſe I have two wagers depending, in the firſt of which I have 3 to 2 the beſt of the lay, and in the ſecond 7 to 4, what is the probability I win both wagers?

1. The probability of winning the firſt is $\frac{3}{5}$, that is the number of chances I have to win, divided by the number of all the chances: the probability of winning the ſecond is $\frac{7}{11}$: therefore, multiplying theſe two fractions together, the product will be $\frac{21}{55}$, which is the probability of winning both wagers. Now, this fraction being ſubtracted from 1, the remainder is $\frac{34}{55}$, which is the probability I do not win both wagers: therefore the odds againſt me are 34 to 21.

2. If I would know what the probability is of winning the firſt, and loſing the ſecond, I argue thus: the probability of winning the firſt is $\frac{3}{5}$, the probability of loſing the ſecond is $\frac{4}{11}$: therefore multiplying $\frac{3}{5}$ by $\frac{4}{11}$, the product $\frac{12}{55}$ will be the probability of my winning the firſt, and loſing the ſecond; which being ſubtracted from 1, there will remain $\frac{43}{55}$, which is the probability I do not win the firſt, and at the ſame time loſe the ſecond.

3. If I would know what the probability is of winning the ſecond, and at the ſame time loſing the firſt, I ſay thus: the probability of winning the ſecond is $\frac{7}{11}$; the probability of loſing the firſt is $\frac{2}{5}$: therefore, multiplying theſe two fractions together, the product $\frac{14}{55}$ is the probability I win the ſecond, and alſo loſe the firſt.

4. If I would know what the probability is of loſing both wagers, I ſay, the probability of loſing the firſt is $\frac{2}{5}$, and the probability of loſing the ſecond $\frac{4}{11}$: therefore, the probability of loſing them both is $\frac{8}{55}$; which being ſubtracted from 1, there remains $\frac{47}{55}$: therefore, the odds of loſing both wagers is 47 to 8.

This way of reaſoning is applicable to the happening or failing of any events that may fall under conſideration.

deration. Thus if I would know what the probability is of miſſing an ace four times together with a die, this I conſider as the failing of four different events. Now the probability of miſſing the firſt is $\frac{5}{6}$, the ſecond is alſo $\frac{5}{6}$, the third $\frac{5}{6}$, and the fourth $\frac{5}{6}$; therefore the probability of miſſing it four times together is $\frac{5}{6}\times\frac{5}{6}\times\frac{5}{6}\times\frac{5}{6}=\frac{625}{1296}$; which being ſubtracted from 1, there will remain $\frac{671}{1296}$ for the probability of throwing it once or oftener in four times: therefore the odds of throwing an ace in four times, is 671 to 625.

But if the flinging of an ace was undertaken in three times, the probability of miſſing it three times would be $\frac{5}{6}\times\frac{5}{6}\times\frac{5}{6}=\frac{125}{216}$; which being ſubtracted from 1, there will remain $\frac{91}{216}$ for the probability of throwing it once or oftener in three times: therefore the odds againſt throwing it in three times are 125 to 91. Again, ſuppoſe we would know the probability of throwing an ace once in four times, and no more: ſince the probability of throwing it the firſt time is $\frac{1}{6}$, and of miſſing it the other three times is $\frac{5}{6}\times\frac{5}{6}\times\frac{5}{6}$, it follows that the probability of throwing it the firſt time, and miſſing it the other three ſucceſſive times, is $\frac{1}{6}\times\frac{5}{6}\times\frac{5}{6}\times\frac{5}{6}=\frac{125}{1296}$; but becauſe it is poſſible to hit it every throw as well as the firſt, it follows, that the probability of throwing it once in four throws, and miſſing the other three, is $\frac{4\times125}{1296}=\frac{500}{1296}$; which being ſubtracted from 1, there will remain $\frac{796}{1296}$ for the probability of throwing it once, and no more, in four times. Therefore, if one undertake to throw an ace once, and no more, in four times, he has 500 to 796 the worſt of the lay, or 5 to 8 very near.

Suppoſe two events are ſuch, that one of them has twice as many chances to come up as the other, what is the probability that the event, which has the greater number of chances to come up, does not happen twice before the other happens once, which is the caſe of flinging 7 with two dice before 4 once? Since the number of chances are as 2 to 1, the probability of the firſt happening before the ſecond is $\frac{2}{3}$, but the probability of its happening twice before it is but $\frac{2}{3}\times\frac{2}{3}$ or $\frac{4}{9}$: therefore it is 5 to 4 ſeven does not come up twice before four once.

But, if it were demanded, what muſt be the proportion of the facilities of the coming up of two events, to make that which has the moſt chances come up twice, before the other comes up once? The anſwer is 12 to 5 very nearly: whence it follows, that the probability of throwing the firſt before the ſecond is $\frac{12}{17}$, and the probability of throwing it twice is $\frac{12}{17}\times\frac{12}{17}$, or $\frac{44}{289}$; therefore, the probability of not doing it is $\frac{145}{289}$: therefore the odds againſt it are as 145 to 144, which comes very near an equality.

Suppoſe there is a heap of thirteen cards of one colour, and another heap of thirteen cards of another colour, what is the probability that, taking one card at a venture out of each heap, I ſhall take out the two aces?

The probability of taking the ace out of the firſt heap is $\frac{1}{13}$, the probability of taking the ace out of the ſecond heap is $\frac{1}{13}$; therefore the probability of taking out both aces is $\frac{1}{13}\times\frac{1}{13}=\frac{1}{169}$, which being ſubtracted from 1, there will remain $\frac{168}{169}$: therefore the odds againſt me are 168 to 1.

In caſes where the events depend on one another, the manner of arguing is ſomewhat altered. Thus, ſuppoſe that out of one ſingle heap of thirteen cards of one colour I ſhould undertake to take out firſt the ace; and, ſecondly, the two: though the probability of taking out the ace be $\frac{1}{13}$, and the probability of taking out the two be likewiſe $\frac{1}{13}$; yet, the ace being ſuppoſed as taken out already, there will remain only twelve cards in the heap, which will make the probability of taking out the two to be $\frac{1}{12}$; therefore the probability of taking out the ace, and then the two, will be $\frac{1}{13}\times\frac{1}{12}$.

In this laſt queſtion the two events have a dependence on each other, which conſiſts in this, that one of the events being ſuppoſed as having happened, the probability of the other's happening is thereby altered. But the caſe is not ſo in the two heaps of cards.

If the events in queſtion be n in number, and be ſuch as have the ſame number a of chances by which they may happen, and likewiſe the ſame number b of chances by which they may fail, raiſe $a+b$ to the power n. And if A and B play together, on condition that if either one or more of the events in queſtion happen, A ſhall win, and B loſe, the probability of A's winning will be $\frac{\overline{a+b}|^{n}-b^{n}}{\overline{a+b}|^{n}}$; and that of B's winning will be $\frac{b^{n}}{\overline{a+b}|^{n}}$; for when $a+b$ is actually raiſed to the power n, the only term in which a does not occur is the laſt b^{n}: therefore all the terms but the laſt are favourable to A.

Thus if $n=3$, raiſing $a+b$ to the cube $a^{3}+3a^{2}b+3ab^{2}+b^{3}$, all the terms but b^{3} will be favourable to A; and therefore the probability of A's winning will be $\frac{a^{3}+3a^{2}b+3ab^{2}}{\overline{a+b}|^{3}}$, or $\frac{\overline{a+b}|^{3}-b^{3}}{\overline{a+b}|^{3}}$; and the probability of B's winning will be $\frac{b^{3}}{\overline{a+b}|^{3}}$. But if A and B play on condition, that if either two or more of the events in queſtion happen, A ſhall win; but in caſe one only happen, or none, B ſhall win; the probability of A's winning will be $\frac{\overline{a+b}|^{n}-nab^{n-1}-b^{n}}{\overline{n+b}|^{n}}$; for the only two terms in which aa does not occur, are the two laſt, *viz.* nab^{n-1} and b^{n}.

GAMMUT, in muſic, a ſcale whereon we learn to ſound the muſical notes, *ut*, *re*, *mi*, *fa*, *ſol*, *la*, in their ſeveral orders and diſpoſitions. See MUSIC.

GANG-WAY is the ſeveral paſſages or ways from one part of the ſhip to the other; and whatever is laid in any of thoſe paſſages, is ſaid to lie in the gang-way.

GANGEA, the capital of a territory in the province of Chirvan, in Perſia: E. long. 46°, N. lat. 41°.

GANGES, a large river of the hither India, riſes in the mountains which ſeparate India from Tartary; and, running from the north weſt to the ſouth eaſt near 1500 miles through the Mogul's dominions, diſcharges itſelf by ſeveral channels into the bay of Bengal.

GANGI, or Couler, a town of Golconda, in the hither India: E. long. 79°, and N. lat. 16°.

GANGLIO, or Ganglion, in ſurgery, a hard tubercle, generally moveable, in the external or internal part of the carpus, upon the tendons or ligaments in that part, uſually without any pain to the patient.

GANGRENE, a very great and dangerous degree of inflammation, wherein the parts affected begin to corrupt, and put on a ſtate of putrefaction. See Medicine and Surgery.

GANTLET, or Gauntlet, a large kind of glove, made of iron, and the figures covered with ſmall plates. It was formerly worn by cavaliers, when armed at all points.

GAOL, a priſon, or place of legal confinement.

Gaol delivery, is where a commiſſion or patent is granted by the king in the nature of a letter, to certain perſons, who are thereby appointed his juſtices, or to two or three of them, authoriſing them to deliver his gaol, at ſuch a place, of the priſoners contained therein; and for that end it commands them to meet at ſuch a place, at the time they themſelves ſhall appoint, when the ſheriff of the county is commanded to bring all the priſoners in the gaol before them, *&c.*

GAP, a city and biſhop's ſee of Dauphine, in France, eighteen miles weſt of Embrun: E. long. 5° 46′, N. lat. 44° 32′.

GARBE, in heraldry, a ſheaf of any kind of grain, bore in ſeveral coats of arms, and ſaid to repreſent ſummer, as a bunch of grapes does autumn.

GARCINIA, in botany, a genus of the icoſandria monogynia claſs. The flower conſiſts of four roundiſh patent petals; and the fruit is a large unilocular coriaceous berry, containing eight hairy and fleſhy ſeeds, convex on one ſide, and angular on the other. There are two ſpecies, none of them natives of Britain.

GARDA, a town of the Veroneſe, in Italy, ſubject to Venice: E. long. 11°, N. lat. 45° 25′.

GARDANT, or Guardant, in heraldry, denotes any beaſt full faced, and looking right forward. See Plate LXXXVII. fig. 6. which repreſents a lion gardant.

GARDELEBEN, a town of Bradenburg, in Germany: E. long. 11° 45′, N. lat. 52° 40′.

GARDENING.

GARDENING, a branch of agriculture, containing the cultivation of gardens.

The ſimpleſt idea of a garden, is that of a ſpot embelliſhed with a number of natural objects, trees, walks, poliſhed parterres, flowers, ſtreams, *&c.* One more complex comprehends ſtatues and buildings, that nature and art may be mutually ornamental. A third approaching nearer perfection, is of objects aſſembled together, in order to produce, not only an emotion of beauty, eſſential to every garden, but alſo ſome other particular emotion, grandeur for example, or gaiety. The moſt perfect idea of a garden is an improvement upon the third, requiring the ſeveral parts to be arranged in ſuch a manner, as to inſpire all the different emotions that can be raiſed by gardening. In this idea of a garden, the arrangement is an important circumſtance; for ſome emotions figure beſt in conjunction, and others ought always to appear in ſucceſſion and never in conjunction. When the moſt oppoſite emotions, ſuch as gloomineſs and gaiety, ſtillneſs and activity, follow each other in ſucceſſion, the pleaſure on the whole will be the greateſt; but ſuch emotions ought not to be united, becauſe they produce an unpleaſant mixture. For that reaſon, a ruin, affording a ſort of melancholy pleaſure, ought not to be ſeen from a flower-parterre, which is gay and cheerful: but to paſs from an exhilarating object to a ruin, has a fine effect; for each of the emotions is the more ſenſibly felt by being contraſted with the other. Similar emotions, on the other hand, ſuch as gaiety and ſweetneſs, ſtillneſs and gloomineſs, motion and grandeur, ought to be raiſed together; for their effects upon the mind are greatly heightened by their conjunction.

Kent's method of embelliſhing a field, is admirable; which is, to paint a field with beautiful objects, natural and artificial, diſpoſed like colours upon a canvas. It requires indeed more genius to paint in the gardening way: in forming a lanſcape upon a canvas, no more is required but to adjuſt the figures to each other: an artiſt who lays out ground in Kent's manner, has an addditional taſk; he ought to adjuſt his figures to the ſeveral varieties of the field.

One garden muſt be diſtinguiſhed from a plurality; and yet it is not obvious wherein the unity of a garden conſiſts. A notion of unity is indeed ſuggeſted from viewing a garden ſurrounding a palace, with views from each window, and walks leading to every corner: but there may be a garden without a houſe; in which caſe, what makes it one garden, is the unity of deſign, every ſingle ſpot appearing part of a whole. The gardens of Verſailles, properly expreſſed in the plural number, being no fewer than ſixteen, are indeed all of them connected with the palace, but have ſcarce any mutual connection: they appear not like parts of one whole, but rather like ſmall gardens in contiguity. Were theſe gardens at ſome diſtance from each other, they would have a better effect: their junction breeds confuſion of ideas, and upon the whole gives leſs pleaſure than would be felt in a flower ſucceſſion.

Regularity is required in that part of a garden which joins the dwelling-houſe; for being conſidered as a more immediate acceſſory, it ought to partake the regularity of the principal object: but in proportion to the diſtance from the houſe conſidered as the centre, regularity ought leſs and leſs to be ſtudied; for, in an extenſive plan, it hath a fine effect to lead the mind inſenſibly from regularity to a bold variety. Such arrangement tends to make an impreſſion of grandeur: and grandeur ought to be ſtudied as much as poſſible, even in a more confined plan, by avoiding a multiplicity of ſmall parts. A ſmall garden, on the other hand, which admits not grandeur, ought to be ſtrictly regular.

Milton, deſcribing the garden of Eden, prefers juſtly the grand taſte to that of regularity:

Flow'rs worthy of paradiſe, which not nice art
In beds and curious knots; but Nature boon
Pour'd forth profuſe on hill, and dale, and plain;
Both where the morning-ſun firſt warmly ſmote
The open field, and where the unpierc'd ſhade
Imbrown'd the noontide bow'rs. *Paradiſe Loſt, b.* 4.

An hill, by being covered with trees, appears both more powerful and more lofty; provided no other beauties be hid that might be ſeen if the hill were naked. To diſtribute trees in a plain requires more art: near the dwelling houſe they ought to be ſo thin, as not to break the unity of the field; and even at the greateſt diſtance of diſtinct viſion, they ought never to be ſo crowded as to hide any beautiful object.

In the manner of planting a wood or thicket, much art may be diſplayed. A common centre of walks, termed *a ſtar*, from whence are ſeen a number of remarkable objects, appears too artificial, and conſequently too ſtiff and formal, to be agreeable: the crowding withal ſo many objects together, leſſens the pleaſure that would be felt in a ſlower ſucceſſion. Abandoning therefore the ſtar, let us try to ſubſtitute ſome form more natural, that will lay open all the remarkable objects in the neighbourhood. This may be done by various openings in the wood contrived to catch ſurrounding objects, which in walking bring ſucceſſively under the eye theſe objects as by accident; ſometimes a ſingle object, ſometimes a plurality in a line, and ſometimes a rapid ſucceſſion of them. In this form, the mind at intervals is rouſed and cheered by agreeable objects; and the ſcene is greatly heightened by the ſurpriſe it occaſions when we ſtumble, as it were, upon objects of which we had no expectation.

An object terminating in a narrow opening in a wood, appears at a double diſtance. This ſuggeſts another rule for diſtributing trees in ſome quarter near the dwelling-houſe; which is, to place a number of thickets one behind another, with an opening in each directing the eye to the moſt diſtant through all the intermediate thickets; which, by making theſe thickets appear more diſtant from each other than they are in reality, will enlarge in appearance the ſize of the whole field. To give this plan its utmoſt effect, the thickets ought to be at a conſiderable diſtance from each other: and, in order that each may be ſeen diſtinctly, the opening neareſt the eye ought to be wider than the ſecond, the ſecond wider than the third, and ſo one to the end.

By a judicious diſtribution of trees, various beauties may be produced, far exceeding what have been mentioned; which will appear as follows. A landſcape ſo rich as to ingroſs the whole attention, and ſo limited as ſweetly to be comprehended under a ſingle view, has a much finer effect than the moſt extenſive landſcape that requires a wandering of the eye through ſucceſſive ſcenes. This conſideration ſuggeſts a capital rule in laying out a field; which is, never at any one ſtation to admit a larger proſpect than can eaſily be taken in at once. A field ſo happily ſituated as to command a great extent of proſpect, is a delightful ſubject for applying this rule: let the proſpect be ſplit into proper parts by means of trees; ſtudying at the ſame time to introduce all the variety poſſible. A plan of this kind executed with taſte will produce charming effects: the beautiful proſpects are multiplied: each of them is much more agreeable than the entire proſpect was originally: and, to crown the whole, the ſcenery is greatly diverſified.

As gardening is not an inventive art, but an imitation of nature, or rather nature itſelf ornamented, it follows neceſſarily, that every thing unnatural ought to be rejected with diſdain. Statues of wild beaſts vomiting water, a common ornament in gardens, prevails in thoſe of Verſailles. Is this ornament in a good taſte? A jet d'eau, being partly artificial, may, without diſguſt, be tortured into a thouſand ſhapes: but a repreſentation of what really exiſts in nature, admits not any unnatural circumſtance. Theſe ſtatues therefore of Verſailles muſt be condemned; and yet ſo inſenſible has the artiſt been to juſt imitation, as to have diſplayed his vicious taſte without the leaſt colour or diſguiſe: a lifeleſs ſtatue of an animal pouring out water, may be endured without much diſguſt; but here the lions and wolves are put in violent action, each has ſeized its prey, a deer or a lamb, in act to devour; and yet, inſtead of extended claws and open mouth, the whole, as by a hocus-pocus trick, is converted into a different ſcene; the lion, forgetting his prey, pours out water plentifully; and the deer, forgetting its danger, performs the ſame operation.

In gardening, every lively exhibition of what is beautiful in nature has a fine effect: on the other hand, diſtant and faint imitations are diſpleaſing to every one of taſte. The cutting evergreens in the ſhape of animals, is a very ancient practice; as appears from the epiſtles of Pliny, who ſeems to be a great admirer of this puerile conceit. The propenſity to imitation gave birth to this practice; and has ſupported it wonderfully long, conſidering how faint and inſipid the imitation is. But the vulgar, great and ſmall, devoid of taſte, are entertained with the oddneſs and ſingularity of a reſemblance, however diſtant, between a tree and an animal. An attempt in the gardens of Verſailles, to imitate a grove of trees by a group of jets d'eau, appears, for the ſame reaſon, not leſs ridiculous.

In laying out a garden, every thing trivial or whimſical ought to be avoided. Is a labyrinth then to be juſtified? It is a mere conceit, like that of compoſing verſes in the ſhape of an ax or an egg: the walks and hedges may be agreeable; but in the form of a labyrinth, they ſerve to no end but to puzzle: a riddle is a conceit not ſo mean;

becauſe the ſolution is a proof of ſagacity, which affords no aid in tracing a labyrinth.

The gardens of Verſailles, executed with infinite expence by the beſt artiſts that could be found, are a laſting monument of a taſte the moſt depraved: the faults above mentioned, inſtead of being avoided, are choſen as beauties, and multiplied without end. Nature, it would ſeem, was deemed too vulgar to be imitated in the works of a magnificent monarch; and for that reaſon preference was given to things unnatural, which probably were miſtaken for ſupernatural.

A ſtraight road is the moſt agreeable, becauſe it ſhortens the journey. But in an embelliſhed field, a ſtraight walk has an air of ſtiffneſs and confinement: and at any rate is leſs agreeable than a winding or waving walk; for in ſurveying the beauties of an ornamented field, we love to roam from place to place at freedom. Winding walks have another advantage: at every ſtep they open new views. In ſhort, the walks in a field intended to pleaſe the eye, ought not to have any appearance of a road. This rule excludes not long ſtraight openings terminating upon diſtant objects; which openings, beſide variety, never fail to raiſe an emotion of grandeur, by extending in appearance the ſize of the field: an opening without a terminating object, ſoon cloſes upon the eye; but an object, at whatever diſtance, continues the opening, and deludes the ſpectator into a conviction, that the trees which confine the view are continued till they join the object: and the object alſo, as obſerved above, ſeems to be at a greater diſtance than it is in reality. Straight walks alſo in receſſes do extremely well: they vary the ſcenery, and are favourable to meditation.

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Regularity is required in that part of a garden which joins the dwelling-houſe; for being conſidered as a more immediate acceſſory, it ought to partake the regularity of the principal object: but in proportion to the diſtance from the houſe conſidered as the centre, regularity ought leſs and leſs to be ſtudied; for, in an extenſive plan, it hath a fine effect to lead the mind inſenſibly from regularity to a bold variety. Such arrangement tends to make an impreſſion of grandeur: and grandeur ought to be ſtudied as much as poſſible, even in a more confined plan, by avoiding a multiplicity of ſmall parts. A ſmall garden, on the other hand, which admits not grandeur, ought to be ſtrictly regular.

Milton, deſcribing the garden of Eden, prefers juſtly the grand taſte to that of regularity:

> Flow'rs worthy of paradiſe, which not nice art
> In beds and curious knots; but Nature boon
> Pour'd forth profuſe on hill, and dale, and plain;
> Both where the morning-ſun firſt warmly ſmote
> The open field, and where the unpierc'd ſhade
> Imbrown'd the noontide bow'rs. *Paradiſe Loſt, b.* 4.

An hill, by being covered with trees, appears both more powerful and more lofty; provided no other beauties be hid that might be ſeen if the hill were naked. To diſtribute trees in a plain requires more art: near the dwelling houſe they ought to be ſo thin, as not to break the unity of the field; and even at the greateſt diſtance of diſtinct viſion, they ought never to be ſo crowded as to hide any beautiful object.

In the manner of planting a wood or thicket, much art may be diſplayed. A common centre of walks, termed *a ſtar*, from whence are ſeen a number of remarkable objects, appears too artificial, and conſequently too ſtiff and formal, to be agreeable: the crowding withal ſo many objects together, leſſens the pleaſure that would be felt in a ſlower ſucceſſion. Abandoning therefore the ſtar, let us try to ſubſtitute ſome form more natural, that will lay open all the remarkable objects in the neighbourhood. This may be done by various openings in the wood contrived to catch ſurrounding objects, which in walking bring ſucceſſively under the eye theſe objects as by accident; ſometimes a ſingle object, ſometimes a plurality in a line, and ſometimes a rapid ſucceſſion of them. In this form, the mind at intervals is rouſed and cheered by agreeable objects; and the ſcene is greatly heightened by the ſurpriſe it occaſions when we ſtumble, as it were, upon objects of which we had no expectation.

An object terminating in a narrow opening in a wood, appears at a double diſtance. This ſuggeſts another rule for diſtributing trees in ſome quarter near the dwelling-houſe; which is, to place a number of thickets one behind another, with an opening in each directing the eye to the moſt diſtant through all the intermediate thickets; which, by making theſe thickets appear more diſtant from each other than they are in reality, will enlarge in appearance the ſize of the whole field. To give this plan its utmoſt effect, the thickets ought to be at a conſiderable diſtance from each other: and, in order that each may be ſeen diſtinctly, the opening neareſt the eye ought to be wider than the ſecond, the ſecond wider than the third, and ſo one to the end.

By a judicious diſtribution of trees, various beauties may be produced, far exceeding what have been mentioned; which will appear as follows. A landſcape ſo rich as to ingroſs the whole attention, and ſo limited as ſweetly to be comprehended under a ſingle view, has a much finer effect than the moſt extenſive landſcape that requires a wandering of the eye through ſucceſſive ſcenes. This conſideration ſuggeſts a capital rule in laying out a field; which is, never at any one ſtation to admit a larger proſpect than can eaſily be taken in at once. A field ſo happily ſituated as to command a great extent of proſpect, is a delightful ſubject for applying this rule: let the proſpect be ſplit into proper parts by means of trees; ſtudying at the ſame time to introduce all the variety poſſible. A plan of this kind executed with taſte will produce charming effects: the beautiful proſpects are multiplied: each of them is much more agreeable than the entire proſpect was originally: and, to crown the whole, the ſcenery is greatly diverſified.

As gardening is not an inventive art, but an imitation of nature, or rather nature itſelf ornamented, it follows neceſſarily, that every thing unnatural ought to be rejected with diſdain. Statues of wild beaſts vomiting water, a common ornament in gardens, prevails in thoſe of Verſailles. Is this ornament in a good taſte? A jet d'eau, being partly artificial, may, without diſguſt, be tortured into a thouſand ſhapes: but a repreſentation of what really exiſts in nature, admits not any unnatural circumſtance. Theſe ſtatues therefore of Verſailles muſt be condemned; and yet ſo inſenſible has the artiſt been to juſt imitation, as to have diſplayed his vicious taſte without the leaſt colour or diſguiſe: a lifeleſs ſtatue of an animal pouring out water, may be endured without much diſguſt; but here the lions and wolves are put in violent action, each has ſeized its prey, a deer or a lamb, in act to devour; and yet, inſtead of extended claws and open mouth, the whole, as by a hocus-pocus trick, is converted into a different ſcene; the lion, forgetting his prey, pours out water plentifully; and the deer, forgetting its danger, performs the ſame operation.

In gardening, every lively exhibition of what is beautiful in nature has a fine effect: on the other hand, diſtant and faint imitations are diſpleaſing to every one of taſte. The cutting evergreens in the ſhape of animals, is a very ancient practice; as appears from the epiſtles of Pliny, who ſeems to be a great admirer of this puerile conceit. The propenſity to imitation gave birth to this practice; and has ſupported it wonderfully long, conſidering how faint and inſipid the imitation is. But the vulgar, great and ſmall, devoid of taſte, are entertained with the oddneſs and ſingularity of a reſemblance, however diſtant, between a tree and an animal. An attempt in the gardens of Verſailles, to imitate a grove of trees by a group of jets d'eau, appears, for the ſame reaſon, not leſs ridiculous.

In laying out a garden, every thing trivial or whimſical ought to be avoided. Is a labyrinth then to be juſtified? It is a mere conceit, like that of compoſing verſes in the ſhape of an ax or an egg: the walks and hedges may be agreeable; but in the form of a labyrinth, they ſerve to no end but to puzzle: a riddle is a conceit not ſo mean;

becauſe the ſolution is a proof of ſagacity, which affords no aid in tracing a labyrinth.

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The Chineſe ſtudy to give play to the imagination. They hide the termination of their lakes: the view of a caſcade is frequently interrupted by trees, through which are ſeen obſcurely the waters as they fall. The imagination once rouſed, is diſpoſed to magnify every object.

Nothing is more ſtudied in Chineſe gardens than to raiſe wonder or ſurprize. In ſcenes calculated for that end, every thing appears like fairy-land; a torrent, for example, conveyed under ground, puzzling a ſtranger by its uncommon ſound to gueſs what it may be; and, to multiply ſuch uncommon ſounds, the rocks and buildings are contrived with cavities and interſtices. Sometimes one is led inſenſibly into a dark cavern, terminating unexpectedly in a landſcape inriched with all that nature affords the moſt delicious. At other times, beautiful walks inſenſibly conduct us to a rough uncultivated field, where buſhes, briers, and ſtones interrupt the paſſage: when we look about for an outlet, ſome rich proſpect unexpectedly opens to view. Another artifice is, to obſcure ſome capital part by trees or other interpoſed objects: our curioſity is raiſed to know what lies beyond; and after a few ſteps, we are greatly ſurprized with ſome ſcene totally different from what was expected.

Theſe curſory obſervations upon gardening, ſhall be cloſed with ſome reflections. Rough uncultivated ground, diſmal to the eye, inſpires peeviſhneſs and diſcontent: may not this be one cauſe of the harſh manners of ſavages? A field richly ornamented, containing beautiful objects of various kinds, diſplays, in full luſtre, the goodneſs of the Deity, and the ample proviſion he has made for our happineſs; which muſt fill every ſpectator with gratitude to his Maker, and with benevolence to his fellow-creatures. Other fine arts may be perverted to excite irregular, and even vicious, emotions: but gardening, which inſpires the pureſt and moſt refined pleaſures, cannot but promote every good affection. The gaiety and harmony of mind it produceth, inclining the ſpectator to communicate his ſatisfaction to others, and to make them happy as he himſelf is, tend naturally to eſtabliſh in him a habit of humanity and benevolence.

Having thus unfolded the general principles of gardening, that have an influence upon taſte or manners; we ſhall now ſubjoin the practical part, in the form of a calendar.

JANUARY.

Flower-Garden.

This is the proper time for planting roots of the ranunculus; the ſoil ſhould be rich and ſandy, and they ſhould be planted at leaſt three inches deep. By laying a quantity of earth made of old thatch or ſtraw, about ſeven inches beneath the ſurface of the ground, and then filling it up with rich mould, a prodigious number of theſe flowers may be produced. A fine earth may likewiſe be made of tanner's bark, or the bottom of a wood pile, well mixed with about a third of natural ſoil, which will prove peculiarly ſerviceable.

As the wind and froſt are very prejudicial to carnations and auriculas, they ſhould this month be kept covered.

Anemonies ſhould be planted in beds of fine earth; no dung muſt be uſed in planting them. The roots of theſe flowers may be increaſed by breaking the knots, about the ſize of a ſmall button, aſunder, and letting them lie two or three days in the ſun, before you plant them. It ſhould be remembered, that the roots of the anemony are to be taken up about the end of June or the beginning of July; after being dried in the ſun, they ſhould be preſerved in a dry cool place, or kept in ſand for a month, and then put in papers till the ſeaſon for planting them. When theſe roots are firſt tranſplanted, a thin layer of willow-earth, or rotten ſally-wood, being put under them, forwards their growth.

Fruit-Garden.

The prunning of pears, vines, and plumbs, is the chief employment of this month. In pruning the pear, thoſe buds which appear fuller than the reſt ſhould be carefully preſerved; all branches that proceed from the knob, whereon the ſtalk of a pear grew, are to be taken away, but the knob muſt remain; and the extremity of the laſt year's pruning is to be taken off.

As the large branches of a pear-tree are uſeleſs in bearing, care ſhould be taken to extend the branches ſideways, and none but ſmall branches ſuffered to grow in the middle, and not even thoſe to grow directly perpendicular, as, by that means, they would ſoon become what is called *great wood.*

A pear-tree that is vigorous and luxuriant ſhould not be pruned till after it has begun to ſhoot. A languiſhing pear-tree may be reſtored to its former ſtate by pruning and removal into better ground. Another very good method of treating pear-trees not in a bearing ſtate, is to bark the luxuriant branches all round about a quarter of an inch wide, more or leſs, according to their ſtrength. Apple-trees will likewiſe bear this operation, which ſhould be done in April. Trees that are too vigorous may be made to bear by cutting off the ſap roots, or taking them up, and re-ſetting them, for they are often planted too deep. Plumbs and cherries may be pruned in the ſame manner as pears.

The winter-pruning of the vine (which requires a firſt, ſecond, third, and ſometimes a fourth pruning) ſhould be done either in October, November, December, or this month. The vigour of the vine is to be regarded; the ſmall weak ſhoots that never bear any fruit muſt be cleared away, and the other branches are to be ſo proportioned as not to occaſion any confuſion; ſuch as are thickeſt and beſt placed ſhould be preſerved, and the ſtrong ſhort branches left nine inches or more, according to the ſize of the vine. When they have ſhot twelve or fifteen inches long, which will be in the ſummer, you muſt begin to nail them up; and when they have ſhot two or three feet, ſtop or cut off the ends of the ſhoots; thoſe on the ſide ſhould not be broke off till the fruit is ſet: and a fruit bearing branch ſhould be cut within three or four eyes of the fruit.

All ſuckers ſhould be cut off as ſoon as they have ſhot ſeven or eight inches. The vine ſhould be kept thinner of wood than any other tree, though it puts forth the largeſt ſhoots. All the old wood ſhould be cut out, and its place ſupplied with vigorous young ſhoots.

All dead or cankered branches ſhould this month be cut from the ſtandard fruit-trees, as alſo ſuch as croſs each other; but in doing this you muſt be careful to make the wounded part as ſmooth as poſſible, and ſloping, that the wet may not enter and be detained there, to the great prejudice of the trees.

KITCHEN-GARDEN.

THE management of hot-beds claims almoſt the ſole attention of the kitchen-gardener this month. The place moſt expoſed to the ſun is beſt for making a hot-bed: when you have marked out the dimenſions of the bed, drive ſtakes into the ground on every ſide, a yard above the ground, and a foot aſunder; wind theſe round with bands made of hay or ſtraw, and then fill them up with wet litter and new horſe-dung, treading it down very hard as you fill; in doing which you muſt be careful to leave room for the earth and the ſhooting of your plants.

When you have thus laid the bed, fix your wooden frames fitted to the ſame, for the reception of the mould at top, and for the ſupport of glaſs frames, which are to be fixed ſloping.

The hot bed ſhould then be finiſhed by putting in the earth; an old hot-bed, well rotted, affords excellent ſtuff for this purpoſe; but if that cannot be procured, ſome very rich mould well ſifted will do.

Over the whole you muſt fix matts ſupported by ſhort ſticks, which muſt remain about a week; by which time the bed will abate of its extreme heat, and be of a proper temperature for uſe.

The bed ſhould be warm, not hot; and when the heat leſſens too much, by applying new dung to the ſides, you may renew it.

When plants are come up in a hot-bed, they ſhould have air and the ſun by degrees; and when ſtrong enough, ſhould be removed to a ſecond hot-bed, of leſs heat than the former, or into very rich earth, where they ſhould be frequently watered gently, and kept from the meridian ſun till well ſettled; and when the weather is cold, by covering the glaſſes a little before ſun-ſet with litter and matts, they may eaſily be defended from it.

Gardeners in general make their ſeed beds for cucumbers and melons in this month, for raiſing them before their natural ſeaſon; but the better method is, to make hot-beds the latter end of October or beginning of November: about four feet ſquare, and two feet high, is the proper ſize, wherein, after the heat is moderated, cucumbers and melons may be ſown.

About a week after their coming up, plant them four inches apart in the ſame bed, after having well ſtirred up the earth. As the days in October are uſually warm, the plants may be allowed to have air; but in January they muſt be kept covered up cloſe. In this firſt raiſing of plants, a gardener may, with due care, make them as hardy as he pleaſes.

It is uſual with ſome people to keep their melon-ſeeds in milk four and twenty hours before they make uſe of them; others uſe them without that preparation: they ſhould be ſet two or three in a hole, in the hot-bed, about an inch deep, and covered cloſe up, to keep them warm. About the end of April is the time for planting melons, which ſhould firſt be done in ſmall baſkets made of old willow-twigs, three inches deep, and eight or nine inches over.

Two or three plants ſhould be planted in one baſket, and when they will bear it, moved on another hot-bed, covered with a ſandy loam five or ſix inches thick, ſifted fine, wherein they are to grow all the ſummer.

Cucumbers are propagated after the ſame manner as melons; but as a bad ſeaſon may prevent their being ſucceſsfully raiſed, it is highly neceſſary to put ſome ſeeds into the bed at three or four different times this month, that if ſome ſhould fail, the others may ſupply their loſs. In order to raiſe aſparagus for hot-beds, make choice of a piece of ground that has been well dug and mellowed, then ſtrike out lines ſeven or eight inches from each other, and plant the aſparagus roots in them at ſix or ſeven inches apart when they are a twelvemonth old: let them be kept free from weeds, and remain in the nurſery two years, in which time they will be fit for the hot-bed. The hot-bed for the reception of theſe roots ſhould be made pretty ſtrong, and covered with earth ſix inches thick, encompaſſed round with bands of ſtraw. The aſparagus-roots ſhould be planted as cloſe as they can be placed together without trimming; which being done, cover the buds of the plants two inches thick with earth; in which ſtate let them remain five or ſix days before the frames and glaſſes are put over them; and then lay on over the whole three inches thick of freſh earth.

As ſoon as the buds appear, give them what air the ſeaſon will permit, which will make them green, and of a good taſte. The bed will laſt good about a month, producing daily freſh buds, if the weather be not too ſevere: when it begins to cool, warm horſe-litter laid upon the glaſſes every night will contribute as much to facilitate the ſhoot of the buds as if new dung were applied to the roots.

It ſhould be obſerved, that the time for this work is not only in this month, but from November till April; (making freſh buds every month to follow one another for a conſtant ſupply) and in April comes the natural crop.

A very moderate hot-bed made after the manner firſt directed, will ſerve to propagate early ſtrawberries.

You may make a bed in two or three hours, with the uſe of hot lime and powdered dung, the dung being in the middle, and the lime underneath and at top; over which you ſhould lay a quantity of fine rich mould.

To raiſe radiſhes in the hot-bed with ſucceſs, you ſhould have ſufficient thickneſs of rich light mould, that they may have proper depth to root in before they reach the dung.

Radiſhes may be ſowed all the year, but in hot-beds in the winter.

Muſtard, lettuce, creſſes, and other ſallading, are generally raiſed from the ſeeds ſown in drills or lines, in ſuch an expoſure as is required by the ſeaſon of the year; in the winter-ſeaſon, on moderate hot beds; in the ſpring, under glaſſes and frames; and in the ſummer, on natural beds of earth.

Creſſes ſown in the natural ground in Auguſt, reſiſt the froſts of the winter, and help greatly to inrich the hot-bed ſallads with the high taſte they maintain by being expoſed to the open air.

Small herbs ſhould be drawn up by the roots from the hot beds; and, in ſowing a ſecond crop, ſeeds of another kind ſhould be ſown, and not the ſame kind in the ſame place.

The hotſpur, charlton maſter, and other peas, muſt be ſown in drills three feet aſunder, that you may have room to go between them; and the lines ſhould run from north to ſouth.

When they have ſhot about ſix inches high, earth them about four inches on both ſides of the lines, raiſing a little bank on the eaſt ſide of them, to defend them from the blaſting winds.

In February you may ſow a ſecond crop, and in March a third.

You muſt, in the beginning of the winter, ſow twice the quantity of peaſe you need to do, if you ſtay till February or March; becauſe the cold weather and the mice will deſtroy great part of them.

FEBRUARY.

Flower-Garden.

For the better management of the auricula, which is to be ſown this month, prepare a box of oak or deal, four feet long, two feet wide, and ſix inches deep, with holes in the bottom, ſix inches diſtance from each other; in which, after laying two inches thick of cinders or ſea-coals; and ſpreading over them ſome earth taken out of hollow willow-trees, till you have filled the box, ſow the ſeeds on the top, without any covering of earth, preſſing them into the mould with a flat board, in order to ſettle them below the edges of the box that the light ſeeds may not float over the brim in watering.

From the time of ſowing to the beginning of April, this box muſt be placed where it will receive the ſun; but after that time, it muſt be removed into a ſhady place; and the ſeeds muſt be continually refreſhed with gentle waterings.

If the ſeedlings do not come up the firſt year, they will the ſecond; and in July or Auguſt, after they appear above ground, will be ſtrong enough to tranſplant; when you muſt ſet them in beds of light earth well ſifted, at about four inches diſtance from each other, and place them where they may receive only the morning ſun.

The April afterwards they will begin to ſhew themſelves, when they ſhould be tranſplanted into pots filled with ſoil made of one load of melon earth, or dung well rotted, half a load of ſea-ſand, and half a load of ſandy loam; or a load of melon earth, and the like of ſandy loam; or one load of rotten wood, or the bottom of a wood-pile, the ſame quantity of loam, and half a load of melon earth, prepared as above.

Theſe flowers muſt be carefully ſheltered from the rains, which greatly impair their colours.

Provided the weather is mild, you may, toward the end of this month, plant out your choice carnations into the pots where they are to remain to flower; in doing which, you ſhould not take too much of the earth from their roots; and when they are planted, it will be proper to place the pots in a warm ſituation (but not too near walls, or pales, which will draw them up weak); and arch them over with hoops, that in bad weather they may be covered with mats; for unleſs they acquire ſtrength in the ſpring before the heat comes on, they will not produce large flowers.

The polyanthus ſeed muſt be ſown upon a place prepared with earth taken out of decayed willows, often watered and kept ſhaded from the ſun all April and May, till the young plants are come up.

The ſeedlings will be fit to tranſplant the July or Auguſt following into beds: the ſoil of which ſhould be ſomewhat binding, and their expoſure only to the morning ſun.

You may have an annual ſupply of larkſpurs without the trouble of ſowing, by ſuffering the ſeeds of the flowers to drop, which will come up the enſuing ſpring: they are ſown in ſpots, and flouriſh in variety of ground.

The ſingle ſort of Sweet William is raiſed by ſeeds ſown in February or March; the double ſorts, propagated from ſlips taken near the root about March or April, and planted in a loamy ſoil: they may alſo be laid down in the earth like carnation layers.

Holyhocks are raiſed by ſeeds ſown in this month, removed in Auguſt or September to their proper places of vegetation, in rich earth.

The moſt agreeable diſpoſition of this flower is, under ſome coarſe wall, which they will handſomely fill, or in any other place guarded from the winds.

Pinks, and candy-tufts, are generally uſed in edgings in gardens, and inſides of borders, where they are planted in ſpots, and have a very agreeable effect.

The ſeed is ſown in lines in this month or March; or they may be propagated from ſlips planted very early in the ſpring, or in Auguſt.

Roſe-trees, of which there are various ſorts, ſucceed beſt in a ſtrong holding ground, tolerably moiſt; they may either be raiſed from layers or ſuckers, laid down and taken from the old roots in February or March, and tranſplanted immediately before the roots grow dry: ſhould there be a neceſſity for keeping them out of the ground for ſome time, lay their roots in water five or ſix hours before they are planted.

The roſe-tree does well in borders, or in the quarters of wilderneſs works, among other flowering ſhrubs; and ſome or other of them will be in flower for ten months in the year.

The laburnum tree is commonly planted among the other flowering ſhrubs of the wilderneſs, and will grow in the moſt open expoſure, as well as under the ſhade of large trees: it may eaſily be raiſed from ſeeds ſown in this month, and tranſplanted two years after it comes up.

The althæa may be raiſed from layers or ſeeds; there are ſeveral different colours of this flower, and they may be budded ſo as to have all the colours on one plant.

The pomegranate proſpers moſt in a light ſoil; and being propagated by laying down the young ſhoots in this month or March, may be tranſplanted either in the ſpring or autumn ſeaſon, when they may be put in pots, or againſt a ſouth wall, where the fruit will ripen.

The pomegranate may alſo be raiſed from ſeed.

The ſyringa may be raiſed from ſeeds; but it is hardly thought worth the trouble, as it is very apt to put forth ſuckers; theſe, however, may with eaſe be taken off and tranſplanted at this time of the year, and in September.

It is a ſhady poſition which makes this ſhrub ſhoot, and the ſun makes it flower; but it will grow almoſt any where.

The lilach is a plant which grows to a pretty large tree, bearing bunches of purple bloſſoms, likes plumes of feathers, in May; and is raiſed by laying down the young branches in this month or March, or by taking off the ſuckers, and planting them in a light ſoil, about the ſame time, or in September.

Theſe trees are highly ornamental in the quarters of wilderneſs works, and ſmall walks of them are very pleaſant.

The Spaniſh broom is planted in wilderneſs works, and may be raiſed from ſeeds ſown in light earth; alſo by laying down the tender branches, and cutting them at the joints, after the manner of the carnation; but the latter method is not ſo certain as the other, though it is far more troubleſome.

The laurus tinus is greatly admired for producing its flower in the winter; and may be raiſed from the berries, managed as the holly; or from layers, which is the moſt expeditious way.

This plant is greatly hurt by froſt, and ſucceeds beſt in moiſt ſhady places; it will flouriſh in loamy ſoil, without the help of any rich manure, which forwards its growth too much.

The laurus tinus, is often trained up as a headed plant, though it is beſt planted againſt a wall, or in wilderneſſes; and it is obſervable, that this plant, like all other exotics, is naturally inclined to bloſſom about the ſpring in its own country, which is our autumn; for which reaſon, it ſhould be pruned in our ſpring ſeaſon after it has done blowing.

The phillyrea, may in general be propagated from the berries, or raiſed from layers, which will preſently take root.

This plant, which ſucceeds beſt in a natural light ſoil, grows very faſt; and being well ſupported with rails or ſtakes, a number of them makes a very thick and handſome hedge.

The yew-tree delights in a light barren ſoil, and is more plentifully produced on the coldeſt mountains than in the richeſt ſoils.

The berries of the yew may be laid in ſand, as thoſe of the holly, before they are ſown; and there is no difficulty in propagating this plant, or removing it, if the roots are pruned from time to time, by digging about it while it ſtands in the nurſery.

The holly will grow to a very large tree; but being a rooted plant, does not ſucceed well when tranſplanted, unleſs the roots have been often pruned in the nurſery.

The berries of this plant, when ripe, are to be gathered; and after they have been laid to ſweat ſome time, are to be put in ſand or earth, till the autumn following, when, and likewiſe in this month, they may be ſown in nurſery beds.

They will lie in the ground for a long time before they begin to ſpring, and it will be four or five years before the young ſtocks will be fit to graft or inoculate upon.

The grafting muſt be done in March, and the inoculating in July; but for ſtandard trees or hedges, they muſt be planted at their proper diſtances while very young, that they may be accuſtomed to the ſoil.

The bay-tree, which is managed as the holly, is raiſed by berries ſown in this month, on a bed of earth freſh dug, and covered with ſome freſh natural earth, well ſifted, about two inches thick.

In about ſix weeks, the ſeeds thus ſown will come up, ſhould the weather prove moiſt; they ſhould he covered with ſtraw, or fern, for the three firſt winters, after which time they muſt be tranſplanted.

When theſe plants are diſcoloured by froſt, cut off the top-branch in the ſpring, and they will ſhoot afreſh.

The bay-tree may alſo be raiſed from layers laid down in the month of October, for cuttings, ſet in pots of fine earth, two or three inches deep; and from ſuckers taken up with as much root as may be, and planted in the ſhade, in a gravelly ſoil, being well watered to ſettle the earth about their roots.

The laurel is propagated in the ſame manner as the bay-tree, loves ſhade, reſiſts the weather, and will thrive in almoſt every ſoil.

Towards the end of this month, if the ſeaſon proves favourable, ſtir the ſurface of the ground of your flower-beds, and clear them from weeds, moſs, and whatever filth may appear thereon, which will not only make your garden look neat, but be of peculiar ſervice to the flowers.

FRUIT GARDEN.

THE buſineſs of this month is chiefly pruning and grafting.

ing; and is more particularly the ſeaſon for pruning fruit-trees.

When a tree has produced two well diſpoſed branches with ſome weak ones intermixed, they ſhould be ſhortened equally to the length of five or ſix inches; and if the poſition of the two branches be irregular, there muſt be only one left to begin the formation of your tree.

A tree will ſometimes ſhoot five, ſix, or ſeven branches, the firſt year; when this happens, three or four only of the beſt branches are to be preſerved.

A multitude of branches in the firſt year, is not always a ſign of vigour; for they ſometimes prove weak, occaſioned by the infirmity of the roots: in pruning, generally a vigorous tree cannot have too many branches, if they are well diſpoſed, nor a weak one too few.

The ſap of all trees muſt be kept within due bounds, and a greater liberty is to be allowed to ſtrong trees than to weak ones; for which reaſon ſtrong and vigorous branches are left of a greater length than feeble ones: and it is beſt to prune weak ſickly trees early, that the ſap may not be too much waſted.

In the pruning of wall-fruit-trees, all the branches ſhooting directly forward are to be cut off cloſe to the branch they ſpring from; and the utmoſt care muſt be taken to prevent their being too much crouded with wood, it being often neceſſary to take off even bearing branches, to preſerve your trees in beauty and health; for it is impoſſible too great a number of branches ſhould be ſupplied with juices as they ought; and if they are not, either the bloſſoms will drop off, or the fruit never ripen.

You ſhould ever be careful to preſerve a convenient ſpace between one branch and another in all prunings; alſo that one branch does not croſs another: a ſlender bearing branch may, notwithſtanding, ſometimes be permitted to ſteal behind the main body of the tree, and be no offence to the eye.

That a tree may be the better diſpoſed to bear fruit, the branches ſhould be carried horizontally as much as poſſible; for the more perpendicular the branches of a tree are led, the more they are inclined to run into great wood and barrenneſs.

Small weak branches, ſhooting from the like, ſhould be cut away, as ſhould all ſhoots put forth in autumn.

When an old tree ſhoots ſtronger branches towards the bottom than the top, and the top is ſickly, it muſt be cut off, and a new figure formed from the lower branches; but if the top be in good health, you muſt cut off the lower ones, unleſs it be a few that are well placed.

Where old trees are in a weak condition, to preſerve them, they are to be diſburthened totally, leaving a few branches only ſhortened to five or ſix inches.

Having thus laid down the principal rules for pruning in general, we now come to the management of the peach and other fruit trees in particular.

When peach trees are vigorous, it is beſt to defer the firſt pruning till they are ready to bloſſom, when you may be at a certainty in preſerving thoſe branches which are moſt promiſing of fruit, and then to ſhorten them as they require.

You may ſoon diſcover the fruit-bearing branches by their ſwelling buds, and you ſhould reduce them to the length of five or ſix inches; the laſt year's ſhoots may be left ten or twelve inches long.

In the ſpace of about three years, all the wood muſt at ſeveral prunings be taken away, but in the mean time the wall is to be furniſhed with other wood.

When you have reduced your tree to beauty and order, you have little to do but thinning your fruit till Midſummer, when the ſhoots are to be ſhortened and faſtened to the wall, giving the fruit the advantage of the ſun as much as poſſible.

If the peach-tree makes over-haſte in its bearing, it is a ſign of infirmity, and muſt be accordingly managed, by pruning the branches ſhort, and plucking off all or moſt of the bloſſoms or fruit; which it is much leſs difficult to do than when a peach is over vigorous; for then nature is apt to make a confuſion, which requires the greateſt ſkill to know what branches are fit to be choſen, and what rejected.

The peach tree requires a ſecond, and ſometimes a third pruning; the laſt of which is to be performed about the middle of May, or in June or July.

The apricot and nectarine may be pruned in the ſame manner as the peach; but it ſhould be obſerved, that the apricot is more apt to run to wood than any other of theſe kind of wall-fruit trees.

The uſual ways of grafting are, in the cleft—in the bark—by approach, and whip-grafting.

Grafting in the cleft, or ſlip-grafting, is performed on the cherry, pear, and plumb ſtocks, in the manner following.

When you have choſen a ſtock, in a ſmooth place cut off the head of it, ſloping: then, with your knife make the top horizontally even; which being done, make a ſlit of near two inches deep down the middle of the ſtock; in which fix a cyon, ſloped on each ſide from a bud; and cloſing the bark of both exactly, tie them round with baſs.

When you have thus finiſhed your grafting, put a quantity of clay and horſe-dung, tempered together, round the ſtock and lower part of the cyon; in doing which, be careful not to diſturb the latter.

Grafting in the bark is generally performed only on apples, by cutting the head of the ſtock as already directed; but inſtead of ſlitting it, ſlit only the bark a little above an inch on the ſouth-weſt ſide, or as long as the ſloped part of the cyon; then, looſening the top of the bark with your knife, put in your cyon (being prepared with a flat ſlope about an inch long, ending in a point, and begun from the back-ſide of an eye) and cloſing it as above, cover it alſo in the ſame manner with clay.

When either an apple, pear, plumb, or cherry tree, wants a branch to make the tree uniform, a graft may be put into the ſide without cutting the head of it.

Grafting by approach, or inarching, is performed when a ſtock grows ſo near another tree, the fruit of which you would propagate, that it may be joined with a branch of that tree, by cutting the ſides of the branch and ſtock about three inches long, and fitting them, that the paſſages of the ſap may meet; in which poſture let them be bound and clayed.

When they are well cemented, cut off the head of the ſtock about four inches above the binding; and in March following, having cut off the ſtubb that was left of the ſtock, and the cyon underneath, cloſe the grafted place, that it may ſubſiſt by the ſtock only.

This manner of grafting agrees beſt with vines, pomegranates, oranges, and ſuch like ſhrubs.

When the ſtock and cyon are of the ſame bigneſs, the operation of whip-grafting is performed, by ſloping the ſtock and cyon about an inch, ſo as to make them fit, and then tying them together, and claying the place.

KITCHEN GARDEN.

HOT-beds for radiſhes and ſpring-carrots ſhould now be made, according to the directions given for a common hot-bed in the preceding month; which, by proper management, will do for all ſorts of ſeeds that are annual.

To make a muſhrum bed, dig a trench five or ſix inches deep, and lay in it either the dung of horſes, mules, or aſſes, in ridges, which dung muſt be the laſt covering before the earth is laid on.

The bed, when it is complete, muſt be three or four feet high; and after covering the dung about two or three inches deep with ſuch earth as is taken from under a turf, put ſome muſhroom-earth all over the bed on the laſt covering of dung.

Should the weather be ſevere, you may defend the bed with ſtraw or dry litter, eight or ten inches thick, or cover it with matts faſtened on hoops.

The bed muſt be kept properly watered, twice or thrice a-week, and the muſhrooms will come up in two months time at fartheſt; ſometimes in a month, when they muſt be immediately cut.

By putting ſome muſhroom earth on your cucumber beds, you will greatly forward their growth.

In the natural ground potatoes love a ſandy ſoil; and the ſmaller roots, or knots of them, are commonly ſaved to raiſe a crop from, being ſet about four or five inches deep in the ground, and five or ſix inches apart; and when their haulms begin to decay, which is generally about Michaelmas, you may take them out of the ground with forks as you have occaſion to uſe them.

The Jeruſalem artichoke ſucceeds beſt in a ſtiff ſoil, and affords a root as large as an ordinary turnip, being in taſte ſomewhat like a potatoe, but rather more watery.

The ſeveral ſorts of cabbages, as the red cabbage, the Dutch cabbage, the Savoy cabbage, the Ruſſia cabbage, the Batterſea cabbage, and the two ſorts of the ſugar-loaf cabbage, ſhould be planted at proper diſtances, according to their ſeveral ſtatures.

The Savoy cabbages are for winter uſe, and towards the ſpring put forth ſprouts preferable to the cabbages themſelves.

Almoſt any ground will ſerve for cabbages; but if the weather be dry, it muſt be well watered before planting.

The hardeſt cabbages may be taken up before the great froſts come on; and after they have hung up by the roots about a fortnight, lay them in a cellar, where they will keep a long time; or plant them deep in the ground cloſe to one another, and cover them with haulm or ſtraw, till you have occaſion to uſe them.

Carrots are moſt proſperous in a light ground, in which their roots will grow to a great bigneſs.

Spring-carrots are ſown in July or Auguſt; thoſe intended for a winter-crop, in February or March, in dry weather.

When your carrots are come up, and have been above ground about a month, they muſt be houghed, leaving the ſpace of about five inches between the plants; and after the firſt houghing they ſhould be kept as clean as poſſible till they are full grown, when they may be taken up for preſent uſe, and kept in ſand during the winter.

Parſnips thrive beſt in a rich ſoil, and, excepting that they ſhould not ſtand ſo thick, are to be managed in the ſame manner as carrots.

The ſkirret requires a light, moiſt, yet a rich ſoil; and is propagated either by ſowing ſeeds, or by tranſplanting the offsets from the roots,

As ſoon as the leaves begin to put forth, they ſhould be taken out of the ground, and parted into as many ſlips as can be conveniently taken off with the roots, ſo as only the freſh ſpringing fibres remain on them; drills about four or five inches deep muſt then be prepared to plant them five or ſix inches apart, and they muſt be kept well watered till their roots are fully grown.

The uſual time for ſowing turnips is in July or Auguſt, but ſome people ſow them in this month, by way of providing them for the ſummer. They thrive beſt in a ſandy, loamy ſoil, but will grow in any ground: when the plants have two or three leaves, they ſhould be houghed at the diſtance preſcribed for parſnips and carrots.

Onions are ſown in this month, and in March, in rich garden ſoil; and toward the latter end of April, being come up, they are houghed, when about three inches ſhould be left between the plants till they begin to grow fit for ſallads, and then they may be drawn, or thinned where they grow too cloſe together.

In ſowing onions you muſt not be ſparing of ſeeds, as it often happens many of them, being bad, have no effect.

When the leaves begin to change their colour, they ſhould be pulled up, (in dry weather;) and after being well dried without doors, they muſt be ſpread on ſome floor, to dry more thoroughly for winter uſe.

Such onions as ſpire in the houſe, may this month be planted in lines ſix inches apart, and two inches diſtance for ſeeds for another year.

The leek is ſown in a well-wrought ground, and is to be kept free from weeds, and houghed like the onion; the plants are tranſplanted in July, in rich light ſoil, in lines about five inches apart.

Strawberries proſper moſt in ground inclining to clay; and the beſt way of managing them, is to provide a quantity of horſe-dung and coal-aſhes well mixed together, and lay it upon the land to be dug or trenched in this month; then make borders three feet wide, on which the ſlips are to be planted from eight to eighteen inches apart, according to the ſorts: the chila ſtrawberries being largeſt, ſhould be ſet two feet aſunder.

Afterwards you may ſet beans for a ſummer crop, and plant roſes, ſweet brier, currants or gooſeberries, at every five or ſix feet diſtance, as the plants will not begin to bear fruit to any purpoſe till the following year, and it will be the third year after planting before there will be a full crop; in the mean time the roſes, gooſeberries, *&c.* turn to a good account, beſides being ſerviceable to the plants by ſhading them.

The ſtrawberries ſhould be kept clear of weeds, and, if their blowing ſeaſon be dry, well watered: early in the ſpring you muſt cleanſe them, and fling looſe earth among them to ſtrengthen their roots.

Of ſtrawberries there are five ſorts, the chila ſtrawberry, the hautboy, the ſcarlet, the red, and the white wood ſtrawberry.

There are two kinds of raſpberries, the red and white; the latter is the greater rarity, and thrives in ſuch ground as agrees beſt with ſtrawberries, being propagated by ſlips taken from the roots the latter end of this month or in March.

Raſpberries ſhould be planted in ſingle rows, about a foot or eighteen inches aſunder, and three feet between every row, leaving the heads two feet high when planted.

The Muſcovy cluſtered raſpberry, planted againſt a wall between the trees where there is a vacancy, will ripen very ſoon; and their chief culture is to keep them clean from weeds in the ſpring; to prune the tops of the ſtrongeſt ſhoots of the laſt year, leaving them about three feet high; and to cut away all dead and weak branches.

The gooſeberry is propagated either by ſeeds, ſuckers, or cuttings; the firſt may be ſown as ſoon as ripe, and will come up the ſpring following; the ſuckers are taken from the roots of old trees when their leaves are fallen, and tranſplanted in nurſeries, in open weather; and the cuttings will take root, being planted in the months of September or October.

This tree requires a ſtrong holding ſoil, and may be tranſplanted with more ſafety in October than at this time of the year.

Currants are to be raiſed in the ſame manner as the gooſeberry, and thrive beſt in the ſame kind of ſoil.

Liquorice ſhould be planted at this ſeaſon of the year; and the ground made choice of for planting it ſhould be trenched three feet deep, and the liquorice ſet at a foot diſtance every way.

MARCH.

Flower-Garden.

The roſe campion is propagated either from ſeeds ſown this month, or from ſlips taken from the roots: the double-bloſſom kind is raiſed from ſlips only, as it does not produce any ſeeds; the laſt-mentioned thrives beſt in a loamy ſoil, and open expoſure.

In this month alſo off-ſets of the white hellebore are planted in a rich light ſoil.

Seeds are now ſown of the fox-glove, which ſucceed beſt in the ſhade and a loamy ſoil; this flower does not blow till two months from the time of ſowing.

The poppy, which is an annual, is ſown in ſpots; as is the Venus looking-glaſs: the latter is proper alſo for edgings.

The valerian is raiſed from ſeeds, and ſome kinds of it are increaſed by parting the roots.

The primroſe tree will grow in any ſoil, and the ſeed of it is ſown in the natural ground towards the end of this month: it is very proper for the middle of borders in large gardens; and the ſeedling plants, which will not bloſſom till the ſecond year, are to be ſown in the nurſery, and the young plants removed to proper places in the Auguſt after they come up.

Slips of the gentianella are planted in a ſandy ſoil in this month or Auguſt.

Cardinal flowers are raiſed by ſeeds ſown in hot beds, in fine ſifted earth; and the ſeeds being ſmall, are to be lightly covered with mould: theſe flowers, which are commonly cultivated in pots, may be increaſed by parting their roots in April, and planting them in places well expoſed to the ſun.

You ſhould now ſow the ſeeds of the ſtock-gilliflowers, and tranſplant them in the Auguſt following, in a light natural dry ſoil.

The double kinds of this flower may be increaſed by ſlips or cuttings planted in May, June, or July.

Sow the ſeeds of the acanthus, in a ſandy ſoil, and in the ſhade.

A loamy ſoil is requiſite for raiſing the double rocket flower, which is propagated from ſlips taken from about the root.

The ſcarlet lynchis is propagated either from ſeeds, or ſlips taken from the root; it is alſo cultivated in pots, and requires a loamy ſoil, and open expoſure.

The ſeveral ſorts of double wall-flowers may be raiſed from ſlips planted in ſhady places, either in March, April, May, or June; but the bloody wall-flower may be more eaſily raiſed from ſeeds ſown in this month: and a ſandy ſoil is requiſite to make them thrive.

The monk's hood, a flower of a poiſonous quality, is propagated by parting the roots, which ſhould be done in this month, and will thrive beſt in a loamy ſoil, in the moſt ſhady place in your garden.

The ſun-flower, which will grow in any ſoil, is raiſed from ſeeds ſown in large borders; and alſo by parting the roots, either in this month or in Auguſt.

The aſters, or ſtarworts, will thrive in any ſoil, and are fit companions for the talleſt flowers in your garden: they are propagated from ſlips taken from the root; and the beſt method is to plant them in pots, otherwiſe they will grow ſo numerous as to become a nuſance rather than an ornament.

Seeds or layers of the paſſion-tree may be ſown this month; and every cutting of it, being planted in fine earth, will take root about May or June.

This tree is a prodigious quick grower, and very hardy; loves moiſt and cool places; and, if conſtantly watered, and dunged about the roots, it will bear fruit reſembling lemons.

The arbutus, thrives in a light, gravelly ſoil, and may be raiſed either from ſeeds or layers; and the fruit (which muſt be gathered about Chriſtmas, and laid to dry for a month) is to be ſown in pots of light earth, and covered about a quarter of an inch with fine mould in this month; and the gentle heat of a hot bed will greatly aſſiſt the germination of the ſeeds, which are to be frequently ſprinkled with pond-water as they come up.

The layers of the arbutus are made of the moſt tender ſhoots about September; but will not be ſtrong enough to tranſplant the ſpring following, though they will take root in a year's time.

The apocynum, or dog's-bane, is propagated from ſeeds ſown this month in hot-beds, or from cuttings; a light natural ſoil agrees beſt with them; they ſhould be watered but ſeldom, and then gently; and they ſhould be ſet in the hot-houſe ſooner or later, as they are more or leſs tender.

Set the ſtone of the fruit of the palm-tree this month in light earth, and give them the aſſiſtance of the hot-bed; it is a green-houſe plant, but might be made to ſtand abroad, after ſheltering for three or four years.

The green privet, which is a plant of a quick growth, and makes an admirable hedge, is propagated by ſowing the berries in light earth, about an inch deep, watering them frequently till they come up; a hot gravelly ſoil is the moſt proper for this tree; and they are to be tranſplanted from the ſeed-bed the ſecond year after ſowing.

The mezeron, ſhould now be ſown in a loamy ſoil, and care ſhould be taken to preſerve it from the birds.

The berries of the juniper tree may be ſown this month in rich ground without watering, or in any light manure, and in about two months they will come up; and they are to remain in the ſeed-bed two years, during which time they muſt be kept free from weeds, and then they may be tranſplanted.

You may now take off the ſuckers of the *ſpiræa frutex*, and plant them in a light ſoil.

Sow the ſeeds of the ſeveral kinds of firs ornamental in wilderneſs-works, which will flouriſh in any ſoil; in order to keep their bodies ſmooth and free from knots, you muſt break off their collateral buds while they are young and tender.

Upon the hot-bed, ſow ſuch exotic ſeeds as are leſs tender, and arrive ſooner at perfection than thoſe ſown the laſt month; among which are the China or Indian pink, the *naſturtium Indicum*, *convolvulus*, and balſamines; and none of theſe muſt be planted in the natural ground till the middle of May: if you have no hot-bed, you may defer growing the marvel of Peru and the *naſturtium* till the next month, when they will come up in the natural ground.

Plant tube-roſes in pots of freſh earth, giving them a gentle warmth, but no water till they ſprout out of the ground.

The ſeeds of the *campanula pyramidalis* ſhould now be ſown, and ſlips taken off from the roots; freſh air ſhould be given to the pots of this flower, and they ſhould be ſet in ſome pit where the ſun may come at them, by which means they will grow tall.

Mend and repair your ſhelves and places of ſhelter for auriculas, which ſhould now be guarded on all ſides but the eaſt from the ſun, and defended from rain; put canvas coverings or matts over your tulips, to prevent their being blighted; and tranſplant your carnation layers for blowing, if they were not planted out in autumn.

The ſeeds of the humble and ſenſitive plants may now be ſown upon the hot-beds; and the *noli me tangere* in the natural ground.

You may tranſplant your evergreens; graft the Spaniſh white jeſſamin upon the common Engliſh ſort; and ſlip or ſet box for edgings, or in figured works.

Such exotic plants as have ſuffered in the green-houſe, ſhould be removed to the hot-houſe; where, to prevent the ſteam of the bed from being of bad conſequence, the dung ſhould be covered with a due thickneſs of earth.

Fruit-Garden.

You may make layers of the vine either in this or the next month, and they will be fit to tranſplant at Michaelmas; this tree is alſo propagated by laying down the young branches as ſoon as the fruit is gathered, or by making plantations of cuttings at that time.

If the weather proves open in February, that is the beſt time for planting vines; and the ſoil in which they beſt ſucceed is rocky or gravelly.

A chalky hill, lying very open to the ſun, will produce better grapes than any of the rich ſoils prepared with horſe-dung; but a tolerable good compoſt, to mix with the earth about the roots, may be made with the rubbiſh of old buildings.

In planting a vine, let the places where your vines are to ſtand be open and prepared before any of the plants are taken out of the nurſery, when great care ſhould be taken in their removal; they are to be planted ſix or ſeven feet every way, and the beſt grapes for a vineyard are the marlmorſe, chiante, claret grape, and Burgundy black morellon.

Theſe vines are to be pruned the September before tranſplanted, according to their ſtrength, leaving not more than four buds on the ſtrongeſt; and to cleanſe them from weeds is all the care they will require the firſt ſummer.

Shorten the ſummer-ſhoots about the end of September, and the ſtrongeſt of them will begin to ſhew a little fruit the ſummer following.

In May or June of this ſecond year, the ſmall ſhoots and ſuperfluous branches are to be carefully broke off, and two or three ſhoots only preſerved on each vine, which ſhould be ſupported by ſtakes or poles, till the September following, (for the nearer the grapes grow to the ground, provided they do not touch it, the ſweeter they will be) and then they may be ſhortened.

The vineyard, thus planted and managed, will, in five or ſix years time, ptoduce a good crop of grapes.

The fig is raiſed either from layers, ſeeds, or ſuckers; the layers are ordered like thoſe of the vine; the ſeeds are ſown in rubbiſh, or ſuch like ſoil; and the ſuckers are ſeparated from the old roots the beginning of this month, and tranſplanted without cutting off their tops.

The fig-tree thrives in the ſame ſort of ſoil as the vine, and may be planted either againſt walls or in ſtandards.

The pruning of this tree is very different from that of other fruit-trees; for as the practice is to take away the ſmall branches in pruning other trees, ſo here it is to be avoided, becauſe the fig puts forth its fruit chiefly at the extremities of the laſt year's ſhoots; but you may cut off ſome of the weak ſmaller ſhoots which do not promiſe to bear, ſo as you do it cloſe to the great wood.

The branches muſt not be ſuffered to grow too high, as they are prevented by that means from being full; the new thick branches muſt be ſhortened yearly to about a foot, and the bud at the end of the branches broken off in the ſpring time, which will cauſe the figs to ſhoot out more early, and inſtead of a ſingle branch there will be two.

The pruning ſeaſon of the fig is towards the end of this month; and it is beſt in the ſummer to let this tree have ſome liberty from the wall, and not ſuffer it to continue cloſe tacked to it like other fruit-trees; but in the winter ſome of the ſtraggling branches ſhould be cut off, and the beſt and biggeſt branches tacked to the wall in November, that they may be more effectually ſettled, and ſheltered from the froſt in the winter by the defence of a matt, or otherwiſe, eſpecially when the ſeaſon is very cold.

The ſuckers which this tree puts forth in great abundance, muſt be kept down, and whatever you cut away, muſt be as cloſe to the great wood or roots as you can; and a whole tree may, after an unkind winter, be cut down for the recovery of its former ſtate of health.

The following is the method of making the horizontal ſhelters for fruit trees: Lay rows of tiles in the ſtructure of the wall, at certain diſtances one above another, the tiles jetting forward, and hanging over the plane of the wall about an inch and a half; this is neither a difficult nor a chargeable work, if the wall be of brick, to place between every two rows of bricks theſe horizontal ſhelters of tiles: and if the wall be of ſtone, and the joints be any thing regular, it is not leſs eaſy.

In order to avoid the inconvenience of branches riding over the edges of the tiles, in each row, at convenient diſtances, muſt be left void places or gaps, for the wood branches to paſs through; which gaps are to be left wider at the bottom than at the top of the wall; and the rows of the tiles are not to be laid exactly horizontal, but rather a little ſloping, the beter to ſhoot off the water from the fruit.

Bloſſoms and tender fruit are more eſpecially preſerved by theſe horizontal ſhelters, than by matts, or coverings, of any kind whatſoever; and by their aſſiſtance a good quantity of the choiceſt fruit may be depended on in the moſt difficult and unſeaſonable year.

KITCHEN GARDEN.

DIRECTIONS have, in the month of January, been given how to ſow peaſe in drills, or lines, and to earth them when they come out of the ground; when beans may be planted three feet aſunder between the rows, and the large peas four feet, being ſet about five inches apart in a ſtiff ſoil, without any manure, kept clean and watered about the time of their bloſſom.

Thyme is raiſed either by ſeeds ſown in this month or April, or from ſlips planted at the ſame time.

Sage is alſo propagated from ſeeds or ſlips, but moſt commonly from the latter, taken from the roots at the end of this month, or the beginning of the next, and planted, in light earth, a foot apart.

Of marjoram there are two ſorts; one of which is called winter ſweet marjoram, and propagated by planting the ſlips about March or April in moiſt ground; and the other ſort is ſown annually on hot-beds.

Camomile and penny-royal are propagated from ſlips planted in this or the next month, in ſtiff ſoil and in a ſhady part of the garden.

Fennel is raiſed from ſeeds ſown in this month in the natural ground; as is parſley, dill, *&c.*

Mint and balm will grow any where, and are propagated by parting their roots in any time of the ſpring as well as by ſowing.

Mint is more generally propagated than balm, and when it is about a foot high you may cut it in branches, and dry it in the ſhade for winter uſe.

Rue is a plant which is multiplied by ſlips ſet in a light ſoil, and ſhould have a place in the ſhade.

Tanſy is a plant, which ſhould always be kept dry in winter, and is increaſed by parting the roots in the ſpring.

Sellery is a hot herb, and raiſed from ſeed ſown in this month, or April, in ſome well expoſed place in the garden; it muſt be planted out about ſix weeks after it is come up in beds, allowing ſix inches diſtance between the plants, and they may remain to the middle of June, at which time ſome of the firſt ſowing will be fit to plant in trenches for blanching, in a light rich ſoil.

Your trenches muſt be eight or ten inches wide, and of the ſame depth; in which the plants are to be put as ſoon as made, after having pruned off their tops and roots; place them at five inches diſtance; as they increaſe in growth, earth them up within four or five inches of their tops. Endive may be ſown in this month, but April is the more proper time; a light ſoil agrees beſt with it, and when it has been come up about ſix weeks, plant it in beds as directed for ſellery, and about the middle of July plant it in rows about ſix inches apart.

When it is well grown, tie up ſome of it to whiten; which work ſhould be continued every ten or twelve days.

Purſlane is ſown in this month, and glaſſes are uſed to help it forward; and in April it is ſown in warm places.

Sorrel is ſown in rows or drills, like other ſallading.

Of ſpinach, in March, April and May, you are to ſow ſeveral parcels of ground at different times, about a fortnight from each other, as a conſtant ſupply for the table, till there is plenty of other greens.

There are two ſorts of ſpinach, the prickly ſort, and the round ſpinach, both of which thrive in a light rich ſoil; and ſuch as is intended for winter uſe muſt be ſown in Auguſt.

Chives are raiſed by off-ſets from the roots, planted at ſix inches diſtance, cutting off their branches at the time of planting; they ſucceed beſt in a light, rich ground; and the oftener they are cut, the ſmaller and finer they are.

Tarragon is raiſed from ſlips and ſeeds; the ſlips are taken from the root, and planted in this month in as warm an expoſure as poſſible.

Artichoke ſeeds are ſown about the beginning of this month, and planted out in April; and the middle of this month is the moſt proper time to ſlip the roots for new plantations; for they are raiſed by ſuckers as well as ſeeds.

When you have ſevered the ſlips, three heads are to be left growing upon every old root; and theſe ſlips are to be planted two feet apart, in lines four feet diſtance from each other, and well watered after planting.

Artichokes thrive beſt in a ſtrong rich ground, expoſed to the ſun, with dung well mellowed in it: when they bloſſom the firſt year, the roots are endangered; you may therefore break off the bloſſoms, and about the middle of July break off the ſtems of the old roots that have done blowing, by which means you will furniſh yourſelves with freſh ſhoots.

The ſeeds of the cabbage and lettuce of all kinds may now be ſown in the open ground among the crops; a light rich ground and a warm expoſure agrees beſt with them; and that there may not be wanting a ſupply of them, they are to be ſown every month from March to Auguſt, when the winter crops are to be put in, which ſhould be planted out three weeks after they come up, at about five inches diſtance.

Such as produce large cabbages early in the ſpring may be permitted to ſtand for ſeed, and are to be ſtaked up and defended from the wind; the ſeeds will be fit to gather as ſoon as they begin to ſhew their down, and then the plants are to be pulled up and ſet to dry in a green-houſe.

The cauliflower ſeed is ſown in ſome well-expoſed corner of the garden, where the young plants may be ſheltered; and about the middle of April, when they are in their firſt leaf, they are to be planted in a nurſery about five or ſix inches aſunder, and there continue till the latter end of May, or June, when they are to be tranſplanted abroad for your crop, which ſhould be done in moiſt or rainy weather; or if it be a dry ſeaſon, holes are to be made in the ground, about three feet apart, and to be well watered before you plant the cauliflowers, which will make the plants ſhoot, being alſo frequently watered afterwards.

In the autumn following they will bear large flowers; but ſome of them will not flower till after Michaelmas, and ſuch plants may be taken up with the earth round their roots, and ſet together in the green-houſe, or ſome ſuch place, where they will enlarge themſelves, and be fit for uſe in the winter.

To raiſe ſummer cauliflowers, you muſt ſow the ſeed the beginning of Auguſt, upon ſome decayed hot-bed; and as ſoon as they have put out their leaf, tranſplant them about three inches diſtance, upon ſome other bed: in the middle of September draw out every other plant, and ſet them ſix inches apart under a ſouth wall, to ſtand there till ſpring, when they are to be planted out for flowering; or you may ſet them in the places where they are to bloſſom, covering them with glaſs-bells in the winter.

If the weather is open, the firſt week in this month you may ſow aſparagus; and the ſeedlings will be fit for planting out the February or March following.

The following is the method uſed by the beſt gardeners to produce a natural crop.

After meaſuring out the ground, allowing four feet for the breadth of each bed, and two feet for the alleys between the beds; open a trench at one end, and lay into the bottom of it horſe-dung about ſix or eight inches thick; then go on and trench the ſame quantity of ground lying next to the firſt trench, throwing the earth of the ſecond trench upon the dung at the bottom of the firſt, and thus continue working till the whole is done.

Having finiſhed your beds, plant aſparagus, taken freſh out of the nurſery, in lines at eight or ten inches diſtance, ſpreading their roots, and covering their buds with earth about four inches thick; each bed takes up four rows; and when they are all planted, ſow the whole with onions, and rake it level, for the alleys will not be of any uſe till after Michaelmas, when the onions will be off, and the ſhoots of the aſparagus plants made that ſummer are to be cut down, the alleys dug up, part of the ſoil thrown upon the beds, to raiſe the earth about five or ſix inches above the buds of the plants, and the alleys ſupplied with dung, or ſome rich ſoil.

In March following the earth muſt be raked down; and the alleys are to be turned up every winter, and now and then enriched with dung.

When Michaelmas is paſt, you may cut down the haulm, and give them their winter-dreſſing; and you ſhould not be later than the middle of March in raking and laying down the beds.

It is a general rule, not to cut any of the aſparagus till the fourth year after planting; but where the plants are ſtrong, a few may be taken here and there in very ſmall quantities the third year.

The aſparagus appears above ground the beginning of April, and may be cut till the beginning of June, when they have ſtood five years; but if they are younger, you muſt not cut them after the middle of May.

No buds that appear above ground ſhould be ſuffered to grow in the cutting ſeaſon, unleſs they proceed from freſh plants, to make good deficiencies; and thoſe muſt be ſuffered to run up every year, till they have gathered ſtrength: it is beſt to cut them downwards a little ſloping with a knife made blunt at the point.

APRIL.

Flower-Garden.

In this month, and the beginning of May, the ſeeds of the carnation are to be ſown in a compoſt made of ſandy loam, and well-conſumed melon-earth, two loads of the former to one load of the latter; ſiſt them well together, and let them lie in a heap for a time to mellow; then ſiſt it a ſecond time either to ſow the carnation-ſeeds in, or to plant your layers or roots of them upon.

Having filled your pots with this earth, and ſmoothed them on the top, ſprinkle on your ſeeds; and covering them with the ſame compoſt, preſs it gently with a board, and let them ſtand expoſed to the weather.

The ſeed will come up in about three weeks ; and in the July following the young plants will be big enough to tranſplant into beds, where they muſt be ſet about ten inches diſtant from one another, and ſhaded from the ſun with mats for about three weeks.

You may find many varieties from the ſeedling plants in the ſecond year; and whatever rarities appear, they muſt be laid down as ſoon as poſſible, by cutting half through a joint, and ſplitting the internode upwards, half way to the other joint above it; then the wounded part muſt be buried in the earth, and faſtened down till it takes root, which, provided the earth is light, will be in about two months.

The moſt proper ſeaſon for laying down the layers of the ſeedlings is in July ; and when planted they muſt be carefully guarded, both from the intenſe heat in ſummer, and the chilling froſts in winter.

The flower ſtems will begin to put forth about April, when each flower muſt be ſupported by its ſtem being tyed to a ſtick about four feet long ; and as ſoon as the flower-buds appear, leave only one or two of the largeſt upon each flower ſtem, to bloſſom ; and about ten days before the flowers open, the round poded kinds will begin to crack their huſks on one ſide, when you ſhould ſplit or open the huſk on the oppoſite ſide to the natural fraction with a fine needle ; and three or four days before the complete opening of the flower, you muſt cut off the points on the top of the flower-pod, and ſupply the vacancies on each ſide of the huſk with two ſmall pieces of vellum, which may be eaſily ſlipped between the flower-leaves and the inſide of the huſk, by which means the flower will make an equal diſplay of its parts, and the form of it, conſequently, be entirely regular.

When the bloſſom begins to ſhew its colour, you ſhould fix a piece of flat board upon the ſticks, to ſhelter it from the ſun's extreme heat.

The ſeeds of the carnation muſt be gathered towards the end of September, in dry weather, and be expoſed for a month or two, through a glaſs, without opening the huſks till the time of ſowing the ſeeds comes round again.

The ſeeds of the columbine are ſown in the nurſery this month, from whence you may remove the choice plants to the garden, and next year they will yield flowers : the roots of this flower will hold good for three or four years, when you muſt have a ſupply of freſh ones.

The ſeed of the ſcarlet bean is annually ſown in good ground, well expoſed to the ſun; and ſticks ſhould be fixed in the ground, round which they will twine, and make a very agreeable ſhew.

The amaranthus is an annual, ſown on a hot-bed ; and the ſeeds being ſown in this or the preceding month, in the hotteſt part of your garden, are to be raiſed under glaſſes.

The African marygold is alſo an annual, raiſed on a hot bed.

FRUIT-GARDEN.

YOU ſhould now carefully weed your beds of ſtrawberries, and take off their runners ; and if the ſeaſon is dry, it will be proper to water them, for they produce but little fruit when this is neglected.

Lay the branches of the peach-tree horizontally, and keep them free from great wood, and perpendicular ſhoots in the middle, that the ſap may be carried in ſuch due proportion as is neceſſary ; and it ſhould be ever obſerved, that too much vigour is as pernicious as too little, with reſpect to the tree bearing a ſufficient quantity of fruit.

When a pear or apple-tree is ungovernable, and will not bear fruit, ſtrip off the bark of the ſtrongeſt branches half an inch, or an inch, according to the bigneſs of the tree, and take it entirely away to the wood.

Theſe branches will continue to bear fruit for ſeveral years ; and when they die, there are always in a pear-tree a ſufficient number of others to ſucceed them, eſpecially in the middle of the tree ; which, if ungovernable, ought to undergo the ſame kind of diſcipline.

This work, which ſhould be practiſed only on low dwarfs, or wall-trees, is beſt done in March or April.

Cherry-trees, not in a thriving condition, ſhould now be ſlit perpendicularly down with the point of a knife, juſt entering the bark of the ſtem of the tree, to prevent being hide-bound ; after which operation they will thrive and proſper wonderfully, when, for want of it, they will continue almoſt barren for ten or fifteen years.

At this time you ſhould look carefully to your young fruit-trees which were planted in the ſpring, obſerving to water them in dry weather ; and if you obſerve the leaves beginning to curl up, you ſhould water them gently all over their branches ; which may alſo be practiſed to great advantage on old trees ; but it muſt not be done in the heat of the day, leſt the ſun ſhould ſcorch their leaves, nor too late in the evening, eſpecially if the nights are cold.

Where you obſerve the fruit-trees to be greatly infeſted with inſects, you ſhould waſh the branches with water, in which a great quantity of tobacco-ſtalks have been ſteeped ; which, if carefully done, will infallibly deſtroy the inſects, and not do any any injury to the trees ; or if the leaves which are curled are taken off, and ſome tobacco-duſt thrown on the branches, it will deſtroy the inſects, and may, in a day or two, be waſhed off again.

Towards the end of this month, you muſt look over your eſpaliers and walls of fruit-trees, training in the regular kindly ſhoots in their proper ſituation, and diſplacing all fore-right and luxuriant ones.

In the middle of this month uncover thoſe fig-trees which were ſcreened from the froſt in the winter ; but do it with caution, as the young fruit, which now begins to appear, may be greatly hurt by being expoſed to the air too ſuddenly.

KITCHEN-GARDEN.

THE middle of this month is the proper time to plant out melons, which are to be raiſed under paper : in making theſe ridges, if the ground is dry, the dung ſhould be but a half a foot higher than the ſurface of the ground, and the earth ſhould be laid at leaſt a foot and a half thick upon the dung, that the plants may have depth enough to root ; they will require no watering, after they are well rooted, and hereby a choicer ſort of melons may be generally obtained; which, in the common method, frequently miſcarry, or produce but little fruit.

The alleys between theſe beds ſhould be afterwards raiſed with dung and earth to the level of the beds, that the roots may have room to extend on each ſide, for the roots of theſe plants ſpread as far in the ground as their branches extend on the ſurface.

Of kidney-beans we have two ſorts; the one, which is called the Batterſea-bean, bears early, and near the root, without running high; and the other, grows near ſix feet high.

We ſow theſe beans, the firſt week in this month, about four inches apart, in drills from north to ſouth, in a light freſh ſoil, covering them with earth, raiſed in a ridge, to keep the wet from them: the lines of the Batterſea-beans ſhould be too feet apart; and the other ſort are be ſown in rows like rounceval-peas, having alleys between them two feet and a half wide; the former kind need not be ſtaked, but the others will not bear well unleſs they are ſtaked.

From the firſt ſowing in this month, you may, once every three weeks till the middle of July, continue to ſow freſh ground with kidney-beans to ſucceed one another; obſerving, that when the ground is very dry, as in June and July, and the weather hot, you muſt water the drills as ſoon as you have opened them, before you put in the ſeed, which will contribute to their vegetation; but after they are ſown, you muſt avoid watering them.

Toward the end of this month, you may ſow the nonpareils, and the Spaniſh morotto-peas, about two or three inches apart in lines, leaving a ſpace of three or four feet for alleys, till the whole is ſown; and when they grown up ſix inches high, earth them up, and ſet one row of ſticks or boughs about ſix feet high, on each ſide, for them to run up, and you will have a plentiful crop.

The charlton, or maſter-hotſpur, ſhould be ſown in December, for the firſt crop, in drills about two or three feet aſunder, the lines running from north to ſouth: a ſecond crop of the ſame kind of peas ſhould be ſown in February; and in March we may put in a third crop of the ſame ſort.

Some ground may be prepared about the beginning of April for the dwarf-peas, which ſeldom riſe higher than half a foot, and are to be ſet four or five inches apart, in lines about eighteen inches diſtant from one another; and in order to have a conſtant ſupply of young peas, there is a ſort of dwarf peas which may be ſown in May or June, in edgings upon a gentle hot-bed, the firſt week in September, and will produce peas in the winter.

Spaniſh chardons may now be ſown in the natural ground; you are to make holes for the ſeeds about five or ſix feet diſtance, and put four or five ſeeds in each hole: and when they are come up, leave growing only one ſtrong plant in a hole for blanching.

Lavender and roſemary are raiſed from ſlips planted in this month, which take root almoſt immediately if they are ſhoots of the laſt year, but if they are older they will not grow: theſe plants ſhould be ſet in a light ſandy ſoil, in the warmeſt and drieſt part of the garden.

MAY.

FLOWER-GARDEN.

THE ficoides, which is propagated by the cuttings, being planted abroad in a natural bed of earth in this month, will be fit to put in pots in Auguſt, where it may remain in open air till the latter end of September; ſome kinds of this plant being annual, muſt be raiſed from ſeeds every year; and one ſort of it will ſtand the winter, if we raiſe young plants of it about July or Auguſt, that do not bloſſom in three or four months.

The ſhrub-kinds, which have their ſtalks woody, will bear moderate waterings; but the others, which are more ſucculent, muſt have very little water. Theſe plants muſt be expoſed to the ſun, which will open their bloſſoms, unleſs it be two kinds, which only flower in the night. The cuttings of theſe plants ſhould not be planted before the wounded parts have been dried a day or two in the ſun.

The torch-thiſtle is a ſucculent plant, raiſed from cuttings planted between May and the end of July, upon a little hill in the middle of the pot, for they can hardly endure water: and before they are put into the hot bed, they muſt ſtand abroad about twenty days to take root; their waterings muſt be ſeldom, and gentle: and the beſt compoſt for this plant is, the rubbiſh of old walls, mixed with about one third of ſandy ſoil. The ſidums, eſpecially the tree-kind, are eaſily propagated from branches ſet in the earth in a light ſandy ſoil, either in this or any of the ſummer-months, giving them a little water, and as much air and ſhade as poſſible in the ſummer; and in the winter no water at all.

There are ſeveral ſorts of the geranium, which are raiſed by planting the cuttings, this month, in natural ground, where they will become proper for tranſplanting the Auguſt following; and from ſeeds ſown in March on hot-beds. Thoſe planted in the natural ground require a medium ſoil without dung, muſt be frequently watered, and houſed with the orange-trees.

The amomum Plinii is raiſed from cuttings planted this month in the natural ground: during the ſummer it muſt ſtand in ſome place defended from the ſun, and be conſtantly ſupplied with water.

Cuttings of the Arabian jeſſamin may this month be planted in a ſandy ſoil, and is more injured by wet than cold. At the time the cuttings are taken from this plant, it ſhould pruned to within ſix inches of the laſt year's ſhoot, and have freſh earth put to the roots; by which means it will ſhoot near a foot in the enſuing ſummer.

Layers of the myrtle-tree ſhould be made this month: the youngeſt ſhoots muſt be bent into the earth, after it is well ſtirred; and being often refreſhed with water, will take root, and be fit to take off from the mother-plants in the ſpring following. In July, the cuttings of this tree are planted, ſtripping off the leaves, two inches from each cutting, and ſetting them that depth, about an inch apart, in pots of fine light earth, watering them frequently till they have taken root, which will be about the latter end of Auguſt; and this young plantation is to remain till the ſecond of March before they are to be tranſplanted into pots. About the middle of April you may prune, and put earth about the roots of ſuch old myrtle-trees as are in a bad ſtate, and cut the branches off their heads within three or four inches of the ſtem.

The melianthus is a plant propagated with eaſe from ſlips taken about the roots any time between this month and Auguſt, planted in a ſandy ſoil, and frequently watered.

The pyracantha is raiſed from cuttings, planted in May or June, in pots of fine earth, and watered frequently, keeping them from the ſun till the following winter, when a warm expoſure will be ſerviceable to them. This tree may alſo be raiſed from layers and ſeeds, and thrives beſt in a dry gravelly ſoil, unmixed with dung or any other rich manure.

The oleander plant has many varieties; the moſt common of which is the ſcarlet oleander, which being of a hardy nature, may be kept abroad all the winter under a ſouth wall; but the ſweet-ſcented oleander is more tender, and ſhould be houſed with the orange-tree. Theſe ſhrubs are raiſed by layers in this month or the next, in a medium ſoil, and with moderate watering, and will take root to tranſplant the Auguſt following.

Orange and lemon trees may this month be removed and tranſplanted without danger, as well as brought out of the conſervatory: upon bringing out your exotics, and other plants, bruſh and cleanſe them from the duſt they have contracted in the houſe, give them freſh earth on the ſurface of their pots, and water them well, when they are placed in the order they are to ſtand. When you tranſplant or remove orange-trees, you are to do it carefully, without injuring their bodies; let the caſes for your trees be filled with a compoſition of two parts in ſandy loam, one part rotten dung, and one part white ſand; and when your orange-trees are ſo removed, give them frequent waterings, but without wetting either the ſtem or the leaves; ſet them in the ſhade for a fortnight, and let them have the ſun by degrees; as, when it is too hot upon them, it turns their leaves yellow.

Fruit-Garden.

In the beginning of this month, look carefully over your wall and eſpalier trees, and take off all fore-right ſhoots, and ſuch as are luxuriant and ill-placed; and train ſuch kindly branches as you would preſerve regularly to the wall or eſpalier, which will prevent your trees from growing into confuſion.

Fruit-trees may be tranſplanted in the ſummer months, from May to Auguſt, even when the trees are in bloſſom: the method of ttanſplanting them is, by preparing holes for them before you begin to take them up; and the earth taken out of the holes you are to make very fine, and mix with water in large tubs to the conſiſtence of thin batter, with which each hole is to be filled for the tree to be planted in, before the earthy parts have time to ſettle or fall to the bottom. A tree, thus planted in batter, has its roots immediately cloſed, and guarded from the air; and as the ſeaſon now diſpoſes every part of the tree for growth and ſhooting, it loſes very little of its vigour if you are careful of its roots, obſerving to wound but few of them at the taking the tree out of the ground, and not let them dry in the paſſage from one place to another. Though this pap is of uſe in ſummer-plantations, yet in the uſual winter-plantations it is pernicious, as it will then chill and rot the root of your trees.

As the cutting and wounding ſome roots of a tree, and among them of the capital ones, cannot be avoided, a mixture of gum has been contrived to plaiſter over the wounded parts of the great roots, and prevent the air and wet penetrating too much into the veſſels of the roots; and if the root be very large, you may at the ſame time mark its correſponding limb or branch in the head, to be cut off about a fortnight afterwards in the ſame proportion, and then to be plaiſtered in the ſame manner as the root was done before.

In the removal of trees, care muſt be taken that it be ſudden: for if the roots are permitted to grow the leaſt dry, we may preſently diſcern a failure in the top-branches, which will require time to redreſs; for which reaſon, it has been thought impoſſible to remove a large tree to any conſiderable diſtance.

There is one convenience in this laſt way of planting, which is not in the common way; and that is, that the tree may be taken up without any earth about the roots, which makes the tranſportation more eaſy; and by this method, and the aſſiſtance of prepared gums, peach-trees, nectarines, pear-trees, plumb-trees, and cherry-trees, with fruit upon them, either green or ripe, may be removed, though the trees are ſix or ſeven years old; and trees of all ſorts may be thus tranſplanted in the ſummer.

Kitchen-Garden.

You may now give your melons air in the middle of the day, and look to your melon-ridges, weeding them, and carefully pruning off the water-branches, which are known by their flatneſs and extraordinary breadth; it is alſo neceſſary to pinch off the tops of the runners that have fruit upon them, having three or four joints above the fruit, and taking care that the fruit be well ſheltered with leaves from the power of the ſun, otherwiſe their growth will be ſpoiled; but when the growth is perfected, you cannot expoſe them too much to the ſun for ripening. If the ſeaſon be dry, rather float the alleys between the melon-ridges, than pour water upon the plant, or near the ſtems.

About the beginning of this month, ſow cucumbers in the natural ground, both for ſallad and pickling: in ſowing thoſe for ſallads, put about twelve ſeeds in each hole; but leave only four or five when they come up; let the earth be freſh, and well worked with a ſpade, rather light than ſtiff; and a plantation of this kind will produce twice as much fruit as one of the ſame quantity of ground forced with dung.

To raiſe cucumbers for pickling, ſow them in a drill, as you do peaſe or French beans; and put a row of buſhy ſticks on each ſide of them: the rows muſt be four or five feet aſunder; and if ſowed in the ſouth border, where there is a vacancy, and nailed againſt the wall, they will grow ſtraiter and finer flavoured than thoſe on the ground.

Replant imperial and Sileſia lettuce: ſow ſome of the white and brown Dutch cos-lettuce, to be planted out for cabbaging in June: ſow radiſhes and endive very thin, to be branched without tranſplanting; and you may alſo ſow purſlane and cabbage ſeed; tranſplant cauliflower-plants; make your firſt drills for ſellery, if your plants are large enough. Plant out cabbages and beet-chard; and you may yet ſow thyme, ſweet marjoram, and gillyflowers.

You ſhould now be very careful to deſtroy weeds before they ſhed their ſeeds; deſtroy alſo the neſts of caterpillars and other inſects which annoy your trees; prune off all crumpeled leaves, for they harbour the worſt of vermin; and if the weather be dry, water new-planted trees, aſparagus, *&c.*

JUNE.

Flower-Garden.

The leaves of the ſaffron crocus appear as ſoon as the flower is paſt, and remain all winter, which in the ſpring ſhould be tied together in knots to help the increaſe of the roots; and theſe will be fit to remove or tranſplant about Midſummer. This plant delights in chalky ground, but it will proſper alſo in a ſandy ſoil; and the piſtillum contains the ſaffron uſed in medicine. The roots of the ſeveral kinds of crocus may be taken out of the ground in this month, and replanted with other bulbs; they love a light ſoil, and may be increaſed by off-ſets.

The cyclamen is propagated from ſeeds ſown as ſoon as ripe, in a light ſoil, and tranſplanted in Midſummer when their leaves are decayed; and it is a general rule, that all bulbs may be ſafely tranſplanted, when their flowers and leaves are decayed.

The colchicum thrives beſt in a ſandy ſoil, and will only bear tranſplanting about Midſummer, when the roots are entirely at reſt. There are many ſorts of aloes, the moſt common whereof are brought from America; but Africa produces the greateſt variety, where they grow upon rocky ground; therefore the earth proper for them is to be made with one half ſandy ſoil, and the other rubbiſh of old walls, mixed and ſifted together; you ſhould plant them ſhallow in the pots, raiſing the earth about them, ſo that the plant may, as it were, ſtand on a hill; and when you water them, do it without touching any part of the plant, otherwiſe they will be in danger of rotting; the off-ſets of the aloe may be planted in the latter end of this month, and the beginning of July, when they ſhould be ſuffered to ſtand abroad for about nine days; and they may be helped with a hot-bed as ſoon as they begin to take root; if the weather be fair while the aloes are abroad, their earth being dry, will require watering once a-week; and from the time of their being houſed till the middle of October, gentle refreſhments may be given them while the ſun is upon them in the morning; but from October to March, they muſt be kept very dry. In May they ſhould be tranſplanted, without diſturbing the roots; the ſeeds of many kinds of aloes ripen in Britain, and may be ſown in April upon hot-beds. The fritillaria is propagated by planting their branches in a natural bed of earth any time between June and Auguſt, and they will ſoon be fit to plant into pots; they ſucceed beſt in the ſame ſort of earth as the aloe.

The Indian fig is raiſed by planting its leaves ſingly about two inches deep, in pots of earth compoſed of lime, rubbiſh, and ſandy ſoil, after their wounds are dried, and letting them ſtand abroad till they take root, and then they may have the help of the hot-bed; you muſt give theſe plants a good deal of the ſun, and the leaves ſhould be planted during the ſummer-months.

Fruit-Garden.

The inoculation of fruit-trees now demands the attention of the gardener, and the following is the moſt approved method of performing the operation. About Midſummer take off a vigorous ſhoot from any tree you would propagate; and after having made choice of a ſtock of about three or four years growth, in a ſmooth part of it make a downright ſlit in the bark, a little above an inch in length, and another croſswiſe at the top of that, to give way to the opening of the bark; then gently looſen the bark from the wood on both ſides, beginning at the top; which being done, cut off your bud with a penknife, entering pretty deep into the wood, as much above as below the bud, to the length of the ſlit in the ſtock: after the bud is thus prepared, take out the woody part of it (carefully preſerving the eye of the bud) then put it in between the bark and the wood of the ſtock at the croſs ſlit, putting it downward by the ſtalk, where the leaf grew, till it exactly cloſes; then bind it about with coarſe woolen yarn, the better to make all parts regularly cloſe, and the bud incorporate with the ſtock: in three weeks time the bud will be incorporated with the ſtock, when you muſt looſen the yarn, that it may not gall the place too much: the quicker this operation is performed, the better; and you muſt put two buds into one ſtock, in inoculating nectarines and peaches. If the buds inoculated this month do not hit, you may make another attempt in the ſame year, and on the ſame ſtock. The proper time for inoculating is from the beginning of this month to the latter end of Auguſt; and care muſt be taken that the branch and ſhoot made choice of for inoculation, do not lie by, but that they be uſed as ſoon as cut.

You may upon one tree, bud peaches, nectarines, apricots, plumbs, and almonds.

Kitchen-Garden.

Kidney-beans, radiſhes, lettuces for cabbaging, and endive, may now be ſown; as may alſo the large ſort of peas, about five or ſix inches apart, allowing three or four feet diſtance between the lines, and they will in September afford a good crop.

Replant cabbage-lettuces; tranſplant leeks in light rich ground, and at ſix inches diſtance from each other; and if the weather be dry, you may gather herbs for drying againſt

gainſt the winter, ſuch as lavender, roſemary, ſage, mint, ſweet marjoram, thyme, *&c.*

Take eſpecial care to preſerve your plants from the ſcorching ſun; ſtir up ſtiff ground; continue to deſtroy weeds; and give your plants gentle waterings about their extreme fibres, which ſhould be done at the cloſe of day.

JULY.

FLOWER-GARDEN.

THERE is little to be done in the flower-garden this month: the berries of the coffee-tree which are now ripe, may be ſown, firſt cleaning their ſeeds from the pulp, in pots of fine earth, about an inch deep; and if you give them the help of a hot-bed, in leſs than ſix weeks time they will ſprout.

The fruit of the ananas being ripe in this month, if you cut off the crown of the leaves which grows on the top of it, and plant it in a light ſandy earth, it will, with the aſſiſtance of a hot-bed, preſently take root.

Anemony ſeeds, now ſown, muſt be ſprinkled with water frequently and gently.

FRUIT-GARDEN.

THE management of the vine ſhould this month be chiefly attended to: it is to be obſerved, that from a vigorous ſhoot of a vine already once pruned, there will puſh again ſeveral Midſummer ſhoots weaker than the former, from the firſt, ſecond, and third bud towards the extremity; which ſhoots are to be taken off, only remembering that it is proper to ſpare the laſt of ſuch ſhoots ſo far as to leave one bud upon it, from whence, in Autumn, nature may a third time exert herſelf; for if thoſe ſhoots were all entirely removed, the vine would puſh at thoſe bearing buds which lie at the bottom of the ſhoots; in conſequence of which, there would be either a want of fruit at thoſe places next year, or a neceſſity of pruning the branch ſhorter than was intended, or is in the winter convenient.

There is no danger in expoſing the grapes this month to the ſun; for though the vines appear thin of wood and leaves, the Autumn ſhoots will recover that fault.

Put nets over your grapes to preſerve them from the birds; and you ſhould alſo guard againſt waſps and other inſects, which now deſtroy the peaches, apricots, and other fruit; by placing phials of honey and ale near the trees, you may ſoon entrap a great number of them.

KITCHEN GARDEN.

YOU may know ſow kidney-beans, and ſome peas, to bear in September and October; ſow cucumbers upon a bed made with dry horſe-litter, and covered with light earth ten inches thick; they muſt be covered at night in September with a common frame and glaſs, to keep them from froſt and rain, and by this method you may have ſome cucumbers till Chriſtmas.

Make a bed for muſhrooms as directed in February; and be ſure to cover it very thin with earth.

About the middle of this month ſow royal Sileſia, and brown Dutch, white goſs, and other ſorts of lettuces, chervil, carrots, and turnips.

Plant cabbages, and ſavoys; tranſplant endive for blanching againſt winter; earth up ſellery in drills, and plant out a new crop to ſucceed the former; take up ſhallots, garlick; and water plentifully all herbs that are ſeeding.

AUGUST.

FLOWER-GARDEN.

THE tulip-tree being a plant of the wood, ſhould be among ſuch trees as are deſigned for groves. where it will riſe to a great height: the ſeeds of this tree come from Virginia, and are to be ſown in pots this month, and ſheltered the winter, and they will come up all in the ſpring following.

At two years growth the young plants may be tranſplanted into ſingle pots, and muſt have ſhelter in the winter for the firſt nine years at leaſt, till they have gathered ſtrength enough to reſiſt the ſeverity of the froſts, when they may be planted in the natural ground, rather a ſandy ſoil than any other.

The iris flower has many varieties, ſome with bulbous and ſome with tuberous-roots: the roots of the bulbous iris may be taken up as ſoon as the leaves begin to wither, and planted in Auguſt; and they may be increaſed by off-ſets taken from their roots when their ſtalks are decayed: the beſt of the tuberous kind is the the chalcedonian iris, commonly called the toad flag, which requires a warm and rich ſoil, and muſt be carefully ordered, or it will not thrive well.

The narciſſus, or daffodil, is a flower of a hardy nature, and thrives greatly in any ground; theſe flowers are propagated from off-ſets from their roots, planted in this month, and may be raiſed by ſeeds ſown in September, which will produce great varieties: the ſeedling plants are to remain without removal two or three years, when they are to be taken up in June, and replanted in good ground at a proper diſtance.

The jonquil is of the ſame kind with the daffodil, and flowers much about the ſame time; the roots, which are bulbous, are to be taken out of the ground, and replanted like other bulbs.

The bulbous violet, or ſnow-drop, is reckoned amongſt the daffodils, and is one of the earlieſt flowers in the ſpring.

You may now plants off-ſets of the hyacinth, in beds of ſandy ſoil; the tuberous hyacinth is a plant of an aſpiring head, and very tender nature; the roots of it muſt be taken up in April, and replanted in pots of prepared earth; and, like other ſhrubs, it requires the aſſiſtance of a hot-bed: you may take up the bulbs of this plant in September, and preſerve them in dry ſand.

This is the proper time for parting the roots of the lily, which ſucceeds beſt in an open ſandy ſoil: the ſtriped white lily is ſo great a rarity as to deſerve a place in the niceſt garden, and the orange-lily is a proper companion for it; the lily of the valley is eaſily raiſed from plants, and thrives beſt in ſhady ground.

The crown-imperial may be raiſed from ſeeds, but is commonly propagated from off ſets that ſpring yearly from old roots, which are to be taken up in June when the ſtalks are dry, and replanted in Auguſt.

The work to be done this month, in the fruit and kitchen-garden, is the ſame as directed in the preceding month.

SEPTEMBER.

Flower-Garden.

The tulip is propagated in the following manner: the ſtems of this flower being left remaining upon the root, will perfect their ſeeds about July, which will be fit to gather when the ſeed-veſſels begin to burſt; and then they are to be cut cloſe to the ground in a dry day, and laid in ſome dry place till September, when they are to be ſown, in a ſoil compoſed of natural black earth and ſand; and after their ſecond appearance above ground, they may be taken from the pots they were ſown in, and put in a bed of natural ſandy ſoil, well ſifted, where the thickneſs of half an inch of the ſame earth ſhould be ſpread over them; and thus they are to continue, without any other culture than every year adding half an inch for their covering, till they begin to blow, which will be in five or ſix years time: in this manner tulip-ſeeds are every year to be ſown for new varieties.

In planting tulips, all the forward blowers ſhould be planted in a bed together; and of the late flowering tulips the talleſt ſorts ſhould be placed in the middle line of the bed, with two rows of the ſhorter on each ſide.

Tulips planted in this month need no ſhelter till March, when, the flower-buds appearing, they ſhould be defended from blights with mats, or other covering; which covering will alſo ſerve to ſhelter them, when blown from the too powerful heat of the ſun, and pernicious damps.

There are two claſſes of tulips; the prœcoce tulips or early blowers, and the ſerotine or later blowers; and theſe are diſtinguiſhed by their double and ſingle flowers: they have alſo different denominations, from their colour and ſtature, as bagats, which are the talleſt flowers, commonly purple and white marbled: agates, which grow ſhorter, and are veined with two colours; and beazarts, which have four colours, tending to yellow and red, of ſeveral ſorts.

You may now take up the roots of the peony, part and plant them; they will proſper in any ſoil.

The ſeed of the mullein may now be ſown, in a ſandy ſoil, and a ſhady part of the garden; it is a beautiful plant, and bloſſoms four feet high.

Violets are increaſed by tranſplanting their runners either in this month or in February, which will of themſelves take root at every joint; they thrive beſt in a binding ſoil, ſhady ſituation, and ſhould be planted in the moſt rural parts of the garden.

You may now increaſe daiſies by parting their roots; and they make very pretty edgings for flower beds.

Layers of the honeyſuckle may now be put down; they thrive beſt in the ſhade, and are moſt eaſily trained up in pots.

There are ſeven ſorts of the jeſſamine: the common white, the yellow, and the Perſian jeſſamine, are propagated from layers or cuttings, and will grow in any ſoil; the layers are made in this month, and the cuttings may at the ſame time be planted, which ſhould always be a foot long, and two joints be under ground. The jeſſamine ſhould be planted againſt walls or trees, or mixed in hedges. There are jeſſamines of a more tender nature, which require to be ſheltered in the conſervatory in the winter, as the Spaniſh jeſſamine, the Portugal jeſſamine, the Indian jeſſamine, and the Arabian jeſſamine: theſe are propagated by grafting on the common white jeſſamine in March, or by inarching in May, or cuttings planted at the ſame time: the inarched plants are to be cut off the middle of Auguſt following, and in February you are to cut off the branches within four or five inches of the ſtem; and, after they have freſh earth put to their roots, they may be ſet near the glaſſes or windows of the green-houſe: they ſucceed beſt in a medium ſoil between ſand and clay, without dung, and ſhould not be watered too frequently.

The virgin's bower is raiſed from layers in this month, and from cuttings alſo: it is of a twining nature, muſt be ſupported with ſtakes: it may either be planted againſt a wall, or ſet in the wilderneſs; and it thrives beſt in a light ſoil.

The Virginia dog-wood bloſſoms early in the ſpring; and the flowers are ſucceeded by red berries, which hang a long time upon the tree: the ſeeds are ſown in pots of light earth in autumn, and they are to ſtand the winter in the green-houſe, giving them the aſſiſtance of the hot-bed the following ſpring.

The Virginia myrtle, which bears berries, from which is drawn the green wax whereof candles are made, is propagated by ſowing the berries in pots of black ſandy earth, which ſhould be kept continually moiſt.

The ſaſſafras-tree is a plant of Virginia, which loſes its leaves in winter, and in the ſpring puts forth its yellow flowers in cluſters, which are ſucceeded by blue berries, like thoſe of the laurus tinus; theſe berries are ſown in autumn, in a ſandy ſoil.

You may now make layers or ſlips of the box tree; and the ſeeds may be ſown as ſoon as ripe, or laid in ſand during the winter, to be ſown in the ſpring following; this plant thrives beſt in a chalky ſoil

The dwarf or Dutch box, is of great uſe for edging of flower-beds, or making ſcroll-works; it will remain good, without renewing, a long time; and ſo great is the increaſe of it, that being earthed up every year, in four or five years after the planting, it may be taken up, parted, or ſlipped, and be made to plant four times the ground it ſtood upon.

Fruit Garden.

You may now gather the different ſorts of fruit as they ripen; for thoſe which are in eating this month, ſeldom continue long good.

Tranſplant ſtrawberries, gooſeberries, raſpberries, and currants, towards the end of this month, if the weather proves moiſt, otherwiſe it will be better to defer it till the beginning of the next month; and this is the beſt ſeaſon to plant cuttings of gooſeberries and currants, which will take root, and make better plants than thoſe which are propagated by ſuckers.

Your fruit-trees againſt the wall of your forcing-frame, muſt now be pruned and trained cloſe to the wall or eſpalier, that their buds may be preparing before the ſeaſon for applying the heat; and you ſhould alſo prepare for the ground where the fruit-trees are deſigned to be planted the next month, that it may lie to mellow and ſweeten.

KITCHEN-GARDEN.

Sow Spaniſh radiſhes for the winter, and ſpinach to be cut in February; make plantations of the Dutch brown lettuce to ſtand the winter; ſow ſorrel, chervil, and ſmall herbs for ſallads, in ſome well-expoſed place, obſerving to provide ſuch mixtures for this ſeaſon as are hotter to the taſte, than in the former months.

You may now replant endive, and all ſorts of fibrous-rooted herbs; continue to earth up ſellery; raiſe the banks of earth about chardones for blanching; tranſplant aſparagus-roots; make plantations of cabbages and cole-worts; tranſplant young cauliflower plants in places where they are to flower; tranſplant ſtrawberries; make beds for muſhrooms; cover muſhrooms ſown in July every night; earth up your winter-plants; prepare compoſts; and, if the weather be dry, water your plants and herbs in the morning, and give your turnips the firſt houghing.

Such cucumbers as are now ripe, muſt be cut open, and the ſeed or pulp taken out of them, which ſhould lie three or four days together before they are waſhed, and ten days in the ſun before it is laid up; and it ſhould ever be obſerved, that if ſeeds are not thoroughly dry before they are laid up, they will rot, and be good for nothing.

OCTOBER.

FLOWER-GARDEN.

You ſhould now plant anemonies, and ranunculuſes; and as ſoon as they appear, defend them from winds and froſts, with ſaw-duſt, dry ſtraw, or matts; and make an end of putting tulips into the ground: and likewiſe put hyacinths, tulips, narciſſuſes, *&c.* in glaſſes made for that purpoſe, to blow early in the houſe.

Continue to tranſplant and lay roſes, and ſuch like flowering ſhrubs; and to plant the cuttings of jeſſamines and honeyſuckles in ſhady borders. Sow the berries of yew, holly, and other evergreens, prepared in earth or ſand; and prune theſe kinds of plants if the ſeaſon be mild.

This is a proper time to remove your ananas or pine-apples out of the bark-beds into the ſtove; and always keep a tub of water in the ſtove to water them when it is wanted, which ſhould ſtand twenty-four hours before it is uſed.

Set your pots of carnations, which are now blowing, into your green-houſe near the door; and the beginning of this month you are to houſe your myrtles, amomum Plinii, melianthus, and ſuch tender greens as remain yet abroad. Tie up thoſe plants that grow diſorderly, and place the aloes, torch-thiſtles, euphorbiums, *&c.* neareſt the ſun; and the other plants, which are more hardy, towards the back of the houſe.

When you water your houſed greens, let it be in the morning, when the ſun ſhines upon them; but you are to give no more waterings to your tender ſucculent plants after the middle of the month.

The windows of the green-houſe are to be kept open day and night till about the fifteenth of this month: after that, in the day time only.

FRUIT GARDEN.

You may now plant peaches, apricots, and other fruit-trees; and as nothing is more prejudicial to them than dung, this ſhould be done in untried earth.

Should this month be a wet one, you muſt raiſe the borders, and the trees planted high; for it is certain death to peaches and apricots, to ſtand where the water ſtagnates in the winter.

Vines ſhould now be planted againſt walls ſeven or eight feet aſunder, in a ſoil compoſed of ſea coal aſhes, drift ſand, or the rubbiſh of old buildings, with an equal quantity of natural earth mixed with rotten dung.

About the middle of this month ſow cyder-preſſings in beds of freſh earth, to raiſe ſtocks for grafting, or even making of orchards without grafting; and from a nurſery of this kind we may have as many different ſorts of apples as we raiſe plants, although the ſeeds come all from the ſame tree.

You may now have plantations of apples, grafted upon paradiſe ſtocks, in pots; they will bear when the trees are very ſmall, and very greatly ſet off an entertainment, being placed growing upon a table among diſhes of fruit.

Tranſplant trees of all ſorts, and lay up acorns and maſt in ſand; lay bare the roots of old unthriving forward blowing trees; ſtir up new-planted ground; and lay in a good ſtock of untried earth to be ready upon all occaſions, for fruit-trees, ever greens, and flowers.

KITCHEN-GARDEN.

This is the proper ſeaſon to lay up roots for winter-ſtore, ſuch as carrots and parſnips; take the roots of turnips out of the ground, and lay them up in ſand; make plantations of currants and gooſeberries, from the ſuckers or cuttings.

The firſt week of this month ſow cucumbers on the natural ground, to be afterwards tranſplanted into pots, for the convenience of ſheltering from cold nights, till a hot-bed is prepared for them. This is better than to begin after the uſual method in December or January.

Make plantations of lettuce, for winter-uſe: tranſplant cabbages and cauliflower plants. Take up thoſe cauliflower plants which begin to flower, tie their leaves together, and bury their roots and ſtalks in ſand, in a cellar, or ſome cool place. Cut artichokes with long ſtalks, and preſerve them in the houſe by ſetting their ſtalks in ſand. Earth up and dreſs ſuch artichokes as have done blowing: and continue to earth up ſellery for blanching.

Sow kidney beans in baſkets under a ſouth wall, to be afterwards forwarded by hot-beds, for early beans; and hot-ſpur peas, and Spaniſh beans, in ſome well expoſed border, under a wall or a hedge. Sow alſo radiſhes in ſome warm place, to draw early in the ſpring; and creſſes, lettuce, muſtard, ſpinach, *&c.* upon a decayed hot-bed: Put likewiſe ſome roots of mint upon a gentle hot-bed for winter ſallads.

NOVEMBER.

Flower-Garden.

You may now cut down the ſtalks of ſuch tall blowing flowers as have done bloſſoming within three inches of the root. Tie up all trees and ſhrubs to ſtakes, otherwiſe by their being looſe, and at liberty, the winds will deſtroy them. Lay up heaps of earth for your ſeveral ſorts of flowers, and make the proper mixtures for exotics; obſerving, that where the ground is too ſtiff, it may be brought to a ſtate of loam, by adding to it a ſufficient quantity of drift or ſea-ſand.

Peonies, and ſome fibrous roots, may now be planted. If the weather be open, you may yet tranſplant roſes, jeſſamines, honeyſuckles, ſyringa, and lilac. Unnail your paſſion-trees from the wall, and lay them upon the ground, that in caſe of ſevere froſts they may be covered with ſtraw.

Plant hyacinths, jonquils, narciſſus's, and polyanthus's, in pots, and plunge them into hot-beds, to bloſſom about Chriſtmas: lay down your auricula pots upon their ſides, the plants towards the ſun, to drain them from moiſture, and preſerve them from froſts; and ſhelter young ſeedling bulbs from the froſt, but give them daily airings.

Fruit Garden.

The buſineſs of this month being principally planting, it may be neceſſary to give the reader directions for bringing fruits to perfection in the winter, ſo as to have, by a particular management in planting, ripe fruit throughout the year.

Apricots, cherries, early peaches, nectarines, currants, gooſeberries, are to be planted in the following manner, againſt a paling of five feet high: the ſtakes to ſupport this paling muſt be ſet about four feet diſtance from one another; to which you are to nail whole deal-boards of twelve feet long, well-jointed to one another, and ploughed on the edges, ſo as to ſet in laths, that thereby the ſteam of the dung, which is to lie at the back, may not get among the plants; becauſe wherever ſuch ſteam comes, it will cauſe mildews.

The deals are to be an inch in thickneſs; for if they are not quite ſo thick, the trees will be apt to be ſcorched upon the firſt application of the hot dung; and if they are thicker, the artificial heat applied to their backs, upon the time it begins to decline, will not be powerful enough to warm thoroughly, and then the dung muſt be oftener refreſhed.

When the paling is up, you are to mark out a border on the ſouth ſide of it, about four feet wide; and on the outſide of the border, faſten to the ground, in a ſtraight line, ſome ſcantlings of wood about four inches thick, to reſt glaſs lights upon, which are to ſlope back to the paling, to ſhelter the fruit as occaſion requires: between theſe glaſs-lights, there muſt be bars cut of whole deal, about four inches wide, for the glaſſes to reſt upon; and the bars muſt always remain fixed, as in a frame for a hot-bed.

There muſt be a door, ſhaped to the profile of the frame, at each end, to be opened, either the one or the other, as the wind happens to blow, ever obſerving that the door be opened on that ſide only which is moſt free from the wind.

You may plant fruit-trees in a frame of this ſort the ſame ſummer it is made, and the trees will take very good root before winter, and be ſo well ſtored with ſap againſt the following ſpring, that they will ſhew no ſign of their removal, but bear extremely. Beſides, by this ſummer planting, the trees ſeldom or never throw away their ſtrength in autumn-ſhoots, or make any attempts towards it, till September and October, when the froſts prevent their deſign.

The trees planted muſt have time allowed for the juices to digeſt, before you begin to force them: therefore the hot dung is not to be applied to the back of the paling before November.

About the middle of this month, or towards the end, is the time to bring ripe cherries in February: and at the ſame time likewiſe the heat may be uſed for apricots, ſo as to make the maſculine apricots as large as duke cherries by February, and ripen them the beginning of April. The Anne peach will ripen about the end of April, as will alſo ſeveral ſorts of forward plumbs.

The early nectarine thus forced will ripen with the maſculine apricot: we may have green gooſeberries fit for tarts in January and February; and ripe gooſeberries and currants in March and April; but cherries do not bear this alteration in nature ſo well.

The grapes that do beſt for this ſort of work, are, the royal muſcadine, marlmorſe, black ſweet water, and black morillon: the beſt ſorts of the forward peaches, nectarines, cherries, and plumbs, and the Dutch raſpberry, ſhould be ever fixed on for forcing in the above manner. A row or two of ſtrawberries may alſo be planted in this frame, which would ripen at the end of February, or beginning of March; and amongſt the fruit you may mix here and there a monthly roſe-tree; and have a border planted with early tulips, hyacinths, jonquils, narciſſus's, and other flowers, which by the forcing heats would make a kind of ſummer all the winter.

The trees planted in theſe frames muſt be cloſe to the paling, contrary to the methods of planting againſt walls;

for the roots will run under the pales, and draw nouriſhment equally from the earth about them; but with walls it is otherwiſe.

The trees need not be planted at a greater diſtance than four or five feet; and thoſe that have ſtood ſeven or eight years againſt walls, may be removed to theſe forcing frames without any danger: as to pruning theſe trees, the ſame method is to be followed as recommended for other trees in February; but the ſeaſon for doing it is not the ſame; for in the forcing frames our ſpring begins in November; but in the other caſe it does not begin till the end of January, or beginning of February.

The trees are to be pruned and nailed to pales about a week before the forcing heat is applied, and all the glaſſes put up as ſoon as they are pruned.

The hot-dung intended to be laid at the back of the pales, ſhould be toſſed up in an heap ſome days before it is uſed, that it may yield an heap every where alike: when it is fit to be applied to the pales, lay it four feet wide at the baſe; and let it ſlope to two feet at the top, the height in all being at firſt within four inches of the top of the pales, and in about ſix weeks time it will ſink to four feet, when you are to apply freſh dung. The bloſſoming of the tree is very much helped by covering them with the glaſs lights in froſty weather: but they ſhould not be denied the rain, if the weather be tolerably mild, till the buds begin to ſtir; after that, the glaſſes to remain over them conſtantly, till the ſun begins to have ſome power.

When the ſun ſhines warm, and the wind is not too ſharp, give the air at the front of your frame; and if this does not happen during a fortnight's ſpace, then give air at the end, and put up mats or canvas to correct the winds, and cauſe the air to circulate in the frames.

About three changes of dung will be ſufficient to bring your cherries to ripeneſs in February, allowing each parcel to remain a month at the back of the pales: but if April proves cold, the forcing heat is to be continued till May, for plumbs, peaches, nectarines, and apricots.

Kitchen-Garden.

Hot beds for aſparagus ſhould now be made; alſo gentle hot-beds for the cucumbers and kidney-beans ſown in October: continue to ſow radiſhes, lettuce, creſſes, ſpinach, *&c.* on a hot-bed; and if your nurſery is without roots, provide them from ſome old plantations.

Sow peaſe, and beans of the hotſpur and Spaniſh kinds, in open ground; and if the weather be fair, earth up thoſe ſown in September. Earth up ſellery, and tie up endive plants for blanching: and this is the beſt time to cut down aſparagus haulm, when it is turned yellow; it muſt be cut within two or three inches of the ground, and the earth of the alleys flung up upon the beds; or if the aſparagus be worn, you are to give it a covering of rich dung, not quite rotten: and cover well your artichokes with long dung, to defend them from froſts, otherwiſe they will be deſtroyed in a ſevere winter. Houſe, and cover with ſand, carrots, parſnips, *&c.* and houſe-cabbages.

You muſt now trench your ground, and lay it up in ridges to mellow; and in a froſty ſeaſon wheel on dung and other manures upon ſuch places as want to be enriched.

Plants are to be guarded againſt froſts, and ſheltered againſt cold rains; and trees muſt be ſtaked, to defend them againſt violent winds, common in this month.

DECEMBER.

Flower-Garden.

You ſhould now cover the beds of choice anemonies, hyacinths, and ranunculus's; pick off dead and rotten leaves from all exotic plants; lay mulch about the roots of new-planted trees and ſhrubs; cover the pots of ſeedling flowers; turn over the earth prepared for the flower garden, that the froſt may make it mellow; and mix up ſome new heaps, that there may be a ſufficient quantity ready for uſe eight or ten months before it is wanted.

You muſt not be too haſty in warming your green-houſe with artificial heats, but let in as much ſun as poſſible, which being a natural heat, is the moſt agreeable to your tender plants. The chief buſineſs is to keep out froſts; to effect which, the doors and windows of your green-houſe muſt be well matted, and guarded from the piercing air.

But as no plant can live without air, therefore to recruit it in the houſe, and feed the plants therewith without pinching them, it is adviſeable, that at the end of your green-houſe there ſhould be an antichamber, through which you are to paſs to the houſe; which chamber will have freſh air from abroad every time you go into it; and upon opening the door of it into the green-houſe, the air will there mix with the other that has been pent up, and impregnate it with new parts, by which means, it will contribute to the vegetation of plants, without coming upon them too ſuddenly.

Fruit-Garden.

Continue to prune vines; prune and nail wall-fruit trees, alſo ſuch ſtandards as are hardy; examine orchard trees, and take away ſuch branches as make confuſion: covering every conſiderable wound with a mixture of bees wax, roſin, and tar, in equal quantities, and of tallow about half the quantity of any of the others; which are to be melted together in an earthen veſſel well glazed; and, with a painting bruſh dipped into it, the wound is to be covered: deſtroy ſnails in every part of your garden; and you may, if the weather proves mild, remove or plant moſt ſorts of hardy trees that in the winter ſhed their leaves.

Kitchen-Garden.

If the ſeaſon proves mild, you may earth up thoſe artichokes which were in the former months neglected; in doing which, if the ground is not very good, bury ſome rotten dung in it, which will greatly promote the growth of your artichokes in the ſpring following.

Towards the middle of the month, make a hot-bed for aſparagus,

4 AP 54

Plate LXXX

Fig. 1. SEA GAGE

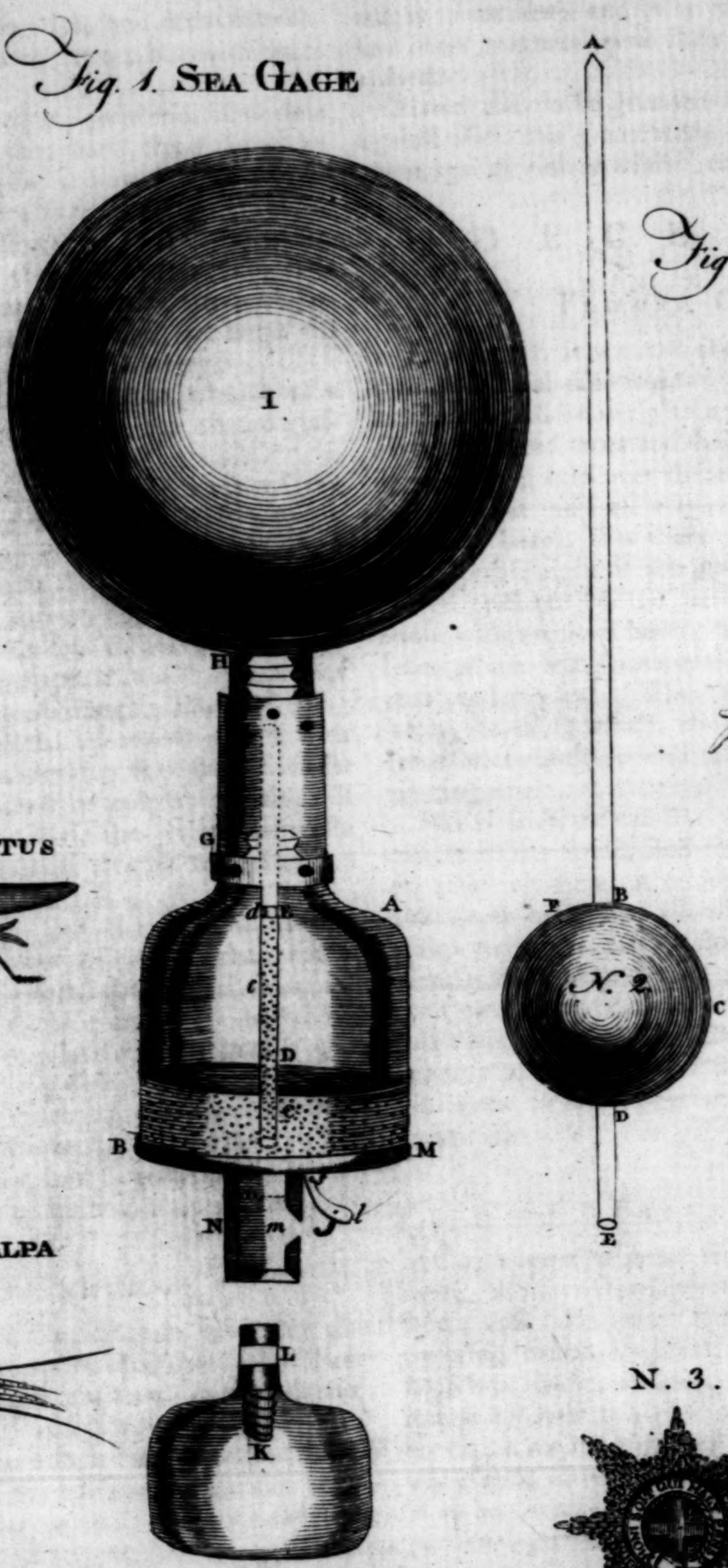
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Fig. 5. GRYLLUS LAURIFOLIUS

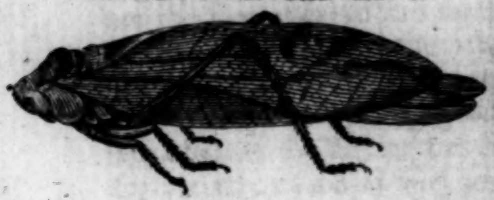


Fig. 4. GRYLLUS ACUMINATUS

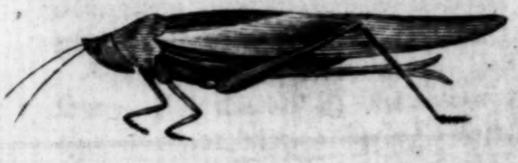


Fig. 6. GRYLLUS GRYLLOTALPA

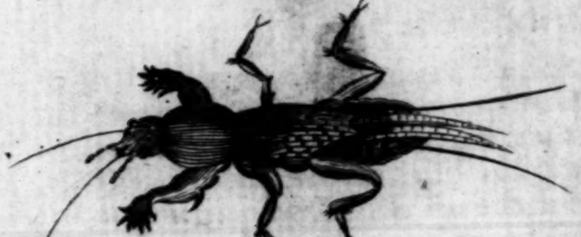


Fig. 3. GAUGING ROD.

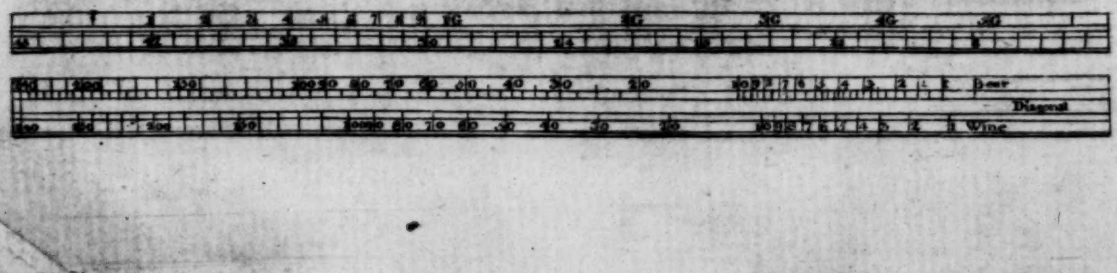
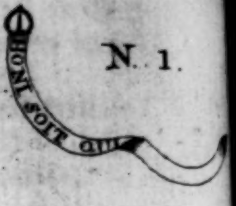

Barrel
Kilderkin
Firkin
Beer
Diagonal
Wine

Fig. 2. Order of the GARTE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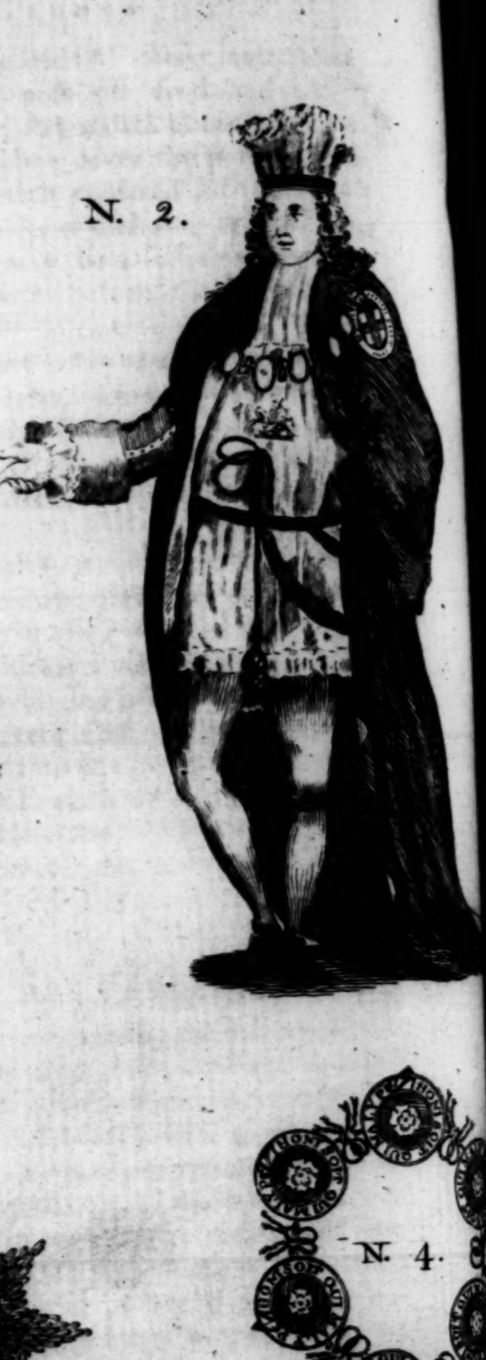
N. 1.



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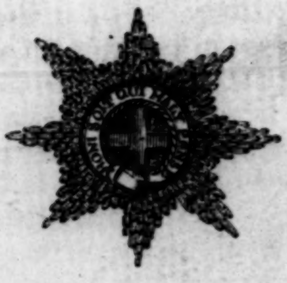

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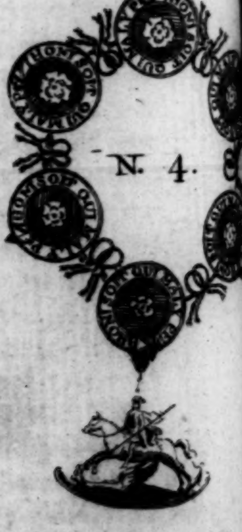

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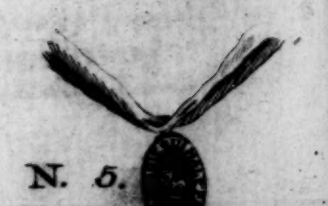

N. 5.

A. Bell Sculp.

aſparagus, in like manner as that made in November. Sow upon hot-beds, lettuce, radiſh, creſſes, muſtard, and other herbs which are hot, to cut for ſmall ſallads.

In open weather you may ſow early peas and beans of the ſame kinds, and in the ſame manner, as directed in November and the preceding months; and as vermin now very much deſtroy your roots and ſeeds, you are to ſet traps to catch them.

You ſhould, when the weather is not too ſevere, uncover the cauliflower plants every day, that they may enjoy the benefit of the air, otherwiſe they will be very weakly; and in dry weather take up ſellery, and endive to blanch.

Great care muſt now be taken of the muſhroom-beds; they ſhould be covered with freſh dry ſtraw, ſo thick as to keep out the wet; for as, where proper care is taken, there will be a conſtant ſupply of them for the table in the moſt rigorous ſeaſon, ſo, when they are neglected, the produce will be ſmall in proportion.

GARGARISM, in medicine, is ſometimes taken, in a large ſenſe, for every collution of the mouth; but, ſtrictly ſpeaking, it ſignifies a liquid medicine, appropriated to affections of the mouth, gums, fauces, larynx, and ſometimes of the head, received into the mouth, and there uſed by way of collution, without deglutition.

GARLAND, a ſort of chaplet made of flowers, feathers, and ſometimes precious ſtones, worn on the head, in manner of a crown.

Garland alſo denotes ornaments of flowers, fruits, and leaves, intermixed; anciently much uſed at the gates of temples, where feaſts and ſolemn rejoicings were held; or at any other place where marks of public joy or gaiety were required, as at triumphal arches, tournaments, *&c.*

GARNET, in natural hiſtory, a very beautiful gem, of a red colour, with an admixture of bluiſh.

When pure and free from blemiſhes, it is little inferior, in appearance, to the oriental ruby, though only of a middle degree of hardneſs between the ſapphire and common cryſtal. It is found of various ſizes, from that of a pin's head to an inch in diameter.

Among our lapidaries and jewellers, genuine garnets are known by different names according to their different degrees of colour. 1. The garnet, ſimply ſo called, is the fineſt and moſt valuable kind, being of a very deep blood red, with a faint admixture of blue. 2. The rock-ruby, a name very improperly given to the garnet, when it is of a very ſtrong but not deep red, and has a fairer caſt of the blue: this is a very beautiful gem. 3. The ſorane or ſerain garnet, that of a yet brighter red, approaching to the colour of native cinnabar, with a faint blue tinge. 4. The almandine, a garnet only a little paler than that called the rock-ruby.

Garnets are very properly diſtinguiſhed into the oriental and occidental kinds, as being found in Europe as well as the Eaſt Indies. The oriental ones are principally brought from Calicut, Cananor, and Cambay; and the European ones are common in Italy, Hungary, and Bohemia.

Some authors have ſuppoſed the deeper-coloured garnet to be the ſame with the carbuncle of the ancients; from which it really differs; ſince, on receiving the ſun's beams, it never gives ſo true a fire-colour as the carbuncle.

GARONNE, a large river of France, which taking its riſe in the Pyrenean mountains, runs north-weſt by the city of Tholouſe, divides the provinces of Guienne and Gaſcony, and, viſiting the city of Bordeaux, falls into the bay of Biſcay, about ſixty miles below that city. It has alſo a communication with the Mediterranean, by means of the royal canal of Lewis XIV. The tide flows up this river twenty miles above Bourdeaux.

GARTER, a ligature for tying up the ſtocking; but particularly uſed for the badge of a noble order of knights, hence denominated the

Order of the Garter, a military order of knighthood, the moſt noble and ancient of any lay-order in the world, inſtituted by Edward III. This order conſiſts of twenty-ſix knights-companions, generally princes and peers, whereof the king of England is the ſovereign or chief. They are a college or corporation, having a great and little ſeal.

Their officers are a prelate, chancellor, regiſter, king at arms, and uſher of the black rod. They have alſo a dean with twelve canons, and petty canons, vergers, and twenty-ſix penſioners or poor knights. The prelate is the head. This office is veſted in the biſhop of Wincheſter, and has ever been ſo. Next to the prelate is the chancellor; which office is veſted in the biſhop of Saliſbury, who keeps the ſeals, *&c.* The next is the regiſter, who by his oath is to enter upon the regiſtry, the ſcrutinies, elections, penalties, and other acts of the order, with all fidelity. The fourth officer is garter, and king at arms, being two diſtinct offices united in one perſon. Garter carries the rod and ſceptre at the feaſt of St George, the protector of this order, when the ſovereign is preſent. He notifies the elections of new knights, attends the ſolemnity of their inſtallations, carries the garter to the foreign princes, *&c.* He is the principal officer within the college of arms, and chief of the heralds. See King *at arms*.

All theſe officers, except the prelate, have fees and penſions. The college of the order is ſeated in the caſtle of Windſor, with the chapel of St George, and the charter-houſe, erected by the founder for that purpoſe. The habit and enſign of the order are, a garter, mantle, cape, george, and collar. The four firſt were aſſigned the knights-companions by the founder; and the george and collar by Henry VIII. The garter (Plate LXXXVI. fig. 2. N° 1.) challenges pre eminence over all the other parts of the dreſs, by reaſon that from it the noble order is denominated; that it is the firſt part of the habit preſented to foreign princes, and abſent knights, who, and all other knights-elect, are therewith firſt adorned; and it is of ſo great honour and grandeur, that by the bare inveſtiture with this noble enſign, the knights are eſteemed companions of the greateſt military order in the world. It is worn on the left leg between the knee and calf, and is enamelled with this motto, HONI SOIT QVI MAL Y PENSE; i. e. *Shame to him that thinks evil hereof:* The meaning of which is, that king Edward having laid claim to the kingdom of France, retorted ſhame and defiance upon him that ſhould dare to think amiſs of the juſt enterprize he had undertaken, for recovering his lawful right to that crown; and that the bravery of thoſe knights whom he had elected into this order, was ſuch as would enable him to maintain the quarrel againſt thoſe that thought ill of it.

The mantle (*ibid.* N° 2.) is the chief of theſe veſtments made uſe of upon all ſolemn occaſions The colour of the mantle is by the ſtatutes appointed to be blue. The length of the train of the mantle only diſtinguiſhes the ſovereign from the knights-companions. To the collar of the mantle is fixed a pair of long ſtrings, anciently wove with blue ſilk only, but now twiſted round, and made of Venice gold and ſilk, of the colour of the robe, with knobs, or buttons, and taſſels at the end. The left ſhoulder of the mantle has, from the inſtitution. been adorned with a large garter, with the device, HONI SOIT, *&c.* within this is the croſs of the order, which was ordained to be worn at all times by king Charles I. At length the ſtar was introduced, being a ſort of croſs irradiated with beams of ſilver. (*ibid.* N° 3.)

The collar (*ibid.* N° 4) is appointed to be compoſed of pieces of gold in faſhion of garters, the ground enamelled blue, and the motto gold.

The manner of electing a knight-companion into this moſt noble order, and the ceremonies of inveſtiture are as follow. When the ſovereign deſigns to elect a companion of the garter, the chancellor belonging to this order draws up the letters, which, paſſing both under the ſovereign's ſign-manual and ſignet of the order, are ſent to the perſon by garter principal king at arms; and are in this manner, or to the ſame effect: "We, with the companions of our moſt noble "order of the garter, aſſembled in chapter, holden this "preſent day at our caſtle at Windſor, conſidering the "virtuous fidelity you have ſhewn, and the honour"able exploits you have done in our ſervice, by vin"dicating and maintaining our right, *&c.* have e"lected and choſen you one of the companions of our "order. Therefore, we require you to make your "ſpeedy repair unto us, to receive the enſigns thereof, "and be ready for your inſtallation upon the — day "of this preſent month, *&c.*"

The garter, which is of blue velvet bordered with fine gold-wire, having commonly the letters of the motto of the ſame, is, at the time of election, buckled upon the left leg, by two of the ſenior companions, who receive it from the ſovereign, to whom it was preſented upon a velvet cuſhion, by garter king at arms, with the uſual reverence, whilſt the chancellor reads the following admonition, enjoined by the ſtatutes: "To the honour of God omnipotent, and in "memorial of the bleſſed martyr St George, tie about "thy leg, for thy renown, this noble garter; wear "it as the ſymbol of the moſt illuſtrious order, ne"ver to be forgotten or laid aſide; that thereby "thou mayeſt be admoniſhed to be courageous; and, "having undertaken a juſt war, in which thou ſhalt "be engaged, thou mayeſt ſtand firm, valiantly fight, "and ſucceſſively conquer."

The princely garter being then buckled on, and the words of its ſignification pronounced, the knight elect is brought before the ſovereign, who puts about his neck, kneeling, a ſky-coloured ribbon, (*ibid.* N° 5.) whereunto is appendant, wrought in gold within the garter, the image of St George on horſeback, with his ſword drawn, encountering with the dragon. In the mean time, the chancellor reads the following admonition: "Wear this ribbon about thy neck, adorned "with the image of the bleſſed martyr and ſoldier of "Chriſt, St George, by whoſe imitation provoked, "thou mayſt ſo overpaſs both proſperous and adverſe "adventures, that having ſtoutly vanquiſhed thy ene"mies, both of body and ſoul, thou mayſt not only "receive the praiſe of this tranſient combat, but be "crowned with the palm of eternal victory."

Then the knight elected kiſſes the ſovereign's hand, thanks his majeſty for the great honour done him, riſes up, and ſalutes all the companions ſeverally, who return their congratulations. N° 2. (*ibid.*) exhibits a view of a knight of the garter in the habit of this order.

Since the inſtitution of this order, there have been eight emperors, and twenty-eight kings, beſides numerous ſovereign princes, enrolled as companions thereof. Its origin is ſomewhat differently related: the common account is, that it was erected in honour of a garter of the counteſs of Saliſbury, which ſhe dropped dancing with king Edward, and which that prince picked up: but our beſt antiquaries think it was inſtituted on account of the victory over the French at Creſſy, where the king ordered his garter to be diſplayed as a ſignal of the battle.

GASCOIN, or **GASCOIGN**, denotes the hinder thigh of a horſe, which begins at the ſtifle, and reaches to the ply or bending of the ham.

GASCONY, the moſt ſouth-weſt province of France, bounded by Guienne, on the north; by Languedoc, on the eaſt; by the Pyrenees, which ſeparate it from Spain, on the ſouth; and by the Bay of Biſcay, on the weſt.

CASSENHOVEN, or **GUTZENHOVEN**, a town of the Auſtrian Netherlands, fifteen miles eaſt of Louvain: E. long. 50°, and N. lat. 5° 55′.

GASTEROSTEUS, in ichthyology, a genus of fiſhes belonging to the order of thoracici. There are three rays in the membrane of the gills; the body is carinated; and there are ſome diſtinct prickles before the back fin. There are eleven ſpecies, diſtinguiſhed by the number of prickles on the back.

GASTRIC, in general, ſomething belonging to the ſtomach.

GASTROCNEMIUS, in anatomy. See ANATOMY, p. 209.

GASTROCNEMIUS is alſo the name of one of the extenſor-muſcles of the foot.

GASTROMANCY, a method of divination by water, practiſed by the ancient Greeks.

GASTRORAPHY, in ſurgery, the operation of ſewing up wounds of the abdomen. See SURGERY.

GATE, in architecture. See ARCHITECTURE, p. 356.

GATTON, a borough-town of Surry, ſixteen miles ſouth of London, which ſends two members to parliament.

GAVEREN, or WAVEREN, a town of the Auſtrian Netherlands, ſituated on the eaſt bank of the river Scheld: E. long. 3° 35′, N. lat. 51°.

GAUGE-POINT of a ſolid meaſure, the diameter of a circle whoſe area is equal to the ſolid content of the ſame meaſure.

GAUGER, a king's officer, who is appointed to examine all tuns, pipes, hogſheads, and barrels of wine, beer, ale, oil, honey, *&c.* and give them a mark of allowance, before they are ſold in any place within the extent of his office.

GAUGING. See GEOMETRY.

GAUNT-BELLIED, in the menage, is ſaid of a horſe whoſe belly ſhrinks up towards his flanks.

GAWSE, or GAWZE, in commerce, a very ſlight, thin, open kind of ſtuff, made of ſilk, and ſometimes of thread; there are alſo figured gawzes, and ſome with gold or ſilver flowers on a ſilk ground.

GAZELLA, in zoology. See CAPRA.

GAZETTE, a news-paper, or printed account of the tranſactions of all the countries in the known world, in a looſe ſheet, or half-ſheet. This name is with us confined to that paper of news publiſhed by authority.

The word is derived from *gazetta*, a Venetian coin, which was the uſual price of the firſt news-papers printed there, and which was afterwards given to the paper itſelf.

GELATINOUS, in pharmacy and medicine, any thing approaching to the glutinous conſiſtence of a gelatina or jelly. See JELLY.

GELDERLAND, comprehending Zutphen, is a province of the United Netherlands, bounded by the Zuider-ſea and Overyſſel on the north, by Weſtphalia on the eaſt, by Brabant on the ſouth, and by the province of Utrecht on the weſt.

GELDING, the operation of caſtrating any animal.

GELDERS, a city of Gelderland, ſituated twenty-three miles ſouth of Nimeguen: E. long. 6° 8′, and N. lat. 51° 35′.

GELENHAUSEN, an imperial city of Germany, governed by its own magiſtrates; it is ſituated nine miles north of Hanau: E. long. 8° 50′, and N. lat. 50° 15′.

GEM, in natural hiſtory, a common name for all precious ſtones; of which their are two claſſes, the pellucid and ſemi-pellucid.

The bodies compoſing the claſs of pellucid gems are bright, elegant, and beautiful foſſils, naturally and eſſentially compound, ever found in ſmall detached maſſes, extremely hard, pellucid, and of great luſtre; compoſed of a very firm and pure matter, without any admixture of earthy ſubſtance, giving fire without ſteel, not fermenting with acid menſtruums, and very difficultly calcinable in the fire.

The bodies compoſing the claſs of ſemi-pellucid gems are, ſtones naturally and eſſentially compound, not inflammable nor ſoluble in water, found in detached maſſes, and compoſed of cryſtalline matter, debaſed by earth: however, they are but ſlightly debaſed, and are of great beauty and brightneſs, of a moderate degree of tranſparency, and are uſually found in ſmall maſſes.

GEMARA, in Jewiſh antiquity, a collection of deciſions and determinations on the law, written after the Miſna was completed.

It was called *gemara*, or *perfection*, becauſe it was conſidered as ſo perfect an explication of the law, that after it no further additions could be made, or any thing more deſired. It is otherwiſe called the talmud. See TALMUD.

GEMBLOURS, a town of the Auſtrian Netherlands, in the province of Brabant, ſituated on the river Orne, ten miles north-weſt of Namur: E. long. 4° 30′, and N. lat. 50° 30′.

GEMELLUS, in anatomy. See ANATOMY, p. 205.

GEMINI, the TWINS, in aſtronomy, one of the twelve ſigns of the zodiac, the third in order, beginning with aries. See ASTRONOMY.

GEMMA, in natural hiſtory. See GEM.

GEMUND, a town of Germany, in the circle of Weſtphalia, and dukedom of Juliers, ſituated on the river Roer: E. long. 6° 15′, and N. lat. 50° 34′.

GEMUND, a town of Germany, in the circle of Swabia, and county of Rechſberg, ſituated on the river Rems: E. long. 9° 40′, and N. lat. 48° 45′.

GEMUND, a town of Germany, in the circle of Franconia, ſituated on the river Maine: E. long. 9° 45′, and N. lat 50° 8′.

GENDARMES, or GENS D'ARMES, in the French armies, a denomination given to a ſelect body of horſe, on account of their ſucceeding the ancient gendarmes, who were thus called from their being completely clothed in armour.

The king's body-guards, the light horſe of the royal houſe, and the muſqueteers, are at preſent reputed to belong to the gendarmerie.

The grand gendarmes are a troop compoſed of about 250 gentlemen, who guard the king's perſon. The king himſelf is their captain, and one of the prime peers their captain-lieutenant, who has under him two lieutenants, three enſigns, three guidons, and other officers. There are, beſides theſe, gendarmes of the queen, the dauphin, *&c.*

GENDER, among grammarians, a diviſion of nouns, or names, to diſtinguiſh the two ſexes.

This was the original intention of gender; but, afterwards, other words which had no proper relation, either to the one ſex or the other, had genders aſſigned them, rather out of caprice than reaſon; which is at length eſtabliſhed by cuſtom. Hence genders vary according to the languages, or even according to the words introduced from one language into another. Thus *arbor*, in Latin, is feminine; but *arbre*, in French, is maſculine: and *dens*, in Latin, is maſculine; but *dent*, in French, is feminine.

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GENERAL, an appellation given to whatever belongs to a whole genus. See Genus.

General charge, in law. See Charge *to enter heir*.

General terms, among logicians, thoſe which are made the ſigns of general ideas.

General *of an army*, in the art of war, he who commands in chief.

The office of a general is, to regulate the march and encampment of the army; in the day of battle to chuſe out the moſt advantageous ground; to make the diſpoſition of the army; to poſt the artillery; and where there is occaſion, to ſend his orders by his aids de camp. At a ſiege, he is to cauſe the place to be inveſted; to order the approaches and attacks; to viſit the works; and to ſend out detachments to ſecure his convoys.

GENERATING Line, or Figure, in geometry, is that which by its motion produces any other plane or ſolid figure.

GENERATION, in phyſiology, the act of procreating and producing a being ſimilar to the parent.

According to Ariſtotle, the male animals contain the principle, and the female the matter of generation: for though both were furniſhed indeed with a ſeminal liquor, yet the ſemen of the males alone was prolific. The moderns, on the other hand, as well thoſe who contend for the ſyſtem of generation from eggs, as they who adopt that of the animalcules in the male-ſeed, pretend that females have no ſuch ſeminal liquor at all, and that what was commonly taken for it was ſome other animal fluid.

Harvey is of opinion, that all females are furniſhed with eggs, and that the embryos, or young animals, are formed in the ſame manner as a chick in the egg of any bird. Generation, according to this celebrated phyſician, is effected wholly by means of the uterus, or womb; which conceives the fœtus by a kind of contagion communicated to it by the male-ſeed, much in the ſame way as the load-ſtone communicates magnetiſm to iron. This contagion, he thinks, acts not only on the uterus, but is communicated to the whole body of the female, which is altogether prolific; tho' the uterus, he acknowledges, is the only part that is capable of conceiving the fœtus, juſt as the brain is alone capable of forming ideas and notions. Agreeable to this doctrine of Harvey, Steno and other anatomiſts have pretended to diſcover certain eggs in the ovaries or teſticles of women; which Mr Buffon denies to be the caſe, affirming, that there are no ſuch eggs to be found in the ovaries or teſticles of women.

We cannot enter into a detail of the reaſonings for and againſt the ſyſtem of generation from eggs; and ſhall therefore only obſerve, that its advocates pretend to have diſcovered eggs in all the females on which they made obſervations; that the largeſt of thoſe found in women did not exceed the bigneſs of a pea; that they are extremely ſmall in young girls under fourteen, but that age and commerce with men makes them grow larger; that there are more than twenty ſuch eggs in each ovary or teſticle; that they are fecundated in the ovary by the ſpirituous and volatile part of the male-ſeed; that they afterwards are detached and fall into the uterus through the Fallopian tubes; that here the fœtus is formed of the internal ſubſtance of the egg, and the placenta of the exterior part.

Leewenhoek is the author of another ſyſtem of generation, from animalcules in the male ſeed. He tells us, he diſcovered many thouſands of theſe in a drop leſs than a grain of ſand. They are found in the ſemen of all males whatever, but not in that of females; and are ſo ſmall, that 3 000,000,000 of them are not equal to a grain of ſand, whoſe diameter is but the hundredth part of an inch. When any of theſe animalcules gets into an egg, fit to receive it, and this falls into the womb through the Fallopian tubes, the humours which diſtil through the veſſels of the womb, penetrating the coats of the egg, ſwell and dilate it, as the ſap of the earth does ſeed thrown into it. The placenta begins to appear like a little cloud, upon one ſide of the external coat of the egg; and, at the ſame time, the ſpine of the embryo-animalcule is grown ſo big, as to become viſible; and a little afterwards, the cerebrum and cerebellum appear like two bladders; and the eyes ſtand next goggling out of the head; then the beating of the heart, or punctum ſaliens, is plainly to be ſeen; and the extremities diſcover themſelves laſt of all.

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With reſpect to the generation of mankind, the ſame author thinks it a certain fact, that the male-ſeed is received into the womb of the woman; and that, for this purpoſe, it is highly probable the internal orifice opens during the act of coition. The female-ſeed alſo makes its way into the womb, where, being mixed with that of the male, they both together contribute to the formation of the fœtus; which is either male or female, according as the ſeed of the man or woman abounds moſt with organic molecules; and the infant reſembles either father or mother, according to the different combinations of theſe molecules. Both theſe ſeminal liquors he thinks equally active in the formation of the fætus, and that they fix and counterbalance each other; the molecules of each parent being thereby determined to form ſimilar parts to thoſe of the individual that furniſhed them, as the head, trunk, arms, legs, *&c.* He thinks the molecules proceeding from the genital parts fix themſelves firſt; and that the other molecules arrange themſelves ſucceſſively round theſe, in the ſame order which they before occupied in the parent. When a great quantity of the ſeminal liquors of both ſexes is received into the womb, there are formed different ſpheres of attraction, in different parts of theſe liquors; the conſequence of which is, that ſeveral fœtuſes are formed at the ſame time.

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GENEVA, or **GIN**, among diſtillers, an ordinary malt ſpirit, diſtilled a ſecond time, with the addition of ſome juniper-berries.

Originally, the berries were added to the malt in the grinding; ſo that the ſpirit thus obtained was flavoured with the berries from firſt, and exceeded all that could be made by any other method. At preſent, they leave out the berries entirely, and give their ſpirits a flavour by diſtilling them with a proper quantity of oil of turpentine; which, though it nearly reſembles the flavour of juniper-berries, has none of their valuable virtues.

GENIAL, an epithet given by the Pagans to certain gods who were ſuppoſed to preſide over generation.

The genial gods, ſays Feſtus, were earth, air, fire, and water. The twelve ſigns, together with the ſun and moon, were ſometimes alſo ranked in the number.

GENICULI, among botaniſts, the knots or joints in the ſtalks of plants; whence they are denominated geniculate plants.

GENIOGLOSSI, in anatomy. See ANATOMY, p. 304.

GENIOHYOIDÆUS, in anatomy. See ANATOMY, p. 304.

GENIS, a town of Savoy, ſituated on the river Guier, twelve miles weſt of Chambery.

GENISTA, **GREEN-WEED**, or **DYER'S WEED**, a genus of the diadelphia decandria claſs. The calix is bilabiated; the vexillum is oblong, and reflected. There are 14 ſpecies, two of which are natives of Britain, *viz.* the tinctoria, or dyer's weed; and the anglica, or needle-furze.

GENITAL, an appellation given to whatever belongs to the parts of generation. See GENERATION.

GENITES, among the Hebrews, thoſe deſcended from Abraham, without any mixture of foreign blood.

The Greeks diſtinguiſhed by the name of genites ſuch of the Jews as were iſſued from parents, who, during the Babyloniſh captivity, had not allied with any gentile family.

GENITIVE, in grammar, the ſecond caſe of the declenſion of nouns. The relation of one thing conſidered as belonging in ſome manner to another, has occaſioned a peculiar termination of nouns, called the genitive caſe: But in the vulgar tongues, they make uſe of a ſign to expreſs the relation of this caſe. In Engliſh they prefix the particle *of*, in French *de* or *du*, *&c.* Though in ſtrictneſs there are no caſes in either of theſe languages; inaſmuch as they do not expreſs the different relations of things by different terminations, but by additional prepoſitions, which is otherwiſe in the Latin.

GENIUS, a good or evil ſpirit, or dæmon, whom the ancients ſuppoſed ſet over each perſon, to direct his birth, accompany him in life, and be his guard. See DÆMON.

The rank and office of the genii were inferior to thoſe of the lares; for the latter were the tutelar gods of a family, whereas the genii had the care or government only of ſingle perſons, or places.

GENIUS, in matters of literature, *&c.* a natural talent or diſpoſition to do one thing more than another; or the aptitude a man has received from nature to perform well and eaſily that which others can do but indifferently and with a great deal of pains.

To know the bent of nature is the moſt important concern. Men come into the world with a genius determined not only to a certain art, but to certain parts of that art, in which only they are cabable of ſucceſs. If they quit their ſphere, they fall even below mediocrity in their profeſſion. Art and induſtry add much to natural endowments, but cannot ſupply them where they are wanting. Every thing depends on genius. A painter often pleaſes without obſerving rules, whilſt another diſpleaſes though he obſerves them, becauſe he has not the happineſs of being born with a genius for painting.

GENOA, a city and archbiſhop's ſee of Italy, and capital of a republic of the ſame name, is built on a ſtrand near the ſea, and riſes gradually to the top of a hill; the houſes, which are lofty and well built, riſing like the ſeats of a theatre, afford a fine proſpect at ſea. The harbour is large and deep, and the principal ſtreet, from one end to the other, reſembles a double row of palaces: E. long. 9° 30′, and N. lat. 44° 30.

GENTIANA, in botany, a genus of the pentandria digynia claſs. The corolla conſiſts of one petal; the capſule has two valves, and one cell. There are twenty-eight ſpecies, five of which are natives of Britain, *viz.* the pneumoanthe, or calathian violet; the amarella, or autumnal gentian; the centaurium, or leſſer centaury; the campeſtris, or vernal dwarf gentian; and the filiformis, or marſh century.

The root of this plant is large, remarkably tough, and of a firm texture. It is brought to us from Germany, where it is in many places cultivated as liquorice is amongſt us; and it is to be choſen freſh, tough, of a middle ſize, free from the ſmall fibres, and well dried; tho' if it be ſcorched, it is to be rejected This root is one of the beſt ſtomachics.

GENTILE, in matters of religion, a pagan, or worſhipper of falſe gods.

GENTILE, in the Roman law and hiſtory, a name which ſometimes expreſſes what the Romans otherwiſe called barbarians, whether they were allies of Rome or not: but this word was uſed in a more particular ſenſe for all ſtrangers and foreigners not ſubject to the Roman empire.

GENTLEMAN-USHER *of the black rod.* See ROD.

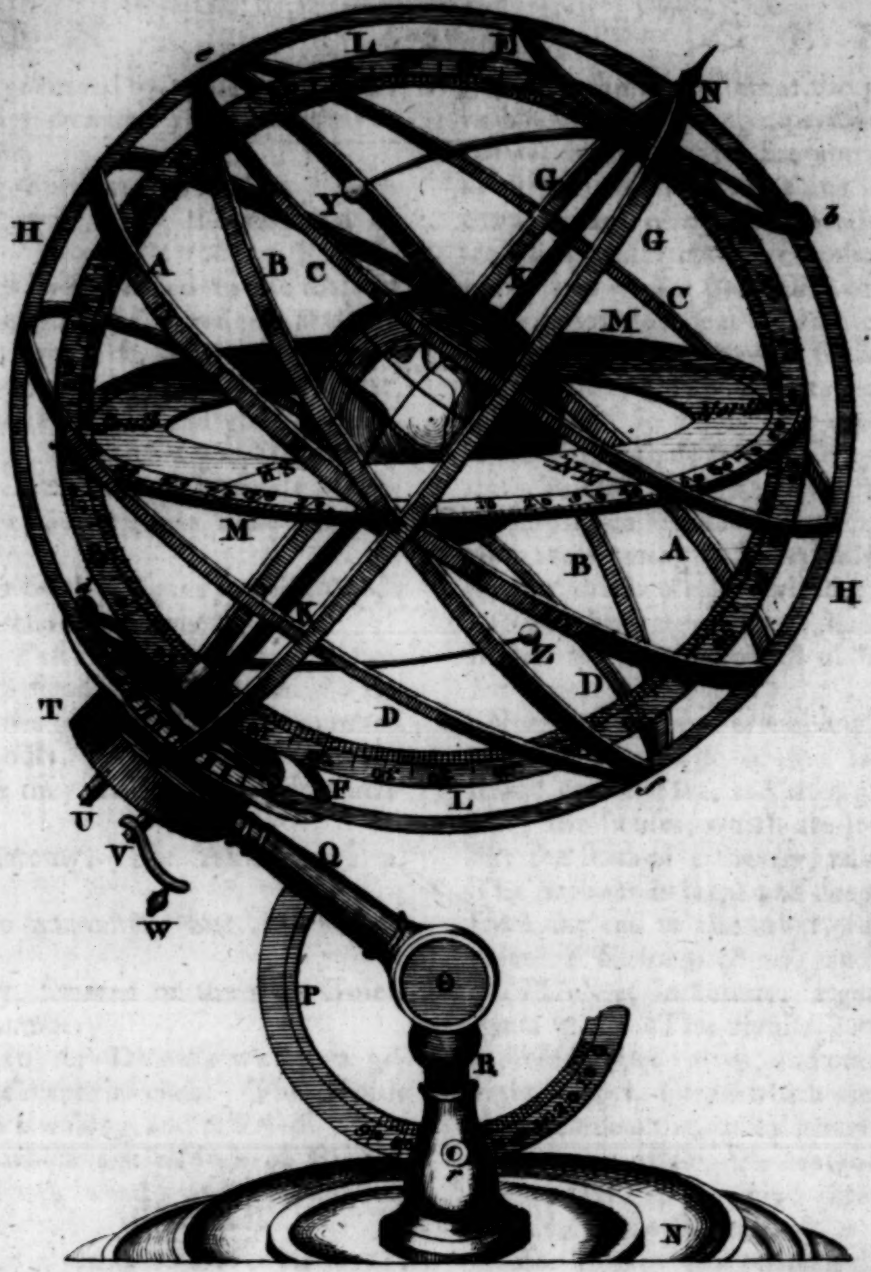
GENTLEMEN *of the chapel*, officers whoſe duty and attendance is in the royal chapel, being in number thirty-two, whereof twelve are prieſts; the other twenty, commonly called clerks of the chapel, aſſiſt in the performance of divine ſervice. One of the firſt twelve is choſen for confeſſor of the houſhold, whoſe office it is to read prayers every morning to the houſhold ſervants, to viſit the ſick, examine and prepare communicants, and adminiſter the ſacrament.

One of twenty clerks, well verſed in muſic, is choſen

firſt

4 AP 54

ARMILLARY SPHERE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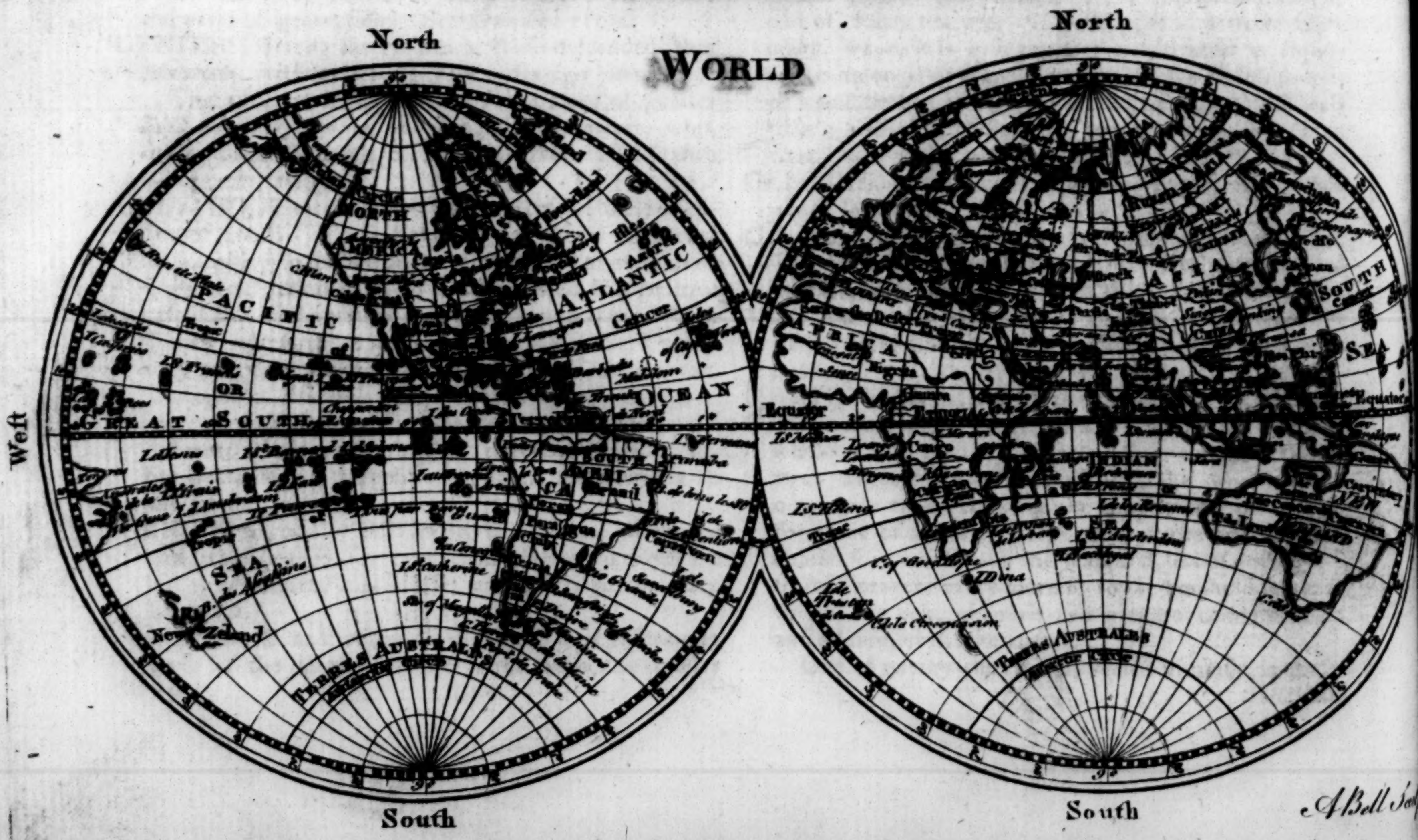
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A Bell Sculp

firſt organiſt, who is maſter of the children, to inſtruct them in muſic, and whatever elſe is neceſſary for the ſervice of the chapel; a ſecond is likewiſe an organiſt; a thirſt, a lutaniſt; and a fourth, a violiſt.

There are likewiſe three vergers, ſo called from the ſilver-rods they carry in their hands; being a ſerjeant, a yeoman, and groom of the veſtry; the firſt attends the dean and ſub-dean, and finds ſurplices and other neceſſaries for the chapel; the ſecond has the whole care of the chapel, keeps the pews, and ſeats the nobility and gentry; the groom has his attendance within the chapel-door, and looks after it.

GENUS, among metaphyſicians and logicians, denotes a number of beings, which agree in certain general properties common to them all; ſo that a genus is nothing elſe but an abſtract idea, expreſſed by ſome general name or term.

It is plain, therefore, that by a genus we do not barely ſignify one particular thing, nor yet a plurality of things; but a ſort or kind of things, all agreeing in certain general properties.

Thus animal is ſaid to be a genus in reſpect of man and brute, in regard man and brute agree in the common nature and character of animal: ſo a right-lined figure of four ſides, is a genus in reſpect of a parallelogram, and a trapezium; and ſo likewiſe is ſubſtance, in reſpect of ſubſtance extended which is body, and thinking ſubſtance which is mind.

GENUS is alſo uſed for a character or manner applicable to every thing of a certain nature or condition: in which ſenſe it ſerves to make capital diviſions in divers ſciences, as rhetoric, anatomy, and natural hiſtory.

GENUS, in rhetoric. Authors diſtinguiſh the art of rhetoric, as alſo orations or diſcourſes produced thereby, into three genera or kinds, demonſtrative, deliberative, and judiciary.

To the demonſtrative kind belong panegyrics, genethliacons, epithalamiums, funeral harangues, *&c.*

To the deliberative kind belong perſuaſions, diſſuaſions, commendations, *&c.* To the judiciary kind belong defences and accuſations.

GENUS, in natural hiſtory, a ſub-diviſion of any claſs or order of natural beings, whether of the animal, vegetable, or mineral kingdoms, all agreeing in certain common characters. See NATURAL HISTORY.

GEOCENTRIC, in aſtronomy, is applied to a planet or its orbit, to denote it concentric with the earth, or as having the earth for its centre, or the ſame centre with the earth.

GEOGRAPHICAL MILE, the ſame with the ſea-mile; being one minute, or the ſixtieth part of a degree of a great circle on the earth's ſurface.

GEOGRAPHY.

GEOGRAPHY, the doctrine or knowledge of the terreſtrial globe; or the ſcience that teaches and explains the properties of the earth, and the parts thereof which depend upon quantity.

THE DESCRIPTION AND USE OF THE GLOBES AND ARMILLARY SPHERE.

IF a map of the world be accurately delineated on a ſpherical ball, the ſurface thereof will repreſent the ſurface of the earth: for the higheſt hills are ſo inconſiderable with reſpect to the bulk of the earth, that they take off no more from its roundneſs than grains of ſand do from the roundneſs of a common globe; for the diameter of the earth is 8000 miles, in round numbers, and no known hill upon it is three miles in perpendicular height.

For the proof of the earth's being ſpherical, ſee ASTRONOMY, p. 440.

With regard to what we call *up* and *down*, ſee ASTRONOMY, p. 445.

To an obſerver placed any where in the indefinite ſpace, where there is nothing to limit his view, all remote objects appear equally diſtant from him; and ſeem to be placed in a vaſt concave ſphere, of which his eye is the centre. The moon is much nearer to us than the ſun; ſome of the planets are ſometimes nearer, and ſometimes farther from us, than the ſun; others of them never come ſo near us as the ſun always is; the remoteſt planet in our ſyſtem, is beyond compariſon nearer to us than any of the fixed ſtars are. And yet all theſe celeſtial objects appear equally diſtant from us. Therefore, if we imagine a large hollow ſphere of glaſs to have as many bright ſtuds fixed to its inſide, as there are ſtars viſible in the heaven, and theſe ſtuds to be of different magnitudes, and placed at the ſame angular diſtances from each other as the ſtars are; the ſphere will be a true repreſentation of the ſtarry heaven, to an eye ſuppoſed to be in its centre, and viewing it all around. And if a ſmall globe, with a map of the earth upon it, be placed on an axis in the centre of this ſtarry ſphere, and the ſphere be made to turn round on this axis, it will repreſent the apparent motion of the heavens round the earth.

If a great circle be ſo drawn upon this ſphere, as to divide it into two equal parts or hemiſpheres, and the plane of the circle be perpendicular to the axis of the ſphere, this circle will repreſent the *equinoctial*, which divides the heaven into two equal parts, called the *northern* and the *ſouthern hemiſpheres*; and every point of that circle will be equally diſtant from the *poles*, or ends of the axis in the ſphere. That pole which is in the middle of the northern hemiſphere, will be called the *north pole of the ſphere*; and that which is in the middle of the ſouthern hemiſphere, the *ſouth pole*.

If another great circle be drawn upon the ſphere, in ſuch a manner as to cut the equinoctial at an angle of 23½ degrees in two oppoſite points, it will repreſent the *ecliptic*, or circle of the ſun's apparent annual motion: one half of which is on the north ſide of the equinoctial, and the other half on the ſouth.

If a large ſtud be made to move eaſtward in this ecliptic, in ſuch a manner as to go quite round it, in the time that the ſphere is turned round weſtward 366 times upon its axis; this ſtud will repreſent the *ſun*, changing his place every day a 365th part of the ecliptic; and going round weſtward, the ſame way as the ſtars do; but with a motion ſo much ſlower than the motion of the ſtars, that they will make 366 revolutions about the axis of the ſphere, in the time that the ſun makes only 365. During one half of theſe revolutions, the ſun will be on the north ſide of the equinoctial; during the other half, on the ſouth; and at the end of each half, in the equinoctial.

If we ſuppoſe the terreſtrial globe in this machine to be about one inch in diameter, and the diameter of the ſtarry ſphere to be about five or ſix feet, a ſmall inſect on the globe would ſee only a very little portion of its ſurface; but it would ſee one half of the ſtarry ſphere; the convexity of the globe hiding the other half from its view. If the ſphere be turned weſtward round the globe, and the inſect could judge of the appearances which ariſe from that motion, it would ſee ſome ſtars riſing to its view in the eaſtern ſide of the ſphere, whilſt others were ſetting on the weſtern: but as all the ſtars are fixed to the ſphere, the ſame ſtars would always riſe in the ſame points of view on the eaſt ſide, and ſet in the ſame points of view on the weſt ſide. With the ſun it would be otherwiſe, becauſe the ſun is not fixed to any point of the ſphere, but moves ſlowly along an oblique circle in it. And if the inſect ſhould look towards the ſouth, and call that point of the globe, where the equinoctial in the ſphere ſeems to cut it on the left ſide, the *eaſt point*; and where it cuts the globe on the right ſide, the *weſt point*; the little animal would ſee the ſun riſe north of the eaſt, and ſet north of the weſt, for 182½ revolutions; after which, for as many more, the ſun would riſe ſouth of the eaſt, and ſet ſouth of the weſt. And in the whole 365 revolutions, the ſun would riſe only twice in the eaſt point, and ſet twice in the weſt. All theſe appearances would be the ſame, if the ſtarry ſphere ſtood ſtill (the ſun only moving in the ecliptic) and the earthly globe were turned round the axis of the ſphere eaſtward. For, as the inſect would be carried round with the globe, he would be quite inſenſible of its motion; and the ſun and ſtars would appear to move weſtward.

We may imagine as many circles deſcribed upon the earth as we pleaſe; and we may imagine the plane of any circle deſcribed upon the earth to be continued, until it marks a circle in the concave ſphere of the heavens.

The *horizon* is either *ſenſible* or *rational*. The *ſenſible* horizon is that circle which a man ſtanding upon a large plane obſerves to terminate his view all around, where the heaven and earth ſeem to meet. The plane of our ſenſible horizon continued to the heaven, divides it into two hemiſpheres; one viſible to us, the other hid by the convexity of the earth.

The plane of the *rational horizon*, is ſuppoſed parallel to the plane of the ſenſible; to paſs through the centre of the earth, and to be continued to the heavens. And although the plane of the ſenſible horizon touches the earth in the place of the obſerver, yet *this* plane, and that of the rational horizon, will ſeem to coincide in the heaven, becauſe the whole earth is but a point compared to the ſphere of the heaven.

The earth being a ſpherical body, the horizon, or limit of our view, muſt change as we change our place.

The *poles of the earth*, are thoſe two points on its ſurface in which its axis terminates. The one is called the *north pole*, and the other the *ſouth pole*.

The *poles of the heaven*, are thoſe two points in which the earth's axis produced terminates in the heaven; ſo that the *north pole* of the heaven is directly over the north pole of the earth; and the *ſouth pole* of the heaven is directly over the ſouth pole of the earth.

The *equator* is a great circle upon the earth, every part of which is equally diſtant from either of the poles. It divides the earth into two equal parts, called the *northern* and *ſouthern hemiſpheres*. If we ſuppoſe the plane of this circle to be extended to the heaven, it will mark the *equinoctial* therein, and will divide the heaven into two equal parts, called the *northern* and *ſouthern* hemiſpheres of the heaven.

The *meridian* of any place is a great circle paſſing through that place and the poles of the earth. We may imagine as many ſuch meridians as we pleaſe, becauſe any place that is ever ſo little to the eaſt or weſt of any other place, has a different meridian from that place; for no one circle can paſs through any two ſuch places and the poles of the earth.

The *meridian* of any place is divided by the poles into two ſemicircles: that which paſſes through the place is called the *geographical*, or *upper meridian*; and that which paſſes through the oppoſite place, is called the *lower meridian*.

When the rotation of the earth brings the plane of the geographical meridian to the ſun, it is *noon* or *mid-day* to that place; and when the lower meridian comes to the ſun, it is *mid-night*.

All places lying under the ſame geographical meridian, have their noon at the ſame time, and conſequently all the other hours. All thoſe places are ſaid to have the ſame *longitude*, becauſe no one of them lies either eaſtward or weſtward from any of the reſt.

If we imagine 24 ſemicircles, one of which is the geographical meridian of a given place, to meet at the poles, and to divide the equator into 24 equal parts; each of theſe meridians will come round to the ſun in 24 hours, by the earth's equable motion round its axis in that time. And, as the equator contains 360 degrees, there will be 15 degrees contained between any two of theſe meridians which are neareſt to one another: for 24 times 15 is 360. And as the earth's motion is eaſtward, the ſun's apparent motion will be weſtward, at the rate of 15 degrees each hour. Therefore,

They whoſe geographical meridian is 15 degrees eaſtward

ward from us, have noon, and every other hour, an hour ſooner than we have. They whoſe meridian is fifteen degrees weſtward from us, have noon, and every other hour, an hour later than we have: and ſo on in proportion, reckoning one hour for every fifteen degrees.

For the ecliptic circle, ſigns, and degrees, ſee ASTRONOMY, p. 435.

The *tropics* are leſſer circles in the heaven, parallel to the equinoctial; one on each ſide of it, touching the ecliptic in the points of its greateſt declination; ſo that each tropic is 23½ degrees from the equinoctial, one on the north ſide of it, and the other on the ſouth. The northern tropic touches the ecliptic at the beginning of Cancer, the ſouthern at the beginning of Capricorn; for which reaſon the former is called the *tropic of Cancer*, and the latter the *tropic of Capricorn*.

The *polar circles* in the heaven, are each 23½ degrees from the poles, all around. That which goes round the north pole, is called the *arctic circle*. The ſouth polar circle, is called the *antarctic circle*, from its being oppoſite to the arctic.

The ecliptic, tropics, and polar circles, are drawn upon the terreſtrial globe, as well as upon the celeſtial. But the ecliptic, being a great fixed circle in the heavens, cannot properly be ſaid to belong to the terreſtrial globe; and is laid down upon it only for the conveniency of ſolving ſome problems. So that, if this circle on the terreſtrial globe was properly divided into the months and days of the year, it would not only ſuit the globe better, but would alſo make the problems thereon much eaſier.

For the earth's motion round its axis every 24 hours; its motion in the ecliptic round the ſun every year; and the viciſſitude of ſeaſons; ſee ASTRONOMY, p. 452.

Deſcription of the Terreſtrial Globe.

[See Plate XLIV. fig. 2.]

The equator, ecliptic, and tropics, polar circles, and meridians, are laid down upon the globe in the manner already deſcribed. The ecliptic is divided into 12 ſigns, and each ſign into 30 degrees. Each tropic is 23½ degrees from the equator, and each polar circle 23½ degrees from its reſpective pole. Circles are drawn parallel to the equator, at every ten degrees diſtance from it on each ſide to the poles: theſe circles are called *parallels of latitude*. On large globes there are circles drawn perpendicularly through every tenth degree of the equator, interſecting each other at the poles: but on globes of or under a foot diameter, they are only drawn through every fifteenth degree of the equator; theſe circles are generally called *meridians*, ſometimes *circles of longitude*, and at other times *hour-circles*.

The globe is hung in a braſs-ring, called the *brazen meridian*; and turns upon a wire in eace pole ſunk half its thickneſs into one ſide of the meridian ring; by which means, *that* ſide of the ring divides the globe into two equal parts, called the *eaſtern* and *weſtern hemiſpheres*; as the equator divides it into two equal parts, called the *northern* and *ſouthern hemiſpheres*. The ring is divided into 360 equal parts or degrees, on the ſide wherein the axis of the globe turns. One half of theſe degrees are numbered, and reckoned, from the equator to the poles, where they end at 90: their uſe is to ſhew the latitudes of places. The degrees on the other half of the meridian ring are numbered from the poles to the equator, where they end at 90: their uſe is to ſhew how to elevate either the north or ſouth pole above the horizon, according to the latitude of any given place, as it is north or ſouth of the equator.

The brazen meridian is let into two notches made in a broad flat ring, called the *wooden horizon*; the upper ſurface of which divides the globe into two equal parts, called the *upper* and *lower hemiſpheres*. One notch is in the north point of the horizon, and the other in the ſouth. On this horizon are ſeveral concentric circles, which contain the months and days of the year, the ſigns and degrees anſwering to the ſun's place for each month and day, and the 32 points of the compaſs.—The graduated ſide of the braſs meridian lies towards the eaſt ſide of the horizon, and ſhould be generally kept towards the perſon who works problems by the globes.

There is a ſmall *horary circle*, ſo fixed to the north part of the brazen meridian, that the wire in the north pole of the globe is in the centre of that circle; and on the wire is an *index*, which goes over all the 24 hours of the circle, as the globe is turned round its axis. Sometimes there are two horary circles, one between each pole of the globe and the brazen meridian.

There is a thin ſlip of braſs, called the *quadrant of altitude*, which is divided into 90 equal parts or degrees, anſwering exactly to ſo many degrees of the equator. It is occaſionally fixed to the uppermoſt point of the brazen meridian by a nut and ſcrew. The diviſions end at the nut, and the quadrant is turned round upon it.

The Deſcription and Uſe of the Armillary Sphere.

[See Plate LXXXVII. Fig. 1.]

THE exterior parts of this machine are, a compages of braſs rings, which repreſent the principal circles of the heaven, *viz.* 1. The equinoctial *AA*, which is divided into 360 degrees (beginning at its interſection with the ecliptic in Aries) for ſhewing the ſun's right aſcenſion in degrees; and alſo into 24 hours, for ſhewing his right aſcenſion in time. 2. The ecliptic *BB*, which is divided into 12 ſigns, and each ſign into 30 degrees, and alſo into the months and days of the year; in ſuch a manner, that the degree or point of the ecliptic in which the ſun is, on any given day, ſtands over that day in the circle of months. 3. The tropic of Cancer *CC*, touching the ecliptic at the beginning of Cancer in *e*, and the tropic of Capricorn *DD*, touching the ecliptic at the beginning of Capricorn in *f*; each 23½ degrees from the equinoctial circle. 4. The arctic circle *E*, and the antarctic circle *F*, each 23½ degrees from its reſpective pole at *N* and *S*. 5. The equinoctial colure *GG*, paſſing through the north and ſouth poles of the heaven at *N* and *S*, and through the equinoctial points Aries and Libra, in the ecliptic. 6. The ſolſtitial colure *HH*, paſſing through the poles of the heaven, and through the ſolſtitial points Cancer and Capricorn, in the ecliptic. Each quarter of the former of theſe colures is divided into 90 degrees, from the equinoctial to the poles of the world, for ſhewing the declination of the ſun, moon, and ſtars; and each quarter of the latter, from the ecliptic at *e* and *f*, to its poles *b* and *d*, for ſhewing the latitude of the ſtars.

In the north pole of the ecliptic is a nut *b*, to which is fixed one end of a quadrantal wire, and to the other end a ſmall ſun *Y*, which is carried round the ecliptic *B B*, by turning the nut: and in the ſouth pole of the ecliptic is a pin *d*, on which is another quadrantal wire, with a ſmall moon Z upon it, which may be moved round by hand: but there is a particular contrivance for cauſing the moon to move in an orbit which croſſes the ecliptic at an angle of 5⅓ degrees, in two oppoſite points called the *moon's nodes*; and alſo for ſhifting theſe points backward in the ecliptic, as the *moon's nodes* ſhift in the heaven.

Within theſe circular rings is a ſmall terreſtrial globe *I*, fixt on an axis *K K*, which extends from the north and ſouth poles of the globe at *n* and *s*, to thoſe of the celeſtial ſphere at *N* and *S*. On this axis is fixt the flat celeſtial meridian *L L*, which may be ſet directly over the meridian of any place on the globe, and then turned round with the globe, ſo as to keep over the ſame meridian upon it. This flat meridian is graduated the ſame way as the braſs meridian of a common globe, and its uſe is much the ſame. To this globe is fitted the moveable horizon *M M*, ſo as to turn upon two ſtrong wires proceeding from its eaſt and weſt points to the globe, and entering the globe at the oppoſite points of its equator, which is a moveable braſs ring let into the globe in a groove all around its equator. The globe may be turned by hand within this ring, ſo as to place any given meridian upon it, directly under the celeſtial meridian *L L*. The horizon is divided into 360 degrees all around its outermoſt edge, within which are the points of the compaſs, for ſhewing the amplitude of the ſun and moon, both in degrees and points. The celeſtial meridian *L L* paſſes through two notches in the north and ſouth points of the horizon, as in a common globe: but here, if the globe be turned round, the horizon and meridian turn with it. At the ſouth pole of the ſphere is a circle of 24 hours, fixt to the rings, and on the axis is an index which goes round that circle, if the globe be turned round its axis.

The whole fabric is ſupported on a pedeſtal *N*, and may be elevated or depreſſed upon the joint *O*, to any number of degrees from 0 to 90, by means of the arc *P*, which is fixed in the ſtrong braſs arm *Q*, and ſlides in the upright piece *R*, in which is a ſcrew at *r*, to fix it at any proper elevation.

In the box *T* are two wheels (as in Dr Long's ſphere) and two pinions, whoſe axes come out at *V* and *U*; either of which may be turned by the ſmall winch *W*. When the winch is put upon the axis *V*, and turn backward, the terreſtrial globe, with its horizon and celeſtial meridian, keep at reſt; and the whole ſphere of circles turns round from eaſt, by ſouth, to weſt, carrying the ſun *Y*, and moon *Z*, round the ſame way, and cauſing them to riſe above and ſet below the horizon. But when the winch is put upon the axis *U*, and turned forward, the ſphere with the ſun and moon keep at reſt; and the earth, with its horizon and meridian, turn round from weſt, by ſouth, to eaſt; and bring the ſame points of the horizon to the ſun and moon, to which theſe bodies came when the earth kept at reſt, and they were carried round it; ſhewing that they riſe and ſet in the ſame points of the horizon, and at the ſame times in the hour circle, whether the motion be in the earth or in the heaven. If the earthly globe be turned, the hour-index goes round its hour-circle; but if the ſphere be turned, the hour-circle goes round below the index.

And ſo, by this conſtruction, the machine is equally fitted to ſhew either the real motion of the earth, or the apparent motion of the heaven.

To rectify the ſphere for uſe, firſt ſlacken the ſcrew *r* in the upright ſtem *R*, and taking hold of the arm *Q*, move it up or down until the given degree of latitude for any place be at the ſide of the ſtem *R*; and then the axis of the ſphere will be properly elevated, ſo as to ſtand parallel to the axis of the world, if the machine be ſet north and ſouth by a ſmall compaſs: this done, count the latitude from the north pole, upon the celeſtial meridian *L L*, down towards the north notch of the horizon, and ſet the horizon to that latitude; then, turn the nut *b* until the ſun *Y* comes to the given day of the year in the ecliptic, and the ſun will be at its proper place for that day: find the place of the moon's aſcending node, and alſo the place of the moon, by an Ephemeris, and ſet them right accordingly: laſtly, turn the winch *W*, until either the ſun comes to the meridian *L L*, or until the meridian comes to the ſun (according as you want the ſphere or earth to move) and ſet the hour-index to the XII, marked noon, and the whole machine will be rectified.——Then turn the winch, and obſerve when the ſun or moon riſe and ſet in the horizon, and the hour-index will ſhew the times thereof for the given day.

As thoſe who underſtand the uſe of the globes will be at no loſs to work many other problems by this ſphere, it is needleſs to enlarge any farther upon it.

Directions for uſing Globes.

In uſing globes, keep the eaſt ſide of the horizon towards you (unleſs your problem require the turning of it), which ſide you may know by the word Eaſt upon the horizon; for then you have the graduated ſide of the meridian towards you, the quadrant of altitude before you, and the globe divided exactly into two equal parts, by the graduated ſide of the meridian.

In working ſome problems, it will be neceſſary to turn the whole globe and horizon about, that you may look on the weſt ſide thereof; which turning will be apt to jog the ball ſo, as to ſhift away that degree of the globe which was before ſet to the horizon or meridian: to avoid which inconvenience, you may thruſt in the feather-end of a quill between the ball of the globe and the brazen meridian; which, without hurting the ball, will keep it from turning in the meridian, whilſt you turn the weſt ſide of the horizon towards you.

Prob. I. *To find the latitude and longitude of any given place upon the globe.*—Turn the globe on its axis, until the given place comes exactly under that graduated ſide of the braſen meridian, on which the degrees are numbered from the equator; and obſerve what degree of the meridian the place then lies under; which is its latitude, north or ſouth, as the place is north or ſouth of the equator.

The globe remaining in this poſition, the degree of the equator, which is under the braſen meridian, is the longitude of the place which is eaſt or weſt, as the place lies on the eaſt or weſt ſide of the firſt meridian of the globe.—All the Atlantic Ocean, and America, is on the weſt ſide of the meridian of London; and the greateſt part of Europe, and of Africa, together with all Aſia, is on the eaſt ſide of the meridian of London, which is reckoned the *firſt meridian* of the globe by the Britiſh geographers and aſtronomers.

Prob. II. *The longitude and latitude of a place being given, to find that place on the globe.*—Look for the given longitude in the equator (counting it eaſtward or weſtward from the firſt meridian, as it is mentioned to be eaſt or weſt;) and bring the point of longitude in the equator to the braſen meridian, on that ſide which is above the ſouth point of the horizon: then count from the equator, on the braſen meridian, to the degree of the given latitude, towards the north or ſouth pole, according as the latitude is north or ſouth; and under that degree of latitude on the meridian, you will have the place required.

Prob. III. *To find the difference of longitude, or difference, of latitude, between any two given places.*—Bring each of theſe places to the braſen meridian, and ſee what its latitude is: the leſſer latitude ſubtracted from the greater, if both places are on the ſame ſide of the equator, or both latitudes added together, if they are on different ſides of it, is the difference of latitude required. And the number of degrees contained between theſe places, reckoned on the equator, when they are brought ſeparately under the braſen meridian, is their difference of longitude; if it be leſs than 180: but if more, let it be ſubtracted from 360, and the remainder is the difference of longitude required. Or,

Having brought one of the places to the braſen meridian, and ſet the hour-index to XII, turn the globe until the other place comes to the braſen meridian, and the number of hours and parts of an hour, paſt over by the index, will give the longitude in time; which may be eaſily reduced to degrees, by allowing 15 degrees for every hour, and one degree for every four minutes.

N B. When we ſpeak of bringing any place to the braſen meridian, it is the graduated ſide of the meridian that is meant.

Prob. IV. *Any place being given, to find all thoſe places that have the ſame longitude or latitude with it.*—Bring the given place to the braſen meridian, then all thoſe places which lie under that ſide of the meridian, from pole to pole, have the ſame longitude with the given place. Turn the globe round its axis, and all thoſe places which paſs under the ſame degree of the meridian that the given place does, have the ſame latitude with that place.

Since all latitudes are reckoned from the equator, and all longitudes are reckoned from the firſt meridian, it is evident, that the point of the equator which is cut by the firſt meridian, has neither latitude nor longitude.—The greateſt latitude is 90 degrees, becauſe no place is more than 90 degrees from the equator. And the greateſt longitude is 180 degrees, becauſe no place is more than 180 degrees from the firſt meridian.

Prob. V. *To find the* antœci, periœci, *and* antipodes, *of any given place.*—Bring the given place to the braſen meridian; and having found its latitude, keep the globe in that ſituation, and count the ſame number of degrees of latitude from the equator towards the contrary pole; and where the reckoning ends, you have the *antœci* of the given place upon the globe. Thoſe who live at the equator have no *antœci*.

The globe remaining in the ſame poſition, ſet the hour-index to the upper XII on the horary circle, and turn the globe until the index comes to the lower XII; then, the place which lies under the meridian, in the ſame latitude with the given place, is the *periœci* required. Thoſe who live at the poles have no *periœci*.

As the globe now ſtands (with the index at the lower XII) the *antipodes* of the given place will be under the ſame point of the braſen meridian where its *antœci* ſtood before. Every place upon the globe has its *antipodes*.

Prob. VI. *To find the diſtance between any two places on the globe.*—Lay the graduated edge of the quadrant of altitude over both the places, and count the number of degrees intercepted between them on the quadrant; then multiply theſe degrees by 60, and the product will give the diſtance in geographical miles: but to find the diſtance in miles, multiply the degrees by 69½, and the product will be the number of miles required. Or, take the diſtance betwixt any two places with a pair of compaſſes, and apply that extent to the equator; the number of degrees, intercepted between the points of the compaſſes, is the diſtance in degrees of a great circle; which may be reduced either to geographical miles, or to Engliſh miles, as above.

Prob. VII. *A place on the globe being given, and its diſtance from any other place, to find all the other places upon the globe which are at the ſame diſtance from the given place.*—Bring the given place to the braſen meridian, and ſcrew the quadrant of altitude to the meridian, directly over that place; then keeping the globe in that poſition, turn the quadrant quite round upon it, and the degree of the quadrant that touches the ſecond place will paſs over all the other places which are equally diſtant with it from the given place.

This is the ſame as if one foot of a pair of compaſſes was ſet in the given place, and the other foot extended to the ſecond place, whoſe diſtance is known; for if the compaſſes be then turned round the firſt place as a centre, the moving foot will go over all thoſe places which are at the ſame diſtance with the ſecond from it.

Prob. VIII. *The hour of the day at any place being given, to find all thoſe places where it is noon at that time.*

time.—Bring the given place to the braſen meridian, and ſet the index to the given hour; this done, turn the globe until the index points to the upper XII, and then all the places that lie under the braſen meridian have noon at that time.

N. B. The upper XII always ſtands for noon; and when the bringing of any place to the braſen meridian is mentioned, the ſide of that meridian on which the degrees are reckoned from the equator is meant, unleſs the contrary ſide be mentioned.

Prob. IX. *The hour of the day at any place being given, to find what o'clock it then is at any other place.*—Bring the given place to the braſen meridian, and ſet the index to the given hour; then turn the globe, until the place where the hour is required comes to the meridian, and the index will point out the hour at that place.

Prob. X. *To find the ſun's place in the ecliptic, and his declination, for any given day of the year.*—Look on the horizon for the given day, and right againſt it you have the degree of the ſign in which the ſun is (or his place) on that day at noon. Find the ſame degree of that ſign in the ecliptic line upon the globe, and having brought it to the braſen meridian, obſerve what degree of the meridian ſtands over it; for that is the ſun's declination, reckoned from the equator.

Prob. XI. *The day of the month being given, to find all thoſe places of the earth over which the ſun will paſs vertically on that day.*—Find the ſun's place in the ecliptic for the given day, and having brought it to the braſen meridian, obſerve what point of the meridian is over it; then, turning the globe round its axis, all thoſe places which paſs under that point of the meridian, are the places required; for as their latitude is equal, in degrees and parts of a degree, to the ſun's declination, the ſun muſt be directly over head to each of them at its reſpective noon.

Prob. XII. *A place being given in the torrid zone, to find thoſe two days of the year on which the ſun ſhall be vertical to that place.*—Bring the given place to the braſen meridian, and mark the degree of latitude that is exactly over it on the meridian; then turn the globe round its axis, and obſerve the two degrees of the ecliptic which paſs exactly under that degree of latitude: laſtly, find on the wooden horizon, the two days of the year in which the ſun is in thoſe degrees of the ecliptic, and they are the days required: for on them, and none elſe, the ſun's declination is equal to the latitude of the given place; and conſequently, he will then be vertical to it at noon.

Prob. XIII. *To find all thoſe places of the north frigid zone, where the ſun begins to ſhine conſtantly without ſetting, on any given day, from the 21ſt of March to the 23d of September.*—On theſe two days, the ſun is in the equinoctial, and enlightens the globe exactly from pole to pole: therefore, as the earth turns round its axis, which terminates in the poles, every place upon it will go equally through the light and the dark, and ſo make equal day and night to all places of the earth. But as the ſun declines from the equator, towards either pole, he will ſhine juſt as many degrees round that pole, as are equal to his declination from the equator; ſo that no place within that diſtance of the pole will then go through any part of the dark, and conſequently the ſun will not ſet to it. Now, as the ſun's declination is northward, from the 21ſt of March to the 23d of September, he muſt conſtantly ſhine round the north pole all that time; and on the day that he is in the northern tropic, he ſhines upon the whole north frigid zone; ſo that no place within the north polar circle goes through any part of the dark on that day. Therefore,

Having brought the ſun's place for the given day to the braſen meridian, and found his declination (by Prob. IX.) count as many degrees on the meridian, from the north pole, as are equal to the ſun's declination from the equator, and mark that degree from the pole where the reckoning ends: then, turning the globe round its axis, obſerve what places in the north frigid zone paſs directly under that mark; for they are the places required.

The like may be done for the ſouth frigid zone, from the 23d of September to the 21ſt of March, during which time the ſun ſhines conſtantly on the ſouth pole.

Prob. XIV. *To find the place over which the ſun is vertical at any hour of a given day.*—Having found the ſun's declination for the given day (by Prob. IX.) mark it with a chalk on the braſen meridian: then bring the place where you are (ſuppoſe Edinburgh) to the braſen meridian, and ſet the index to the given hour; which done, turn the globe on its axis, until the index points to XII at noon; and the place on the globe, which is then directly under the point of the ſun's declination marked upon the meridian, has the ſun that moment in the zenith, or directly over head.

Prob. XV. *The day and hour of a lunar eclipſe being given; to find all thoſe places of the earth to which it will be viſible.*—The moon is never eclipſed but when ſhe is full, and ſo directly oppoſite to the ſun, that the earth's ſhadow falls upon her. Therefore, whatever place of the earth the ſun is vertical to at that time, the moon muſt be vertical to the antipodes of that place: ſo that the ſun will be then viſible to one half of the earth, and the moon to the other.

Find the place to which the ſun is vertical at the given hour (by Prob. XIV.) elevate the pole to the latitude of that place, and bring the place to the upper part of the braſen meridian, as in the former problem: then, as the ſun will be viſible to all thoſe parts of the globe which are above the horizon, the moon will be viſible to all thoſe parts which are below it, at the time of her greateſt obſcuration.

Prob. XVI. *To rectify the globe for the latitude, the zenith, and the ſun's place.*—Find the latitude of the place (by Prob. I.) and if the place be in the northern hemiſphere, raiſe the north pole above the north point of the horizon, as many degrees (counted from the pole upon the braſen meridian) as are equal to the latitude of the place. If the place be in the ſouthern hemiſphere, raiſe the ſouth pole above the ſouth point of the horizon, as many degrees as are equal to the latitude. Then, turn the globe till the place comes under its latitude on the braſen meridian, and faſten the quadrant of altitude ſo, that the chamfered edge of its nut (which is even with the graduated edge) may be joined to the zenith, or point of latitude. This done, bring the ſun's place in the ecliptic for the given day (found by Prob X.) to the graduated ſide of the braſen meridian, and ſet the hour-index to XII at noon, which is the uppermoſt XII on the hour-circle; and the globe will be rectified.

Prob. XVII. *The latitude of any place, not exceeding 66½ degrees, and the day of the month, being given; to find the time of ſun riſing and ſetting, and conſequently the length of the day and night.*—Having rectified the globe for the latitude, and for the ſun's place on the given day (as directed in the preceding problem) bring the ſun's place in the ecliptic to the eaſtern ſide of the horizon, and the hour-index will ſhew the time of ſun riſing; then turn the globe on its axis, until the ſun's place comes to the weſtern ſide of the horizon, and the index will ſhew the time of ſun-ſetting.

The hour of ſun-ſetting doubled, gives the length of the day; and the hour of ſun-riſing doubled, gives the length of the night.

Prob. XVIII. *The latitude of any place, and the day of the month being given; to find when the morning twilight begins, and the evening twilight ends, at that place.*—This problem is often limited: for, when the ſun does not go 18 degrees below the horizon, the twilight continues the whole night; and for ſeveral nights together in ſummer, between 49 and 66½ degrees of latitude; and the nearer to 66½, the greater is the number of theſe nights. But when it does begin and end, the following method will ſhew the time for any given day.

Rectify the globe, and bring the ſun's place in the ecliptic to the eaſtern ſide of the horizon; then mark that point of the ecliptic with a chalk which is in the weſtern ſide of the horizon, it being the point oppoſite to the ſun's place: this done, lay the quadrant of altitude over the ſaid point, and turn the globe eaſtward, keeping the quadrant at the chalk mark, until it be juſt 18 degrees high on the quadrant; and the index will point out the time when the morning twilight begins: for the ſun's place will then be 18 degrees below the eaſtern ſide of the horizon. To find the time when the evening twilight ends, bring the ſun's place to the weſtern ſide of the horizon, and the point oppoſite to it, which was marked with the chalk, will be riſing in the eaſt: then, bring the quadrant over that point, and keeping it thereon, turn the globe weſtward, until the ſaid point be 18 degrees above the horizon on the quadrant, and the index will ſhew the time when the evening twilight ends; the ſun's place being then 18 degrees below the weſtern ſide of the horizon.

Prob. XIX. *To find on what day of the year the ſun begins to ſhine conſtantly without ſetting, on any given place in the north frigid zone; and how long he continues to do ſo.*—Rectify the globe to the latitude of the place, and turn it about until ſome point of the ecliptic, between aries and cancer, coincides with the north point of the horizon where the braſen meridian cuts it: then find, on the wooden horizon, what day of the year the ſun is in that point of the ecliptic; for that is the day on which the ſun begins to ſhine conſtantly on the given place, without ſetting. This done, turn the globe untill ſome point of the ecliptic, between cancer and libra, coincides with the north point of the horizon, where the braſen meridian cuts it; and find, on the wooden horizon, on what day the ſun is in that point of the ecliptic; which is the day that the ſun leaves off conſtantly ſhining on the ſaid place, and riſes and ſets to it as to other places on the globe. The number of natural days, or compleat revolutions of the ſun about the earth, between the two days above found, is the time that the ſun keeps conſtantly above the horizon without ſetting: for all that portion of the ecliptic, which lies between the two points which interſect the horizon in the very north, never ſets below it: and there is juſt as much of the oppoſite part of the ecliptic that never riſes; therefore, the ſun will keep as long conſtantly below the horizon in winter, as above it in ſummer.

Prob XX. *To find in what latitude the ſun ſhines conſtantly without ſetting, for any length of time leſs than 182½ of our days and nights.*—Find a point in the ecliptic half as many degrees from the beginning of cancer (either toward aries or libra) as there are natural days in the time given; and bring that point to the north ſide of the braſen meridian, on which the degrees are numbered from the pole towards the equator: then, keep the globe from turning on its axis, and ſlide the meridian up or down, until the foreſaid point of the ecliptic comes to the north point of the horizon, and then the elevation of the pole will be equal to the latitude required.

Prob. XXI. *The latitude of a place, not exceeding 66½ degrees, and the day of the month being given; to find the ſun's amplitude, or point of the compaſs on which he riſes or ſets.*—Rectify the globe, and bring the ſun's place to the eaſtern ſide of the horizon; then obſerve what point of the compaſs on the horizon ſtands right againſt the ſun's place, for that is his amplitude at riſing. This done, turn the globe weſtward, until the ſun's place comes to the weſtern ſide of the horizon, and it will cut the point of his amplitude at ſetting. Or, you may count the riſing amplitude in degrees, from the eaſt point of the horizon, to that point where the ſun's place cuts it; and the ſetting amplitude, from the weſt point of the horizon, to the ſun's place at ſetting.

Prob. XXII. *The latitude, the ſun's place, and his altitude, being given; to find the hour of the day, and the ſun's azimuth, or number of degrees that he is diſtant from the meridian.*—Rectify the globe, and bring the ſun's place to the given height upon the quadrant of altitude; on the eaſtern ſide of the horizon, if the time be in the forenoon; or the weſtern ſide, if it be in the afternoon: then the index will ſhew the hour; and the number of degrees in the horizon, intercepted between the quadrant of altitude and the ſouth point, will be the ſun's true azimuth at that time.

Prob. XXIII. *The latitude, hour of the day, and the ſun's place, being given; to find the ſun's altitude and azimuth.*—Rectify the globe, and turn it until the index points to the given hour; then lay the quadrant of altitude over the ſun's place in the ecliptic, and the degree of the quadrant cut by the ſun's place is his altitude at that time above the horizon; and the degree of the horizon cut by the quadrant is the ſun's azimuth, reckoned from the ſouth.

Prob. XXIV. *The latitude, the ſun's altitude, and his*

his azimuth being given; to find his place in the ecliptic, the day of the month, and hour of the day, though they had all been loſt.—Rectify the globe for the latitude and zenith, and ſet the quadrant of altitude to the given azimuth in the horizon; keeping it there, turn the globe on its axis until the ecliptic cuts the quadrant in the given altitude: that point of the ecliptic which cuts the quadrant there, will be the ſun's place; and the day of the month anſwering thereto, will be found over the like place of the ſun on the wooden horizon. Keep the quadrant of altitude in that poſition; and, having brought the ſun's place to the braſen meridian, and the hour-index to XII at noon, turn back the globe, until the ſun's place cuts the quadrant of altitude again, and the index will ſhew the hour.

Any two points of the ecliptic, which are equidiſtant from the beginning of Cancer or of Capricorn, will have the ſame altitude and azimuth at the ſame hour, though the months be different; and therefore it requires ſome care in this problem, not to miſtake both the month and the day of the month; to avoid which, obſerve, that from the 20th of March to the 21ſt of June, that part of the ecliptic which is between the beginning of Aries and beginning of Cancer is to be uſed: from the 21ſt of June to the 23d of September, between the beginning of Cancer and beginning of Libra: from the 23d of September to the 21ſt of December, between the beginning of Libra and the beginning of Capricorn; and from the 21ſt of December to the 20th of March, between the beginning of Capricorn and beginning of Aries. And as one can never be at a loſs to know in what quarter of the year he takes the ſun's altitude and azimuth, the above caution with regard to the quarters of the ecliptic will keep him right as to the month and day thereof.

Prob. XXV. *To find the length of the longeſt day at any given place.*—If the place be on the north ſide of the equator (find its latitude by Prob. I.) and elevate the north pole to that latitude; then, bring the beginning of Cancer to the brazen meridian, and ſet the hour-index to XII at noon. But if the given place be on the ſouth ſide of the equator, elevate the ſouth pole to its latitude, and bring the beginning of Capricorn to the braſs meridian, and the hour-index to XII. This done, turn the globe weſtward, until the beginning of Cancer or Capricorn (as the latitude is north or ſouth) comes to the horizon; and the index will then point out the time of ſun-ſetting, for it will have gone over all the afternoon hours, between mid-day and ſun ſet; which length of time being doubled, will give the whole length of the day from ſun-riſing to ſun-ſetting. For, in all latitudes, the ſun riſes as long before mid day, as he ſets after it.

Prob. XXVI. *To find in what latitude the longeſt day is, of any given length, leſs than 24 hours.*—If the latitude be north, bring the beginning of Cancer to the braſen meridan, and elevate the north pole to about 66½ degrees; but if the latitude be ſouth, bring the beginning of Capricorn to the meridian, and elevate the ſouth pole to about 66½ degrees; becauſe the longeſt day in north latitude is, when the ſun is in the firſt point of Cancer; and in ſouth latitude, when he is in the firſt point of Capricorn. Then ſet the hour-index to XII at noon, and turn the globe weſtward, until the index points at half the number of hours given; which done, keep the globe from turning on its axis, and ſlide the meridian down in the notches, until the aforeſaid point of the ecliptic (*viz.* Cancer or Capricorn) comes to the horizon; then, the elevation of the pole will be equal to the latitude required.

Prob. XXVII. *The latitude of any place, not exceeding 66½ degrees, being given: to find in what climate the place is.*—Find the length of the longeſt day at the given place, by Prob. XXV. and whatever be the number of hours whereby it exceedeth twelve, double that number, and the ſum will give the climate in which the place is.

Prob. XXVIII. *The latitude, and the day of the month, being given; to find the hour of the day when the ſun ſhines.*—Set the wooden horizon truly level, and the braſen meridian due north and ſouth by a mariner's compaſs: then, having rectified the globe, ſtick a ſmall ſewing-needle into the ſun's place in the ecliptic, perpendicular to that part of the ſurface of the globe: this done, turn the globe on its axis, until the needle comes to the braſen meridian, and ſet the hour-index to XII at noon; then, turn the globe on its axis, until the needle points exactly towards the ſun (which it will do when it caſts no ſhadow on the globe), and the index will ſhew the hour of the day.

The Uſe of the Celeſtial Globe.

Having done for the preſent with the terreſtrial globe, we ſhall proceed to the uſe of the celeſtial; firſt premiſing, that as the equator, ecliptic, tropics, polar-circles, horizon, and braſen meridian, are exactly alike on both globes, all the former problems concerning the ſun are ſolved the ſame way by both globes. The method alſo of rectifying the celeſtial globe is the ſame as rectifying the terreſtrial.

N. B. The ſun's place for any day of the year ſtands directly over that day on the horizon of the celeſtial globe, as it does on that of the terreſtrial.

The *latitude* and *longitude* of the ſtars, or of all other celeſtial phenomena, are reckoned in a very different manner from the latitude and longitude of places on the earth: for all terreſtrial latitudes are reckoned from the equator; and longitudes from the meridian of ſome remarkable place, as of London by the Britiſh, and of Paris by the French. But the aſtronomers of all nations agree in reckoning the latitudes of the moon, ſtars, planets, and comets, from the ecliptic; and their longitudes from the equinoctial colure, in that ſemi circle of it which cuts the ecliptic at the beginning of Aries; and thence eaſtward, quite round, to the ſame ſemi-circle again. Conſequently thoſe ſtars which lie between the equinoctial and the northern half of the ecliptic, have north declination and ſouth latitude; thoſe which lie between the equinoctial and the ſouthern half of the ecliptic, have ſouth declination and north latitude; and all thoſe which lie between the tropics and poles, have their declinations and latitudes of the ſame denomination.

There are ſix great circles on the celeſtial globe, which cut the ecliptic perpendicularly, and meet in two oppoſite points in the polar circles; which points are each ninety degrees from the ecliptic, and are called its poles. Theſe polar points divide thoſe circles into 12 ſemicircles; which cut the ecliptic at the beginnings of the 12 ſigns. They reſemble ſo many meridians on the terreſtrial globe; and as all places which lie under any particular meridian-ſemicircle on that globe, have the ſame longitude, ſo all thoſe points of the heaven, through which any of the above ſemicircles are drawn, have the ſame longitude.—And as the greateſt latitudes on the earth are at the north and ſouth poles of the earth, ſo the greateſt latitudes in the heaven are at the north and ſouth poles of the ecliptic.

For the diviſion of the ſtars into conſtellations, *&c.* ſee ASTRONOMY, p. 486.

PROB. I. *To find the right aſcenſion and declination of the ſun, or any fixed ſtar.*—Bring the ſun's place in the ecliptic to the braſen meridian; then that degree in the equinoctial which is cut by the meridian, is the ſun's *right aſcenſion;* and that degree of the meridian which is over the ſun's place, is his *declination.* Bring any fixed ſtar to the meridian, and its right aſcenſion will be cut by the meridian in the equinoctial; and the degree of the meridian that ſtands over it, is its declination.

So that the right aſcenſion and declination, on the celeſtial globe, are found in the ſame manner as longitude and latitude on the terreſtrial.

PROB. II. *To find the latiude and longitude of any ſtar.*—If the given ſtar be on the north ſide of the ecliptic, place the 90th degree of the quadrant of altitude on the north pole of the ecliptic, where the twelve ſemicircles meet, which divide the ecliptic into the 12 ſigns: but if the ſtar be on the ſouth ſide of the ecliptic, place the 90th degree of the quadrant on the ſouth pole of the ecliptic: keeping the 90th degree of the quadrant on the proper pole, turn the quadrant about, until its graduated edge cuts the ſtar: then, the number of degrees in the quadrant, between the ecliptic and the ſtar, is its latitude; and the degree of the ecliptic, cut by the quadrant, is the ſtar's longitude, reckoned according to the ſign in which the quadrant then is.

PROB. III. *To repreſent the face of the ſtarry firmament, as ſeen from any given place of the earth, at any hour of the night.*—Rectify the celeſtial globe for the given latitude, the zenith, and ſun's place, in every reſpect, as taught by the XVIth problem, for the terreſtrial; and turn it about, until the index points to the given hour: then, the upper hemiſphere of the globe will repreſent the viſible half of the heaven for that time: all the ſtars upon the globe being then in ſuch ſituations, as exactly correſpond to thoſe in the heaven. And if the globe be placed duly north and ſouth, by means of a ſmall ſea-compaſs, every ſtar in the globe will point toward the like ſtar in the heaven: by which means, the conſtellations and remarkable ſtars may be eaſily known. All thoſe ſtars which are in the eaſtern ſide of the horizon, are then riſing in the eaſtern ſide of the heaven; all in the weſtern, are ſetting in the weſtern ſide; and all thoſe under the upper part of the braſen meridian, between the ſouth point of the horizon and the north pole, are at their greateſt altitude, if the latitude of the place be north: but if the latitude be ſouth, thoſe ſtars which lie under the upper part of the meridian, between the north point of the horizon and the ſouth pole, are at their greateſt altitude.

PROB. IV. *The latitude of the place, and day of the month, being given; to find the time when any known ſtar will riſe, or be upon the meridian, or ſet.*—Having rectified the globe, turn it about until the given ſtar comes to the eaſtern ſide of the horizon, and the index will ſhew the time of the ſtar's riſing; then turn the globe weſtward, and when the ſtar comes to the braſen meridian, the index will ſhew the time of the ſtar's coming to the meridian of your place; laſtly, turn on, until the ſtar comes to the weſtern ſide of the horizon, and the index will ſhew the time of the ſtar's ſetting.

N. B. In northern latitudes, thoſe ſtars which are leſs diſtant from the north pole, than the quantity of its elevation above the north point of the horizon, never ſet; and thoſe which are leſs diſtant from the ſouth pole, than the number of degrees by which it is depreſſed below the horizon, never riſe: and *vice verſa* in ſouthern latitudes.

PROB. V. *To find at what time of the year a given ſtar will be upon the meridian, at a given hour of the night.*—Bring the given ſtar to the upper ſemicircle of the braſs meridian, and ſet the index to the given hour; then turn the globe, until the index points to XII at noon, and the upper ſemicircle of the meridian will then cut the ſun's place, anſwering to the day of the year ſought; which day may be eaſily found againſt the like place of the ſun among the ſigns on the wooden horizon.

PROB. VI. *The latitude, day of the month, and azimuth of any known ſtar, being given; to find the hour of the night.*—Having rectified the globe for the latitude, zenith, and ſun's place, lay the quadrant of altitude to the given degree of azimuth in the horizon: then turn the globe on its axis, until the ſtar comes to the graduated edge of the quadrant; and when it does, the index will point out the hour of the night.

PROB. VII. *The latitude of the place, the day of the month, and altitude of any known ſtar, being given; to find the hour of the night.*—Rectify the globe as in the former problem, gueſs at the hour of the night, and turn the globe until the index points at the ſuppoſed hour; then lay the graduated edge of the quadrant of altitude over the known ſtar, and if the degree of the ſtar's height in the quadrant upon the globe, anſwers exactly to the degree of the ſtar's obſerved altitude in the heaven, you have gueſſed exactly: but if the ſtar on the globe is higher or lower than it was obſerved to be in the heaven, turn the globe backwards or forwards, keeping the edge of the quadrant upon the ſtar, until its centre comes to the obſerved altitude in the quadrant; and then, the index will ſhew the true time of the night.

PROB. VIII. *An eaſy method for finding the hour of the night by any two known ſtars, without knowing either their altitude or azimuth; and then, of finding both their altitude and azimuth, and thereby the true meridian.*—Tie one end of a thread to a common muſket-bullet; and, having rectified the globe as above, hold the other end of the thread in your hand, and carry it ſlowly round betwixt your eye and the ſtarry heaven, until you find it cuts any two known ſtars at once. Then gueſſing at the hour of the night, turn the globe until the index points to that time in the hour circle; which done, lay the graduated edge of the quadrant over any one of theſe two ſtars on the globe, which the thread cut in the heaven. If the ſaid edge of the quadrant cuts the other ſtar alſo, you have gueſſed the time exactly; but if it does not, turn the globe ſlowly backwards or forwards, until the quadrant (kept upon either ſtar) cuts them both through their centres: and then, the index will point out the exact time of the night; the degree of the horizon, cut by the quadrant, will be the true azimuth of both theſe ſtars from the ſouth; and the ſtars themſelves will cut their true altitude in the quadrant. At which moment, if a common azimuth-compaſs be ſo ſet upon a floor or level pavement, that theſe ſtars in the heaven may have the ſame bearing upon it (allowing for the variation of the needle) as the quadrant of altitude has in the wooden horizon of the globe, a thread extended over the north and ſouth points of that compaſs will be directly in the plane of the meridian: and if a line be drawn upon the floor or pavement, along the courſe of the thread, and an upright wire be placed in the ſouthmoſt end of the line, the ſhadow of the wire will fall upon that line, when the ſun is on the meridian, and ſhines upon the pavement.

Prob. IX. *To find the place of the moon, or of any planet; and thereby to ſhew the time of its riſing, ſouthing, and ſetting.*—Seek in Parker's or Weaver's ephemeris the geocentric place of the moon or planet in the ecliptic, for the given day of the month; and, according to its longitude and latitude, as ſhewn by the ephemeris, mark the ſame with a chalk upon the globe. Then, having rectified the globe, turn it round its axis weſtward; and as the ſaid mark comes to the eaſtern ſide of the horizon, to the braſen meridian, and to the weſtern ſide of the horizon, the index will ſhew at what time the planet riſes, comes to the meridian, and ſets, in the ſame manner as it would do for a fixed ſtar.

For an explanation of the harveſt moons by a globe, ſee Astronomy, p. 463.

For the deſcription and uſe of a planetary globe, ſee Astronomy, p. 498.

For the equation of time, ſee Astronomy, p. 458.

Having thus explained the uſe of the globes, and general principles of geography, we muſt refer to the maps for the ſituation of each particular country, with regard to longitude, latitude, *&c.* The uſe of maps is obvious from their conſtruction. The degrees of the meridian, and parallels, ſhew the longitudes and latitudes of places; and the ſcale of miles annexed, their diſtances. The ſituation of places, with regard to each other, as well as the cardinal points, appears by inſpection; the top of the map being always the *north*, the bottom the *ſouth*, the right-hand the *eaſt*, and the left the *weſt*, unleſs the compaſs uſually annexed ſhew the contrary.

The brevity, which we are neceſſarily obliged to obſerve, prevents us from taking any notice of many particulars, which are to be found in large treatiſes on this ſubject. A general account of countries, cities, rivers, mountains, *&c.* is given under their reſpective names, as they occur in the order of the alphabet. We ſhall therefore conclude this article with the following table, which will ſerve to give an idea of the general diviſion of the habitable earth; and at the ſame time ſerve to explain the maps in Plates 87. 88. 89. 90. 91. and 92.

The Diviſion of the Habitable Earth, the ſquare Miles of each Diviſion and Subdiviſion, Capital Cities, with the Diſtance and Bearing of each from London; alſo the Time of each Country compared with that of England.

The terraqueous globe is divided into	I. Europe	2,749,349	Square miles, 60 miles in length to a degree.
	II. Asia	10,257,487	
	III. Africa	8,506,208	
	IV. America	9,153,762	
	Habitable earth	30,666,806	
	Seas, and unknown parts	117,843,821	
	Superficies of the whole globe	148,510,627	

Diviſion and ſubdiviſion.	Square miles.	Capital cities.	Diſtance and bearing from London.	Diff. of time from London.
I. EUROPE.				*H.M.
1. *Spain*	150,243	*Madrid*	690 S	0 16 W
2. *Portugal*	27,851	*Liſbon*	840 S W	0 38 W
3. *France*	138,837	*Paris*	203 E	0 9 E

4. *Italy*

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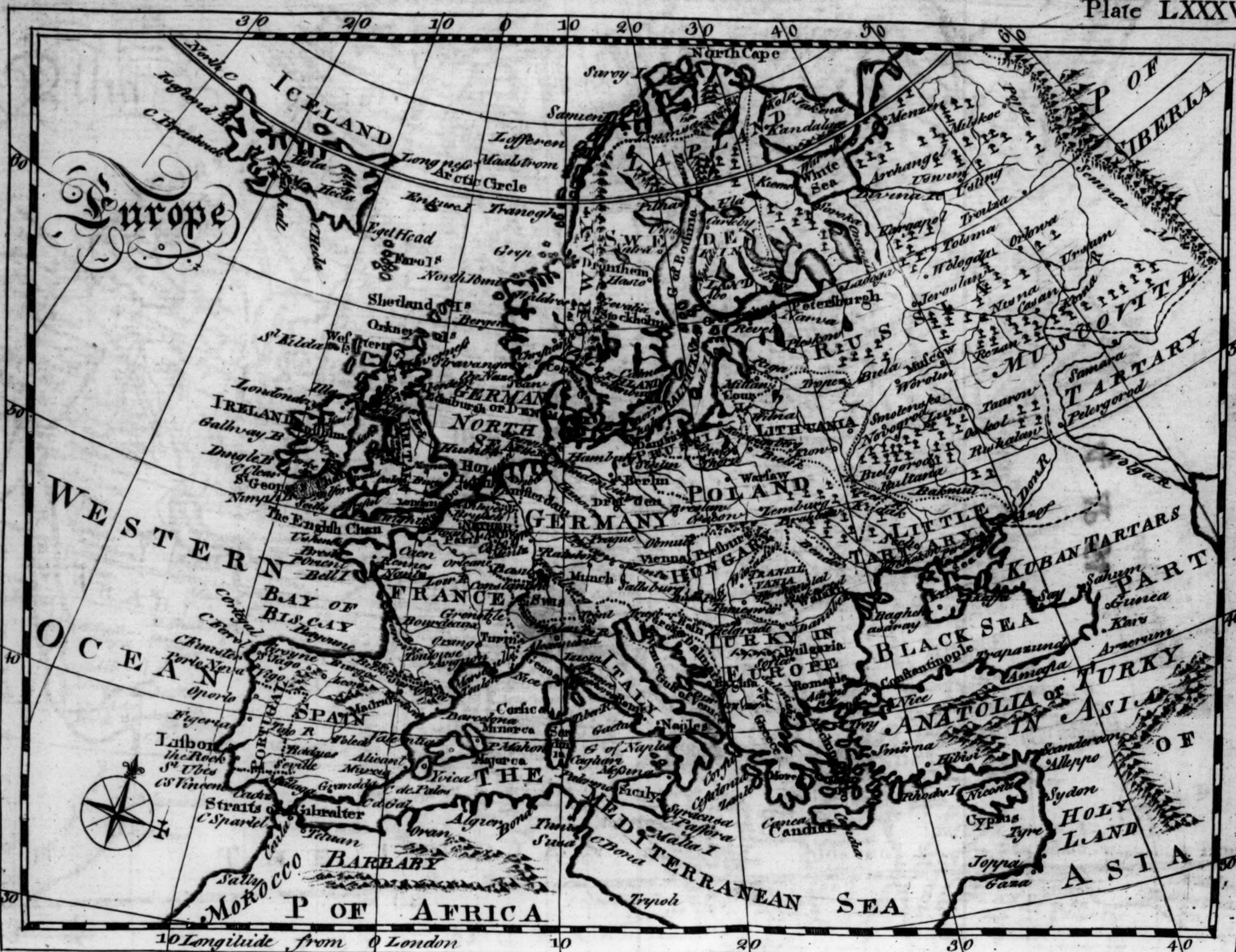
* A degree of longitude being 4 minutes in time, therefore by having the longitude we have the time. A watch that is ſet to time at London would be 16 minutes too faſt at Madrid, as it lies to the weſt of the meridian at London: and Vienna being 16 degrees and 20 minutes to the eaſt of the meridian of London, conſequently a watch ſet at London would be 1 hour and 5 minutes too ſlow at Vienna.

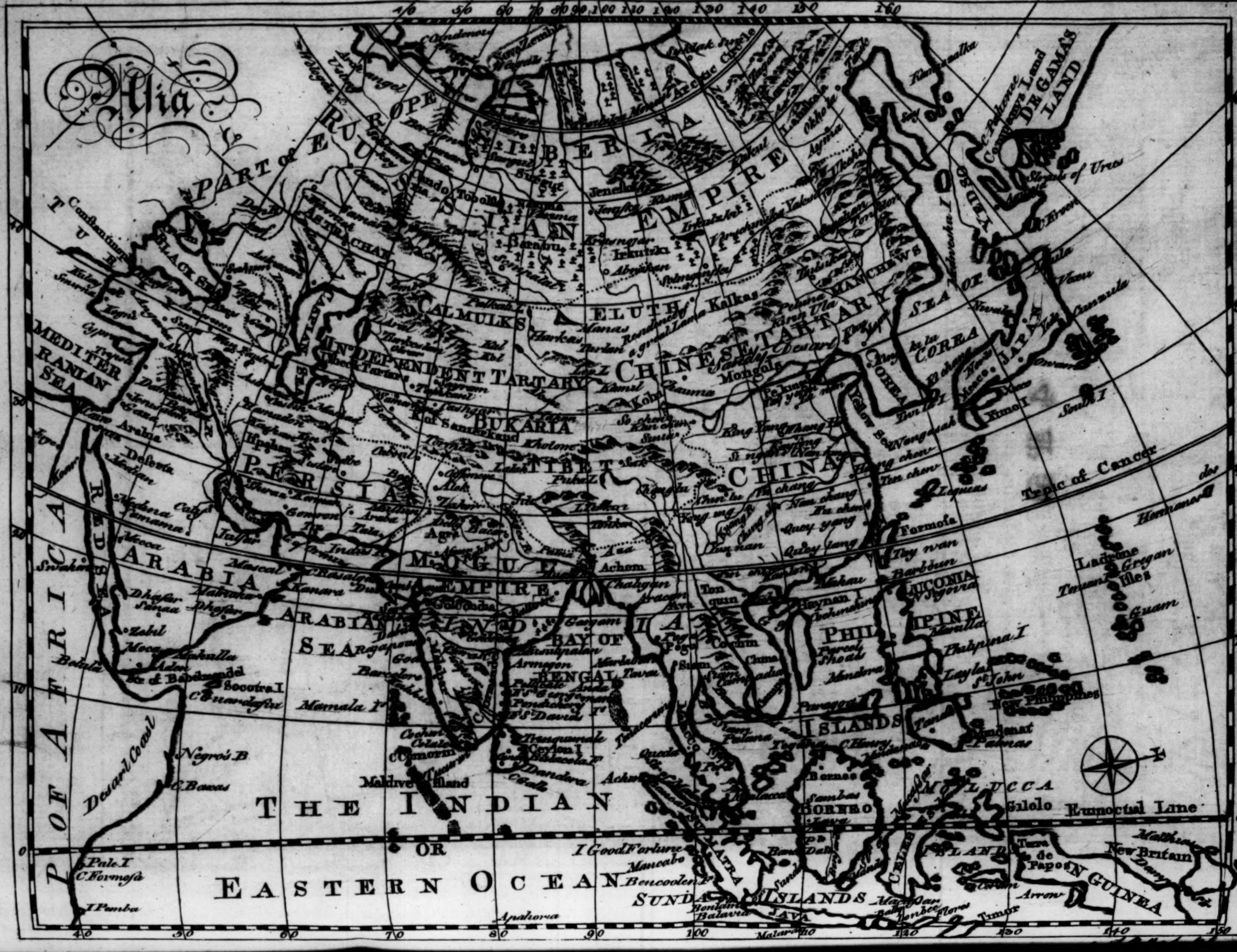
Plate LXXXVIII.


Europe
ICELAND
Arctic Circle
North Cape
LAPLAND
SWEDEN
NORWAY
White Sea
P OF SIBERIA
RUSSIA
MUSCOVITE
TARTARY
Petersburgh
Moscow
LITHUANIA
POLAND
Warsaw
LITTLE TARTARY
KUBAN TARTARS
BLACK SEA
Constantinople
ANATOLIA or TURKY IN ASIA
PART OF ASIA
HOLY LAND
Cyprus
Candia
TURKY IN EUROPE
HUNGARY
Vienna
GERMANY
Berlin
Hamburg
Prague
Munich
NORTH SEA
Shetland Is
Orkney Is
St Kilda
IRELAND
Galway B
Dingle B
The English Chan
FRANCE
BAY OF BISCAY
WESTERN OCEAN
SPAIN
PORTUGAL
Lisbon
Madrid
Straits of Gibralter
Minorca
Majorca
Corsica
Sardinia
ITALY
Sicily
Malta I
THE MEDITERRANEAN SEA
BARBARY
MOROCCO
P OF AFRICA
Tripoli
Longitude from London

A. Bell Sculp.t

4 AP 54

Plate LXXXIX.


Asia
PART of EUROPE
RUSSIAN EMPIRE
SIBERIA
TURKEY
BLACK SEA
CASPIAN SEA
MEDITERRANIAN SEA
CALMUKS
ELUTH
INDEPENDENT TARTARY
CHINESE TARTARY
MANCHEWS
BUKARIA
TIBET
PERSIA
ARABIA
MOGUL EMPIRE
INDIA
CHINA
COREA
SEA OF COREA
JAPAN
YEDSO
DE GAMA'S LAND
Companys Land
Kamtschatka
Arctic Circle
Tropic of Cancer
Equinoctial Line
ARABIAN SEA
BAY OF BENGAL
RED SEA
PHILIPPINE ISLANDS
Formosa
Ladrone Isles
MOLUCCA
BORNEO
SUMATRA
JAVA
SUNDA ISLANDS
CELEBES
NEW GUINEA
New Britain
Ceylon I
Maldive Island
Socotra I
THE INDIAN OR EASTERN OCEAN
PART OF AFRICA
Desart Coast

4 AP 54

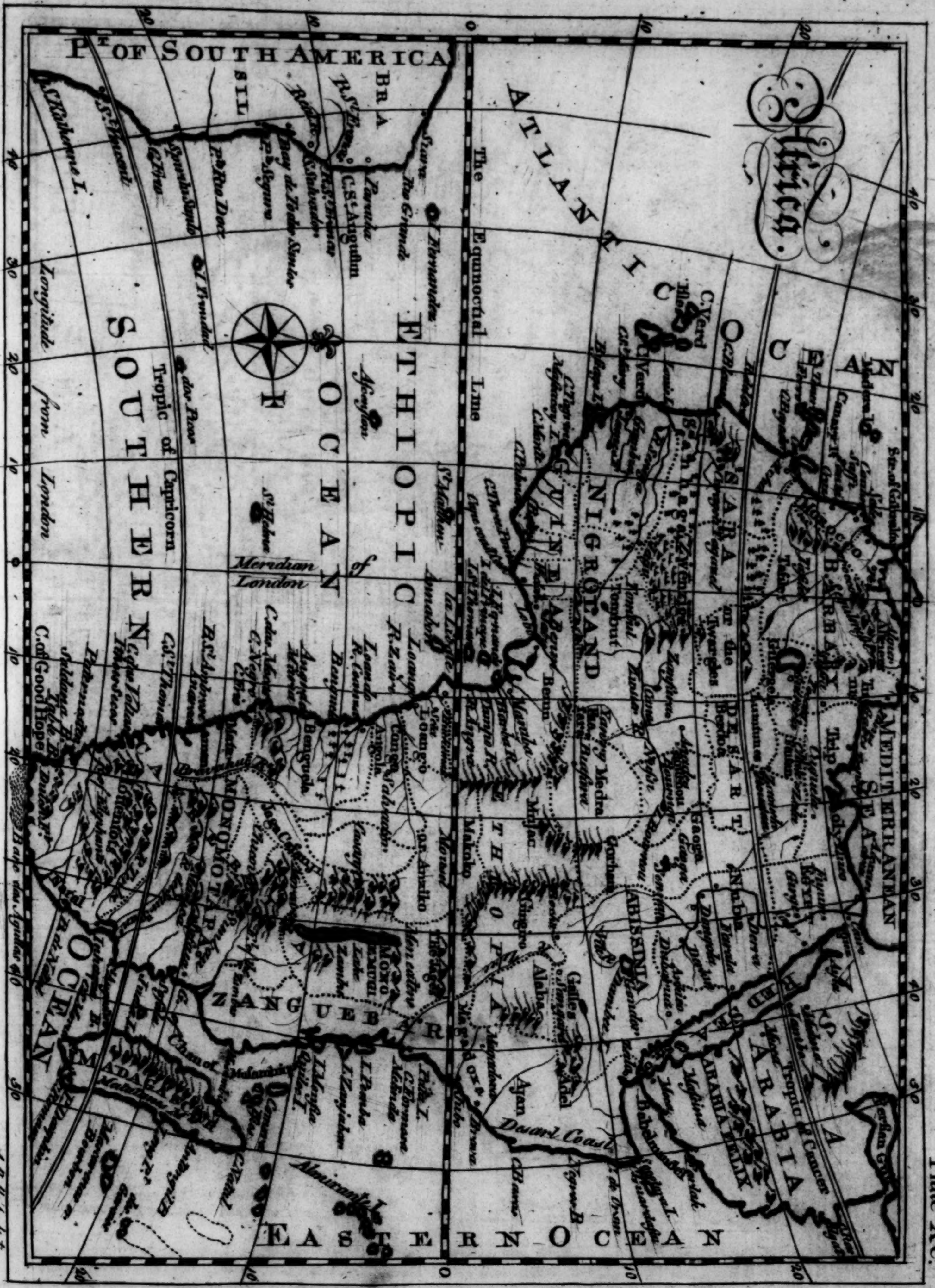
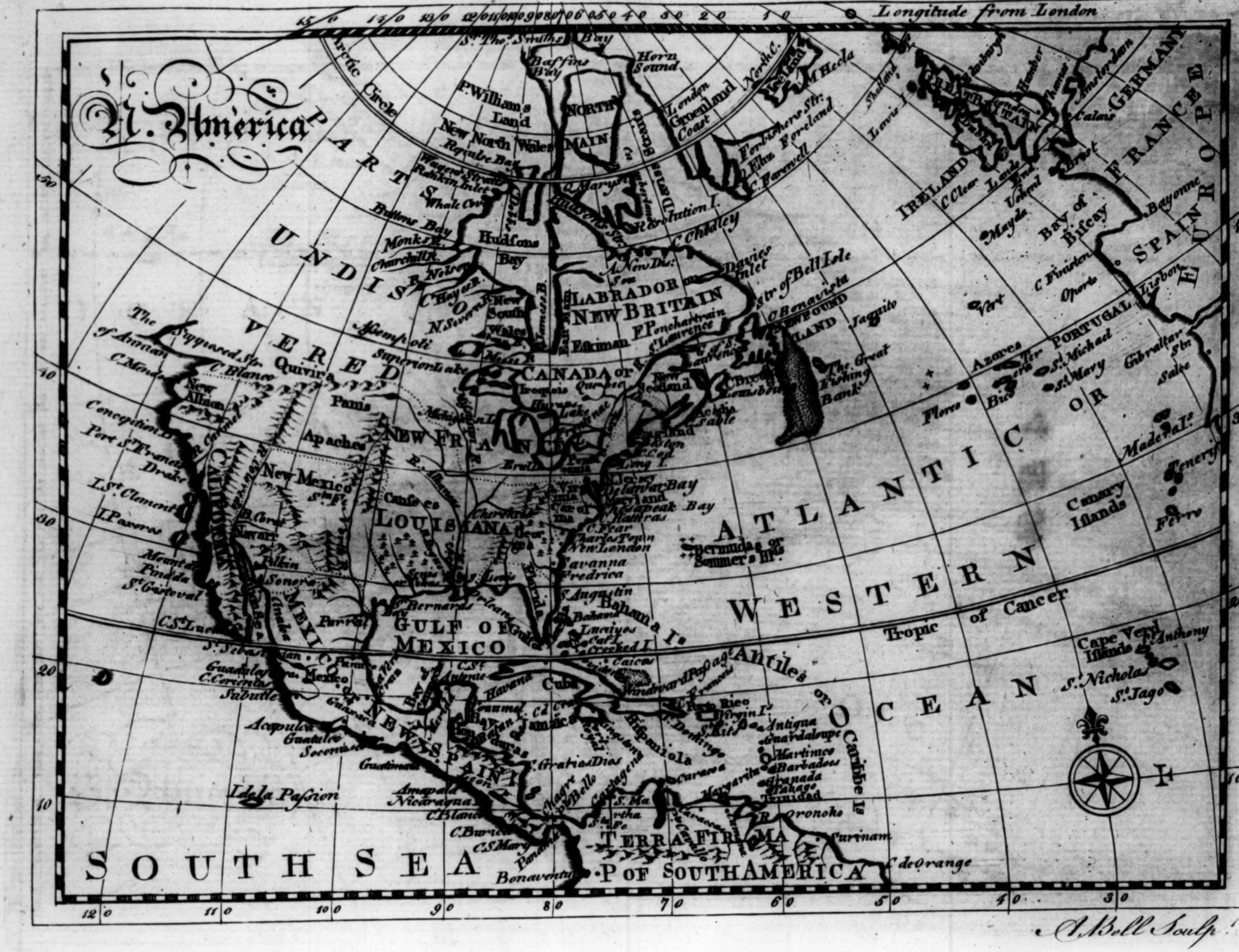

Africa.
Pt. OF SOUTH AMERICA
BRASIL
ATLANTIC OCEAN
ETHIOPIC OCEAN
SOUTHERN OCEAN
EASTERN OCEAN
MEDITERRANEAN SEA
RED SEA
ARABIA
ARABIA FELIX
BARBARY
SARA or the DESART
NIGROLAND
GUINEA
ETHIOPIA
ABISSINIA
ZANGUEBAR
MONOMOTAPA
CAFRARIA
MADAGASCAR
The Equinoctial Line
Tropic of Capricorn
Tropic of Cancer
Meridian of London
Longitude from London
C. of Good Hope
C. Verd
St. Helena
Ascension
Tombut
Desart Coast
Almirante I.
A. Bell sculpt.

Plate XC.

4 AP 54

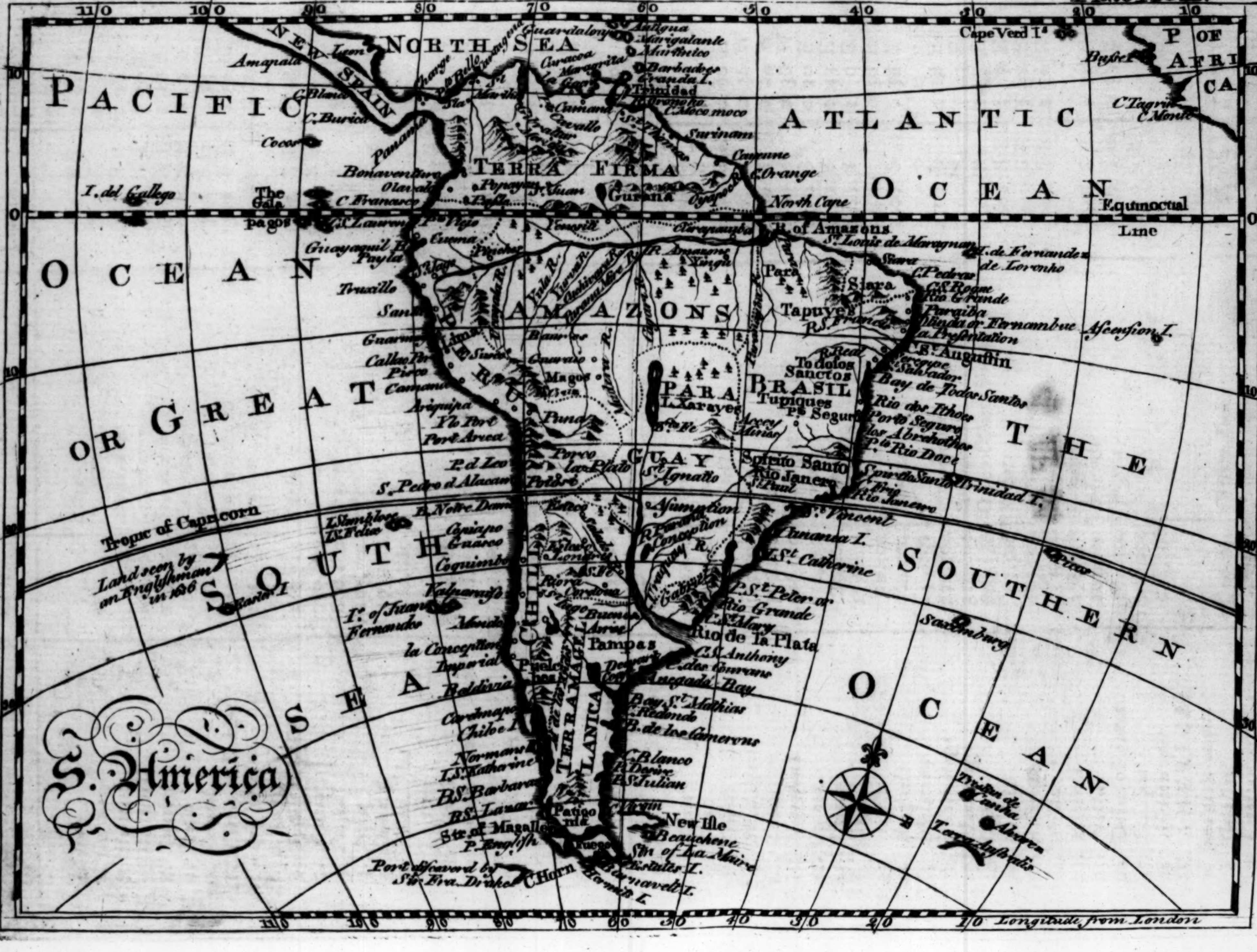
Plate XCI.


N. America
Longitude from London
Arctic Circle
PARTS UNDISCOVERED
Baffins Bay
Horn Sound
P. William's Land
New North Wales
NORTH MAIN
Davis Straits
London Greenland Coast
North C.
Iceland
M. Hecla
Hudsons Bay
LABRADOR or NEW BRITAIN
CANADA or
NEW FRANCE
Quivira
New Albion
CALIFORNIA
New Mexico
Apaches
LOUISIANA
NEW ENGLAND
NEW FOUNDLAND
The Great Fishing Bank
GULF OF MEXICO
MEXICO or NEW SPAIN
Cuba
Jamaica
Hispaniola
Porto Rico
Bahama I.
Antilles or Caribbe Is.
TERRA FIRMA
P OF SOUTH AMERICA
SOUTH SEA
ATLANTIC OR WESTERN OCEAN
Tropic of Cancer
Bermudas or Sommer's Ila.
Azores
Canary Islands
Cape Verd Islands
Madera I.
IRELAND
GREAT BRITAIN
FRANCE
GERMANY
SPAIN
PORTUGAL
EUROPE
Bay of Biscay
Gibraltar Str.
Isla la Passion
Surinam
C. de Orange
Oronoko
10
20
30
40
50
60
70
80
90
100
110
120
130
150

A. Bell Sculp.

4 AP 54

Plate XCII.


S. America
PACIFIC
OCEAN
OR GREAT
SOUTH
SEA
NORTH SEA
ATLANTIC
OCEAN
THE
SOUTHERN
OCEAN
NEW SPAIN
TERRA FIRMA
AMAZONS
PERU
PARA
GUAY
BRASIL
CHILI
TERRA MAGELLANICA
Pampas
Equinoctial Line
Tropic of Capricorn
Cape Verd Is.
P OF AFRICA
Cocos
I. del Gallego
The Galapagos
Land seen by an Englishman in 1686
Panama
Porto Bello
Carthagena
Guayaquil
Lima
Callao
Arequipa
Potosi
Truxillo
Coquimbo
Valparaiso
I.s of Juan Fernando
la Concepcion
Baldivia
Chiloe I.
Str. of Magellan
C. Horn
Port discovered by Sir Fra. Drake
Str. of La Maire
Staten I.
New Isle
St. Julian
Rio de la Plata
Buenos Ayres
Asumption
St. Catherine
Rio Janeiro
Spirito Santo
Porto Seguro
Bay de Todos Santos
St. Salvador
St. Augustin
Olinda or Fernambuc
Paraiba
Rio Grande
Siara
St. Louis de Maragnan
R. of Amazons
North Cape
Cayenne
Surinam
Orange
Trinidad
Barbadoes
Martinico
Marigalante
Antigua
Guardaloupe
Curacoa
Margarita
Cumana
Ascension I.
Trinidad I.
I. de Fernandez de Lorenho
Tristan de Cunha
Saxenburg
C. Tagrin
C. Monte
Longitude from London

4 AP 54

Diviſion and ſubdiviſion.	Square miles.	Capital cities.	Diſtance and bearing from London.	Difference of time from London.
				H. M.
4. *Italy*	75,576	*Rome*	780 S E	0 52 E
5. *Germany*	181,631	*Vienna*	650 E	1 5 E
6. *Holland*	9,540	*Amſterdam*	132 E	0 18 E
7. *Denmark*	163,001	*Copenhagen*	480 N E	0 50 E
8. *Sweden*	228,715	*Stockholm*	720 N E	1 10 E
9. *Ruſſia*	1,103,485	*Peterſburgh*	1080 N E	2 2 E
10. *Poland*	226,414	*Warſaw*	766 S E	1 23 E
11. *Turkey* in *Europe*	212,240	*Conſtantinople*	1300 S E	1 56 E
12. *Britiſh iſles*	105,634	*London*	Firſt meridian.	
II. ASIA.				
1. *Turkey* in *Aſia*	510,717	*Burſa*	1396 S E	1 58 E
2. *Arabia*	700,000	*Mecca*	2240 S E	
3. *Perſia*	800,000	*Iſpahan*	2550 E	3 21 E
4. *India*	1,857,500	*Agra*	3780 E	5 15 E
5. *China*	1,105,000	*Pekin*	4380 N E	7 24 E
6. *Aſiatic iſles*	811,980			
7. *Tartary*				
1. *Chineſe*	644,000	*Chinyan*	4480 N E	8 4 E
2. Independent	778,290	*Samarchand*	2800 E	4 26 E
3. *Muſcovite*	3,050,000	*Tobolſky*	2412 N E	4 10 E
III. AFRICA.				
1. *Egypt*	140,700	*Grand Cairo*	1920 S E	2 10 E
2. *Barca*	66,400	*Tolemeta*	1440 S E	1 26 E
3. *Abex*	30,000	*Erquicko*	3590 S E	2 36 E
4. *Fez* and *Morocco*	111,800	*Fez* and *Morocco*	1080 S 1290 S	0 21 0 30 W
5. *Taſlet* and *Segelmeſſe*	100,600	*Taſlet* and *Segelmeſſe*	1376 S 1240 S	0 30 0 18 W
6. *Algier*	143,600	*Algier*	920 S	0 13 E
7. *Tunis*	54,400	*Tunis*	990 S E	0 39 E
8. *Tripoli*	75,000	*Tripoli*	1260 S E	0 66 E
9. *Biledulgerid*	485,000	*Dara*	1565 S	0 36 W
10. *Zaara*	739,200	*Tegaſſa*	1840 S	0 24 W
11. *Negroland*	1,026,000	*Madinga*	2500 S	0 38 W
12. *Guinea*	510,000	*Benin*	2700 S	0 20 E
13. *Loango*	49,400	*Loango*	3300 S	0 43 E
14. *Congo*	172,800	*St Salvador*	3480 S	1 0 E
15. *Angola*	38,400	*Mocbina*	3750	0 58 E
16. *Benguela*	64,000	*Benguela*	3900 S	0 58 E
17. *Mataman*	144,000			
18. *Monomotapa*	222,500	*Monomotapa*	4500 S	1 18 E
19. *Monoemugi*	310,000	*Chicova*	4260 S	1 44 E
20. *Caffers*	200,340	Cape of *Good Hope*	5200 S	1 4 E
21. *Saffala*	27,500	*Saffala*	4600 S E	2 17 E
22. *Zanguebar*	275,000	*Mozambique*	4440 S E	2 38 E
23. *Anian*	234,000	*Brava*	3702 S E	2 40 E
24. *Abyſſinia*	378,000	*Caxuma*		
25. *Nubia*	264,000	*Dancala*	2418 S E	2 13 E
26. Deſart of *Barca*	184,900	*Angela*	1680 S E	1 33 E
27. *Ethiopia*	1,200,000			
28. *African iſles*	181,668			
IV. AMERICA.				
1. BRITISH empire				
1. *Carolina*	57,500	*Charles-Town*	3450 W	5 2 W
2. *Virginia*	20,750	*James-Town*	3210 W	5 W
3. *Maryland*	12,260	*Baltimore*	3000 W	4 45 W

4. *Penſilvania*

Diviſion and ſubdiviſion.	Square miles.	Capital cities.	Diſtance and bearing from London.	Difference of time from London.
				H. M.
4. *Penſilvania*	12,500	*Philadelphia*	3100 W	4 55 W
5. *New-Jerſey*	10,000	*Elizabeth-Town*	3040 W	4 50 W
6. *New-York*	8,100	*New-York*	3000 W	4 53 W
7. *New England* and *Scotland*	115,000	*Boſton*	2790 W	4 40 W
		Annapolis	2580 W	4 24 W
8. Iſles	42,972	*Kingſton*	4080 W	5 6 W
2. SPANISH empire				
1. *Old Mexico*	571,240	*Mexico*	4800 N W	6 54 W
2. *New Mezico*	300,000	*Sancta Fe*	4320 N W	7 17 W
3. *Florida*	113 000	*St Auguſtine*	3690 W	5 25 W
4. *Terra Firma*	828,000	*Carthagena*	4320 W	5 6 W
5. *Peru*	970,000	*Lima*	5700 S W	5 4 W
6. *Chili*	206,000	*St Jago*	7200 S W	5 6 W
7. *Paragua*	1,150,000	*Aſſumption*	5460 S W	3 52 W
8. Land of *Amazons*	993,600	Unknown		
9. *Magellanica*	325,000	Unknown		
10. *California*	240,000	Unknown		
11. Iſles	143,196	*Havanna*		5 26 W
3. FRENCH empire				
1. *Louiſiana*	516,000	*Port Louis*	4080 N W	6 5 W
2. *Canada* and *New France*	1,059,100	*Quebec*		5 46 W
3. *French iſles*	21,520			
4. DUTCH dominions				
1. *Curaſſow*	342			
2. *Bonair*	168			
5. PORTUGUESE dominions are *Braſil*	940,000	*St Salvador*	2260 S W	4 42 W
6. *Ter de Labrador*	318,750	Unknown		

GEOMETRY.

GEOMETRY originally ſignified no more than the art of meaſuring the earth, or any diſtances or dimenſions within it: but at preſent, it denotes the ſcience of magnitude in general; comprehending the doctrine and relations of whatever is ſuſceptible of augmentation or diminution, conſidered in that light.

Hence to geometry may be referred the conſideration not only of lines, ſurfaces, and ſolids; but alſo of time, velocity, number, weight, *&c.*

This ſcience had its riſe among the Egyptians, who were in a manner compelled to invent it, to remedy the confuſion which generally happened in their lands, from the inundations of the river Nile, which carried away all boundaries, and effaced all the limits of their poſſeſſions. Thus this invention, which at firſt conſiſted only in meaſuring the lands, that every perſon might have what belonged to him, was called Geometry, or the art of meaſuring land; and it is probable that the draughts and ſchemes, which they were annually compelled to make, helped them to diſcover many excellent properties of theſe figures; which ſpeculations continued to be gradually improved, and are ſo to this day.

From Egypt geometry paſſed into Greece; where it continued to receive new improvements in the hands of Thales, Pythagoras, Archimedes, Euclid, *&c.* The Elements of Geometry, written by this laſt in fifteen books, are a moſt convincing proof to what perfection this ſcience was carried among the ancients. However, it muſt be acknowledged, that it fell ſhort of modern geometry; the bounds of which, what by the invention of fluxions, and the diſcovery of the almoſt infinite orders of curves, are greatly enlarged.

We may diſtinguiſh the progreſs of geometry into three ages; the firſt of which was in its meridian glory at the time when Euclid's Elements appeared; the ſecond, beginning with Archimedes, reaches to the time of Des Cartes, who, by applying algebra to the elements of geometry, gave a new turn to this ſcience, which has been carried to its utmoſt perfection by Sir Iſaac Newton and Mr Leibnitz.

Plate XCIII

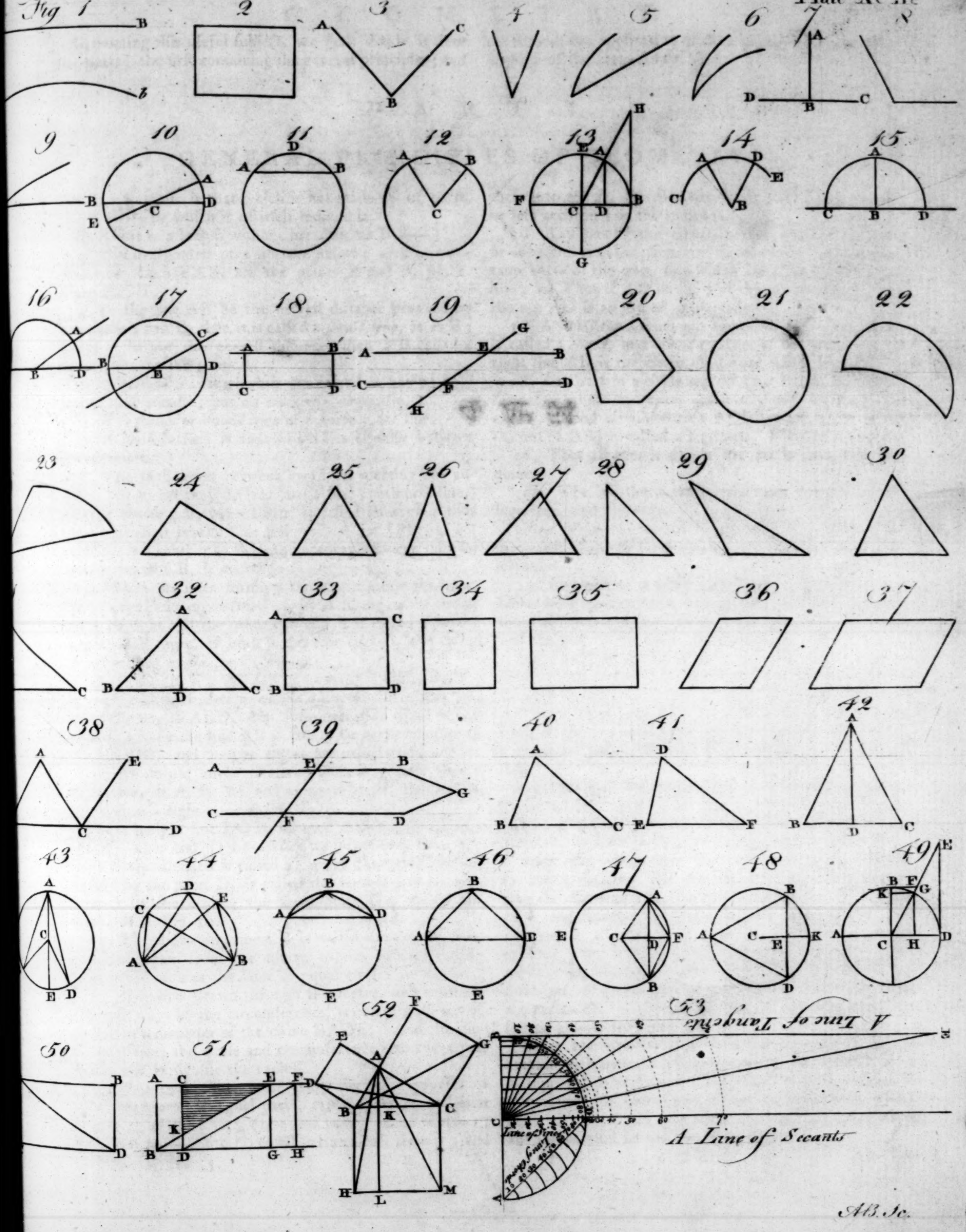


Fig 1 B b
2
3 A B C
4
5
6
7 A D B C
8
9 B
10 A B C D E
11 D A B
12 A B C
13 H E A F C D B G
14 A D C B E
15 A C B D
16 A B D
17 C B E D
18 A B C D
19 G A E B C F D H
20
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29
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32 A B D C
33 A C B D
34
35
36
37
38 A E C D
39 A E B G C F D
40 A B C
41 D E F
42 A B D C
43 A C E D
44 D C E A B
45 B A D E
46 B A D E
47 A E C D F B
48 B A C E K D
49 E B F G K A C H D
50 B D
51 A C E F K B D G H
52 F E A G D B K C H L M
53 A Line of Tangents
A Line of Secants
Line of Sines
Line of Chords
C A E
10 20 30 40 50 60 70

A13. Sc.

4 AP 54

In treating this uſeful ſubject, we ſhall divide it into two parts; the firſt containing the general principles; and the ſecond, the application of theſe principles to the menſuration of ſurfaces, ſolids, *&c.*

PART I.

GENERAL PRINCIPLES OF GEOMETRY.

Art. 1. A point is that which is not made up of parts, or which is of itſelf indiviſible.

2. A line is a length without breadth, as B——

3. The extremities of a line are points; as the extremities of the line AB, are the points A and B, fig. 1. Plate XCIII.

4. If the line AB be the neareſt diſtance between its extremes A and B, then it is called a *ſtrait line*, as A B; but if it be not the neareſt diſtance, then it is called a *curve line*, as AB; fig. 1.

5. A ſurface is that which is conſidered as having only length and breadth, but no thickneſs, as B, fig. 2.

6. The terms or boundaries of a ſurface are lines.

7. A plain ſurface is that which lies equally between its extremes.

8. The inclination between two lines meeting one another (provided they do not make one continued line,) or the opening between them, is called an *angle*; thus the inclination of the line AB to the line CB (fig. 3.) meeting one another at B, or the opening between the two lines AB and CB, is called an angle.

9. When the lines forming the angle are right lines, then it is called a *right-lined angle*, as A, fig. 4. if one of them be right and the other curved, it is called a *mixed angle*, as B, fig 5. if both if them be curved, it is called a *curve-lined angle*, as C, fig. 6.

10. If a right line AB fall upon another DC, (fig. 7.) ſo as to incline neither to one ſide nor to the other; but make the angles ABD, ABC, on each ſide equal to one another; then the line AB is ſaid to be *perpendicular* to the line DC, and the two angles are called *right-angles*.

11. An obtuſe angle is that which is greater than a right one, as A, fig. 8; and an acute angle, that which is leſs than a right one, as B, fig. 9.

12. If a right line DC be faſtened at one of its ends C, and the other end D be carried quite round, then the ſpace comprehended is called a *circle*; the curve line deſcribed by the point D, is called the *periphery* or *circumference* of the circle; the fixed point C is called the *centre* of it. Fig. 10.

13. The deſcribing line CD is called the *radius*, *viz.* any line drawn from the centre to the circumference; whence all radii of the ſame or equal circles are equal.

14. Any line drawn through the centre, and terminated both ways by the circumference, is called a *diameter*, as BD is a diameter of the circle BADE. And the diameter divides the circle and circumference into two equal parts, and is double the radius.

15. The circumference of every circle is ſuppoſed to be divided into 360 equal parts, called *degrees*; and each degree is divided into 60 equal parts, called *minutes*; and each minute into 60 equal parts called, *ſeconds*; and theſe into *thirds*, *fourths*, &c theſe parts being greater or leſs according as the radius is.

16. Any part of the circumference is called an *arch*, or *arc*; and is called an arc of as many degrees as it contains parts of the 360, into which the circumference was divided: Thus if AD be the $\frac{1}{8}$ of the circumference, then the arc AD is an arc of 45 degrees.

17. A line drawn from one end of an arc to the other, is called a *chord*, and is the meaſure of the arc; thus the right line AB is the chord of the arc ADB, fig. 11.

18. Any part of a circle cut off by a chord, is called a *ſegment*; thus the ſpace comprehended between the chord AB and circumference ADB (which is cut off by the chord AB) is called a ſegment. Whence it is plain,

1ſt, That all chords divide the circle into two ſegments.

2dly, The leſs the chord is, the more unequal are the ſegments, and *e contra*.

3dly, When the chord is greateſt, *viz.* when it is a diameter, then the ſegments are equal, *viz.* each a ſemicircle.

19. Any part of a circle (leſs than a ſemicircle) contained between two radii and an arc, is called a *ſector*; thus the ſpace contained between the two radii, AC, BC, and the arc AB, is called the ſector; fig. 12.

20. The right ſine of any arc, is a line drawn perpendicular from one end of the arc, to a diameter drawn through the other end of the ſame arc; thus (fig. 13.) AD is the right ſine of the arc AB, it being a line drawn from A, the one end of the arc AB, perpendicular to CB, a diameter paſſing through B, the other end of the arc AB.

Now the ſines ſtanding on the ſame diameter, ſtill increaſe till they come to the centre, and then becoming the radius, it is plain that the radius EC is the greateſt poſſible ſine, and for that reaſon it is called the *whole ſine*.

Since the whole-ſine EC muſt be perpendicular to the a diameter FB (by def. 20.) therefore producing the diameter EG, the two diameters FB, EG, muſt croſs one another at right angles, and ſo the circumference of the circle muſt be divided by them into four parts EB, BG, GF, and FE, and theſe four parts are equal to one another (by def. 10.) and ſo EB a quadrant, or fourth part of the circumference; therefore the radius EC is always the ſine of the quadrant, or fourth part of the circle EB.

Sines are ſaid to be of ſo many degrees, as the arc contains parts of the 360, into which the circumference is ſuppoſed to be divided; ſo the radius being the ſine of a quadrant, or fourth part of the circumference, which contains 90 degrees (the fourth part of 360), therefore the radius muſt be the ſine of 90 degrees.

21. The part of the radius comprehended between the extremity of the right ſine and the lower end of the arc, *viz.* DB, is called the verſed ſine of the arc AB.

22. If to any point in the circumference, *viz.* B, there be drawn a diameter FCB, and from the point B, perpendicular to that diameter, there be drawn the line BH; that line is called a *tangent* to the circle in the point B; which tangent can touch the circle only in one point B, elſe if it touched it in more, it would go within it, and ſo not be a tangent but a chord, (by art. 17.)

23. The tangent of any arc AB, is a right line drawn perpendicular to a diameter through the one end of the arc B, and terminated by a line CAH, drawn from the centre through the other end A; thus BH is the tangent of the arch AB.

24. And the line which terminates the tangent, *viz.* CH, is called the ſecant of the arc AB.

25. What an arc wants of a quadrant is called the *complement* of that arc; thus AE, being what the arc AB wants of the quadrant EB, is called the complement of the arc AB.

26. And what an arc wants of a ſemicircle is called the *ſupplement* of that arc; thus ſince AF is what the arc AB wants of the ſemicircle BAF, it is the ſupplement of the arc AB.

27. The ſine, tangent, *&c.* of the complement of any arc, is called the *co-ſine, co-tangent, &c.* of that arc; thus the ſine, tangent, *&c.* of the arc AE is called the co-ſine, co-tangent, *&c.* of the arc AB.

28. The ſine of the ſupplement of an arc is the ſame with the ſine of the arc itſelf; for, drawing them according to the definitions, there reſults the ſelf-ſame line.

29. A right-lined angle is meaſured by an arc of a circle deſcribed upon the angular point as a centre, comprehended between the two legs that form the angle; thus (fig. 14.) the angle ABD is meaſured by the arc AD of the circle CADE that is deſcribed upon the point B as a centre; and the angle is ſaid to be of as many degrees as the arc is; ſo if the arc AD be 45 degrees, then the angle ABD is ſaid to be an angle of 45 degrees.

Hence the angles are greater or leſs, according as the arc deſcribed about the angular point and terminated by the two legs contain a greater or a leſs number of degrees.

30. When one line falls perpendicularly on another, as AB on CD, fig. 15. then the angles are right (by the 10th def.); and deſcribing a circle on the centre B, ſince the angles ABC ABD are equal, their meaſures muſt be ſo too, *i. e.* the arcs AC AD muſt be equal; but the whole CAD is a ſemicircle, ſince CD, a line paſſing through the centre B, is a diameter; therefore each of the parts AC AD is a quadrant, *i. e.* 90 degrees; ſo the meaſure of a right angle is always 90 degrees.

31. If one line AB fall any way upon another, CD, then the ſum of the two angles ABC ABD is always equal to the ſum of two right angles; fig. 16. For on the point B, deſcribing the circle CAD, it is plain, that CAD is a ſemicircle (by the 14th); but CAD is equal to CA and AD the meaſure of the two angles; therefore the ſum of the two angles is equal to a ſemicircle, that is, to two right angles, (by the laſt).

Cor. 1. From whence it is plain, that all the angles which can be made from a point in any line, towards one ſide of the line, are equal to two right angles.

2. And that all the angles which can be made about a point, are equal to four right ones.

32. If one line AC croſs another BD in the point E, then the oppoſite angles are equal, *viz.* BEA to CED, and BEC equal to AED; fig. 17. For upon the point E, as a centre, deſcribing the circle ABCD, it is plain ABC is a ſemicircle, as alſo BCD (by the 14th); therefore the arc ABC is equal to the arc BCE; and from both taking the common arc BC, there will remain AB equal to CD, *i. e.* the Angle BEA equal to the angle CED (by art. 29.). After the ſame manner we may prove, that the angle BEC is equal to the angle AED.

33. Lines which are equally diſtant from one another, are called *parallel lines*; as AB, CD, fig. 18.

34. If a line GH croſs two parallels AB, CD, (fig. 19.) then the external oppoſite angles are equal, *viz.* GEB equal to CFH and AEG equal to HFD. For ſince AB and CD are parallel to one another, they may be conſidered as one broad line, and GH croſſing it; then the vertical or oppoſite angles GEB CFG are equal (by art. 32.), as alſo AEG and HFD by the ſame.

35. If a line GH croſs two parallels AB CD, then the alternate angles, *viz.* AEF and EFD, or CFE and FEB, are equal; that is, the angle AEF is equal to the angle EFD, and the angle CFE is equal to the angle FEB, for GEB is equal to AEF (by art. 32.), and CFH is equal to EFD (by the ſame); but GEB is equal to CFH (by the laſt); therefore AEF, is equal to EFD. The ſame way we may prove FEB equal to EFC.

36. If a line GH croſs two parallel lines AB, CD, then the external angle GEB is equal to the internal oppoſite one EFD, or GEA equal to CFE. For the angle AEF is equal to the angle EFD (by the laſt); but AEF is equal to GEB (by art. 32.), therefore GEB is equal to EFD. The ſame way we may prove AEG equal to CFE.

37. If a line GH croſs two parallel lines AB CD, then the ſum of the two internal angles, *viz.* BEF and DFE, or AEF and CFE, are equal to two right angles; for ſince the angle GEB is equal to the angle EFD (by art. 36.), to both add the angle FEB, then GEB and BEF are equal to BEF and DFE; but GEB and BEF are equal to two right angles (by art. 31.) therefore BEF and DFE are alſo equal to two right angles. The ſame way we may prove that AEF and CFE are equal to two right angles.

39. A figure is any part of ſpace bounded by lines or a line. If the bounding lines be ſtrait, it is called a *rectilineal figure*, as A, fig. 20. if they be curved, it is called a *curvineal figure*, as B or C, fig. 21. and fig. 22. if they be partly curve lines and partly ſtrait, it is called a *mixt figure*, as D, fig. 23.

35. The moſt ſimple rectilinear figure is that which is bounded by three right lines, and is called a *triangle*, as A, fig. 24.

40. Triangles are divided into different kinds, both with reſpect to their ſides and angles: with reſpect to their ſides they are commonly divided into three kinds, *viz.*

41. A triangle having all its three ſides equal to one another, is called an *equilateral triangle*, as A, fig. 25.

42. A triangle having two of its ſides equal to one another, and the third ſide not equal to either of them, is called an *Iſoſceles triangle*, as B, fig. 26.

43. A triangle having none of its ſides equal to one another, is called a *ſcalene triangle*, as C, fig. 27.

44. Triangles, with reſpect to their angles, are divided into three different kinds, *viz.*

45. A triangle having one of its angles right, is called a *right-angled triangle*, as A, fig. 28.

46. A triangle having one of its angles obtuſe, or greater than a right angle, is called an *obtuſe-angled triangle*, as B, fig. 29.

47. Laſtly, a triangle having all its angles acute, is called an *acute-angled triangle*, as C, fig. 30.

48. In all right-angled triangles, the ſides comprehending the right angle are called the legs, and the ſide oppoſite to the right angle is called the *hypothenuſe*. Thus in the right-angled triangle ABC, fig. 31. (the right angle being at B) the two ſides AB and BC, which comprehend the right angle ABC, are the legs of the triangle; and the ſide AC, which is oppoſite to the right angle ABC, is the hypothenuſe of the right-angled triangle ABC.

49. Both obtuſe and acute angled triangles are in general called *oblique-angled triangles*; in all which any ſide is called the *baſe*, and the other two the *ſides*.

50. The perpendicular height of any triangle is a line drawn from the vertex to the baſe perpendicularly; thus if the triangle ABC (fig. 32.) be propoſed, and BC be made its baſe, then A will be the vertex, *viz.* the angle oppoſite to the baſe; and if from A you draw the line AD perpendicular to BC, then the line AD is the height of the triangle ABC ſtanding on BC as its baſe.

Hence all triangles ſtanding between the ſame parallels have the ſame height, ſince all the perpendiculars are equal by the nature of parallels.

51. A figure bounded by four ſides is called a *quadrilateral* or *quadrangular figure*, as ABDC, fig. 33.

52. Quadrilateral figures whoſe oppoſite ſides are parallel, are called *parallelograms*. Thus in the quadrilateral figure ABDC, if the ſide AC be parallel to the ſide BD which is oppoſite to it, and AB be parallel to CD, then the figure ABDC is called a parallelogram.

53. A parallelogram having all its ſides equal and angles right, is called a *ſquare*, as A, fig. 34.

54. That which hath only the oppoſite ſides equal and its angles right, is called a *rectangle*, as B, fig. 35.

55. That which hath equal ſides but oblique angles, is called a *rhombus*, as C, fig. 36. and is juſt an inclined ſquare.

56. That which hath only the oppoſite ſides equal and the angles oblique, is called a *rhomboides*, as D, fig. 37. and may be conceived as an inclined rectangle.

57. When none of the ſides are parallel to another, then the quadrilateral figure is called a *trapezium*.

58. Every other right lined figure, that has more ſides than four, is in general called a *polygon*. And figures are called by particular names according to the number of their ſides, *viz.* one of five ſides is called a *pentagon*, of ſix a *hexagon*, of ſeven a *heptagon*, and ſo on. When the ſides forming the polygon are equal to one another, the figure is called a regular figure or polygon.

59. *In any triangle* ABC (fig. 38.) *one of its legs, as* BC, *being produced towards* D, *the external angle* ACD *is equal to both the internal oppoſite ones taken together*, viz. *to* ABC *and* BAC. In order to prove this, through C draw CE parallel to AB; then ſince CE is parallel to AB, and the lines AC and BD croſſeth them, the angle ECD is equal to ABC (by art. 36.) and the angle ACE equal to CAB (by art. 35.); therefore the angles ECD and ECA are equal to the angles ABC and CAB; but the angles ECD and ECA are together equal to the angle ACD; therefore the angle ACD is equal to both the angles ABC and CAB taken together.

Cor. Hence it may be proved, that if two lines AB and CD (fig. 39.) be croſſed by a third line EF, and the alternate angles AEF and EFD be equal, the lines AB and CD will be parallel; for if they are not parallel, they muſt meet one another on one ſide of the line EF (ſuppoſe at G) and ſo form the triangle EFG, one of whoſe ſides GE being produced to A, the exterior angle AEF muſt (by this article) be equal to the ſum of the two angles EFG and EGF; but, by ſuppoſition, it is equal to the angle EFG alone; therefore the angle AEF muſt be equal to the ſum of the two angles EFG and EGF, and at the ſame time equal to the angle EFG alone, which is abſurd; ſo the lines AB and CD cannot meet, and therefore muſt be parallel.

60. *In any triangle* ABC, *all the three angles taken together are equal to two right angles.* To prove this, you muſt produce BC, one of its legs, to any diſtance, ſuppoſe to D; then by the laſt propoſition, the external angle, ACD, is equal to the ſum of the two internal oppoſite ones CAB and ABC; to both add the angle ACB, then the ſum of the angles ACD and ACB will be equal to the ſum of the angles CAB and CBA and ACB. But the ſum of the angles ACD and ACB, is equal to two right ones (by art. 32.), therefore the ſum of the three angles CAB and CBA and ACB, is equal to two right angles; that is, the ſum of the three angles of any triangle ACB is equal to two right angles.

Cor. 1. Hence in any triangle given, if one of its angles be known, the ſum of the other two is alſo known: for ſince (by the laſt) the ſum of all the three is equal to two right angles, or a ſemicircle, it is plain, that taking any one of them from a ſemicircle or 180 degrees, the remainder will be the ſum of the other two. Thus (in the former triangle ABC) if the angle ABC be 40 degrees, by taking 40 from 180 we have 140 degrees; which is the ſum of the two angles BAC, ACB: the converſe of this is alſo plain, *viz.* the ſum of any two angles of a triangle being given, the other angle is alſo known by taking that ſum from 180 degrees.

2. In any right-angled triangle, the two acute angles muſt juſt make up a right one between them; conſequently, any one of the oblique angles being given, we may find the other by ſubtracting the given one from 90 degrees, which is the ſum of both.

61. If in any two triangles, ABC (fig. 40.) DEF (fig. 41.) two legs of the one, *viz.* AB and AC, be equal to

two legs in the other, *viz.* to DE and DF, each to each reſpectively, *i. e.* AB to DE, and AC to DF; and if the angles included between the equal legs be equal, *viz.* the angle BAC equal to the angle EDF; then the remaining leg of the one ſhall be equal to the remaining leg of the other, *viz.* BC to EF; and the angles oppoſite to equal legs ſhall be equal, *viz.* ABC equal to DEF (being oppoſite to the equal legs AC and DF), alſo ACB equal to DFE (which are oppoſite to the equal legs AB and DE). For if the triangle ABC be ſuppoſed to be lifted up and put upon the triangle DEF, and the point A on the point D; it is plain, ſince BA and DE are of equal length, the point E will fall upon the point B; and ſince the angles BAC EDF are equal, the line AC will fall upon the line DF; and they being of equal length, the point C will fall upon the point F; and ſo the line BC will exactly agree with the line EF, and the triangle ABC will in all reſpects be exactly equal to the triangle DEF; and the angle ABC will be equal to the angle DEF, alſo the angle ACB will be equal to the angle DFE.

Cor. 1. After the ſame manner it may be proved, that if in any two triangles ABC, DEF, (ſee the preceding figure) two angles ABC and ACB of the one, be equal to two angles DEF and EFE of the other, each to each reſpectively, *viz.* the angle ABC to the angle DEF, and the angle ACB equal to the angle DFE, and the ſides included between theſe angles be alſo equal, *viz.* BC equal to EF, then the remaining angles and the ſides oppoſite to the equal angles, will alſo be equal each to each reſpectively; *viz.* the angle BAC equal to the angle BDF, the ſide AB equal to DE, and AC equal to DF: for if the triangle ABC be ſuppoſed to be lifted up and laid upon the triangle DEF, the point B being put upon the point E, and the line BC upon the line EF, ſince BC and EF are of equal lengths, the point C will fall upon the point F, and ſince the angle ACB is equal to the angle DFE, the line CA will fall upon the line FD, and by the ſame way of reaſoning the line BA will fall upon the line ED; and therefore the point of interſection of the two lines BA and CA, *viz.* A, will fall upon the point of interſection of the two lines BD and FD, *viz.* D, and conſequently BA will be equal to DE, and AC equal to DF, and the angle BAC equal to the angle EDF.

Cor. 2. It follows likewiſe from this article, that if any triangle ABC (fig. 42.) has two of its ſides AB and AC equal to one another, the angles oppoſite to theſe ſides will alſo be equal, *viz.* the angles ABC equal to the angle ACB. For ſuppoſe the line AD, biſecting the angle BAC, or dividing it into two equal angles BAD and CAD, and meeting BC in D, then the line AD will divide the whole triangle BAC into two triangles ABD and DAC; in which BA and AD two ſides of the one, are equal to CA and AD two ſides of the other, each to each reſpectively, and the included angles BAD and DAC are by ſuppoſition equal; therefore (by this article) the angle ABC muſt be equal to the angle ACB.

62. *Any angle, as* BAD (fig. 43.) *at the circumference of a circle* BADE, *is but half the angle* BCD *at the centre ſtanding on the ſame arch* BED. To demonſtrate this, draw through A and the centre C, the right line ACE, then the angle ECD is equal to both the angles DAC and ADG (by art. 59.); but ſince AC and CD are equal (being two radii of the ſame circle) the angles ſubtended by them muſt be equal alſo, (by *art.* 62. *cor.* 2.) *i. e.* the angle CAD equal to the angle CDA; therefore the ſum of them is double any one of them, *i. e.* DAC and ADC is double of CAD, and therefore ECD is alſo double of DAC: the ſame way it may be proved, that ECB is double of CAB; and therefore the angle BCD is double of the angle BAD, or BAD the half of BCD, which was to be proved.

Cor. 1. Hence an angle at the circumference is meaſured by half the arc it ſubtends; for the angle at the centre (ſtanding on the ſame arc) is meaſured by the whole arc (by art. 29.); but ſince the angle at the centre is double that at the circumference, it is plain the angle at the circumference muſt be meaſured by only half the arc it ſtands upon.

Cor. 2. Hence all angles, ACB, ADB, AEB, *&c.* (fig. 44.) at the circumference of a circle, ſtanding on the ſame chord AB, are equal to one another; for by the laſt corollary they are all meaſured by the ſame arc, *viz.* half the arc AB which each of them ſubtends.

Cor. 3. Hence an angle in a ſegment greater than a ſemicircle is leſs than a right angle: thus, if ADB be a ſegment greater than a ſemicircle, (ſee the laſt figure) than the arc AB, on which it ſtands, muſt be leſs than a ſemicircle, and the half of it leſs than a quadrant or a right angle; but the angle ADB in the ſegment is meaſured by the half of AB, therefore it is leſs than a right angle.

Cor. 4. An angle in a ſemicircle is a right angle. For ſince ABD (fig. 45.) is a ſemicircle, the arc AED muſt alſo be a ſemicircle: but the angle ABD is meaſured by half the arc AED, that is, by half a ſemicircle or quadrant; therefore the angle ABD is a right one.

Cor. 5. Hence an angle in a ſegment leſs than a ſemicircle, as ABD, (fig. 46.) is greater than a right angle: for ſince the arc ABD is leſs than a ſemicircle, the arc AED muſt be greater than a ſemicircle, and ſo it is half greater than a quadrant, *i. e.* than the meaſure of a right angle; therefore the angle ABD, which is meaſured by half the arc AED, is greater than a right angle.

63. *If from the centre* C *of the circle* ABE, (fig. 47.) *there be let fall the perpendicular* CD *on the chord* AB, *then that perpendicular will biſect the chord* AB *in the point* D. To demonſtrate this, draw from the centre to the extremities of the chord the two lines CA, CB; then ſince the lines CA and CB are equal, the angles CAB, CBA, which they ſubtend muſt be equal alſo, (by *art.* 62. *cor.* 2.) but the perpendicular CD divides the triangle ACB into two right-angled triangles ACD and CDB, in which the ſum of the angles ACD and CAD in the one, is equal to the ſum of the angles DCB and CBD in the other, each being equal to a right angle, (by *cor.* 2. of *art.* 61.) but CAD is equal to CBD, therefore ACD is equal to BCD. So in the two triangles ACD and BCD, the two legs AC and CD in the one, are equal to the two legs BC and CD in the other, each to each reſpectively, and the included angles ACD and BCD are equal; therefore the remaining legs AD and BD are equal (by art. 61.) and conſequently AB biſected in D.

64. If from the centre C of a circle ABE, there be drawn a perpendicular CD on the chord AB, and produced till it meet the circle in F, then the line CF biſects the arch AB in the point F; for (ſee the foregoing figure) joining the points A and F, F and B by the ſtreight lines AF, FB, then in the triangles ADF, BDF, AD is equal to DB (by art. 63.) and DF common to both; therefore AD and DF, two legs of the triangle ADF, are equal to BD and DF, two legs of the triangle BDF, and the included angles ADF BDF are equal, being both right; therefore (by art. 61.) the remaining legs AF and FB are equal; but in the ſame circle equal lines are chords of equal arches, therefore the arches AF and FB are equal. So the whole arch AFB is biſected in the point F by the line CF.

Cor. 1. From art. 63. it follows, that any line biſecting a chord at right angles is a diameter; for ſince (by art. 63.) a line draw from the centre perpendicular to a chord, biſects that chord at right angles; therefore, converſly, a line biſecting a chord at right angles, muſt paſs thro' the centre, and conſequently be a diameter

Cor. 2. From the two laſt articles it follows, that the ſine of any arc is the half of the chord of twice the arc; for (ſee the foregoing ſcheme) AD is the ſine of the arc AF, by the definition of a ſine, and AF is half the arc AFB, and AD half the chord AB (by art. 63.); therefore the *cor.* is plain.

65. In any triangle, the half of each ſide is the ſine of the oppoſite angle; for if a circle be ſuppoſed to be drawn through the three angular points A, B, and D of the triangle ABD, fig. 48. then the angle DAB is meaſured by half the arch BKD (by *cor.* 1. of *art.* 62.) but the half of BD, *viz.* BE, is the ſine of half the arch BKD, *viz* the ſine of BK (by *cor.* 2. of the laſt) which is the meaſure of the angle BAD; therefore the half of BD is the ſine of the angle BAD; the ſame way it may be proved, that the half of AD is the ſine of the angle ABD, and the half of AB is the ſine of the angle ADB.

66. The ſine, tangent, *&c.* of any arch is called alſo the ſine, tangent, *&c.* of the angle whoſe meaſure the arc is: thus becauſe the arc GD (fig. 49.) is the meaſure of the angle GCD; and ſince GH is the ſine, DE the tangent, HD the verſed ſine, CE the ſecant, alſo GK the co-ſine, BF the co-tangent, and CF the co-ſecant, *&c.* of the arch GD; then GH is called the ſine, DE the tangent, *&c.* of the angle GCD, whoſe meaſure is the arch GD.

67. *If two equal and parallel lines,* AB *and* CD (fig. 50.) *be joined by two others,* AC *and* BD; *then theſe ſhall alſo be equal and parallel.* To demonſtrate this, join the two oppoſite angles A and D with the line AD; then it is plain this line AD divides the quadrilateral, ACDB, into two triangles, *viz.* ABD, ACD, in which AB a leg of the one, is equal to DC a leg of the other, by ſuppoſition, and AD is common to both triangles; and ſince AB is parallel to CD, the angle BAD will be equal to the angle ADC, (by art. 36.) therefore in the two triangles BA and AD; and the angle BAD is equal to CD and DA; and the angle ADC, that is, two legs and the included angle in the one, is equal to two legs and the included angle in the other; therefore (by art. 61) BD is equal to AC, and ſince the angle DAC is equal to the angle ADB, therefore the lines BD AC are parallel (by *cor. art.* 59.)

Cor. 1. Hence it is plain, that the quadrilateral ABDC is a parallelogram, ſince the oppoſite ſides are parallel.

Cor. 2. In any parallelogram the line joining the oppoſite angles (called the diagonal) as AD, divides the figure into two equal parts, ſince it has been proved that the triangles ABD ACD are equal to one another.

Cor. 3. It follows alſo, that a triangle ACD on the ſame baſe CD, and between the ſame parallels with a parallelogram ABDC, is the half of that parallelogram.

Cor. 4. Hence it is plain, that the oppoſite ſides of a parallelogram are equal; for it has been proved, that ABDC being a parallelogram, AB will be equal to CD, and AC equal to BD.

68. All parallelograms on the ſame or equal baſes, and between the ſame parallels, are equal to one another; that is, if BD and GH (fig. 51.) be equal, and the lines BH and AF be parallel, then the parallelograms ABDC, BDFE, and EFHG, are equal to one another. For AC is equal to EF, each being equal to BD, (by *cor.* 4. of 67.) To both add CE, then AE will be equal CF. So in the two triangles ABE CDF, AB a leg of the one, is equal to CD a leg in the other; and AE is equal to CF, and the angle BAE is equal to the angle DCF (by art. 36.); therefore the two triangles ABE CDF are equal (by art. 61.); and taking the triangle CKE from both, the figure ABKC will be equal to the figure KDFE; to both which add the little triangleKBD, then the parallelogram ABDC will be equal to the parallelogram BDFE. The ſame way it may be proved, that the parallelogram EFHG is equal to the parallelogram EFDB; ſo the three parallelograms ABDC, BDFE, and EFHG will be equal to one another.

Cor. Hence it is plain, that triangles on the ſame baſe, and between the ſame parallels, are equal; ſince they are the half of the parallelograms on the ſame baſe and between the ſame parallels. (by *cor.* 3. of laſt *art.*)

69. *In any right-angled triangle,* ABC, (fig. 52.) *the ſquare of the hypothenuſe* BC, *viz.* BCMH, *is equal to the ſum of the ſquares made on the two ſides* AB *and* AC, viz. *to* ABDE *and* ACGF. To demonſtrate this, through the point A draw AKL perpendicular to the hypothenuſe BC, join AH, AM, DC, and BG; then it is plain that DB is equal to BA (by art. 53.), alſo BH is equal to BC (by the ſame); ſo in the two triangles DBC ABH, the two legs DB and BC in the one are equal to the two legs AB and BH in the other; and the included angles DBC and ABH are alſo equal; (for DBA is equal to CBH, being both right; to each add ABC, then it is plain that DBC is equal to ABH) therefore the triangles DBC ABH are equal (by art. 61.) but the triangle DBC is half of the ſquare ABDE (by *cor.* 3. of 67th) and the triangle ABH is half the parallelogram BKLH (by the ſame), therefore half the ſquare ABDE is equal to half the parallelogram BKL. Conſequently the ſquare ABDE is equal to the parallelogram BKLH. The ſame way it may be proved, that the ſquare ACGF is equal to the parallelogram KCML. So the ſum of the ſquares ABDE and ACGF is equal the ſum of the parallelograms BKLH and KCML, but the ſum of theſe parallelograms is equal to the ſquare BCMH, therefore the

ſum of the ſquares on AB and AC is equal to the ſquare on BC.

Cor. 1. Hence in a right-angled triangle, the hypothenuſe and one of the legs being given, we may eaſily find the other, by taking the ſquare of the given leg from the ſquare of the hypothenuſe, and the ſquare root of the remainder will be the leg required.

Cor. 2. Hence, the legs in a right-angled triangle being given, we may find the hypothenuſe, by taking the ſum of the ſquares of the given legs, and extracting the ſquare root of that ſum.

70. If upon the line AB (fig. 53.) there be drawn a ſemicircle ADB, whoſe centre is C, and on the point C there be raiſed a perpendicular to the line AB, *viz.* CD; then it is plain the arc DB is a quadrant, or contains 90 degrees; ſuppoſe the arc DB to be divided into 9 equal arcs, each of which will contain 10 degrees, then on the point B raiſing BE perpendicular to the line AB, it will be a tangent to the circle in the point B, and if to every one of the diviſions of the quadrant, *viz.* B 10, B 20, B 30, B 40, *&c.* you draw the ſine, tangent, *&c.* (as in the ſcheme) we ſhall have the ſine, tangent, *&c.* to every ten degrees in the quadrant: and the ſame way we may have the ſine, tangent, *&c.* to every ſingle degree in the quadrant, by dividing it into 90 equal parts beginning from B, and drawing the ſine, tangent, *&c.* to all the arcs beginning at the ſame point B. By this method they draw the lines of ſines, tangents, *&c.* of a certain circle on the ſcale; for after drawing them on the circle, they take the length of them, and ſet them off in the lines drawn for that purpoſe. The ſame way, by ſuppoſing the radius of any number of equal parts, (ſuppoſe 1000, or 10,000, *&c.*) it is plain the ſine, tangent, *&c.* of every arc muſt conſiſt of ſome number of theſe equal parts; and by computing them in parts of the radius, we have tables of ſines, tangents, *&c.* to every arc in the quadrant, called natural ſines, tangents, *&c.* and the logarithms of theſe give us tables of logarithmic ſines, tangents, *&c.* See LOGARITHMS.

71. In any triangle, ABC, (Plate XCIV. fig. 1.) if one of its ſides, as AC, be biſected in E, (and conſequently AC double of AE) and thtough E be drawn ED, parallel to BC, and meeting AB in D, then BC will be double of ED, and AB double of AD, through D draw DF, parallel to AC, meeting BC in F: for ſince, by conſtruction, DF is parallel to AC, and DE parallel to BC; therefore, (by art. 36.) the angle BFD will be equal tu the angle BCA, (and by the ſame article) the angle BCA will be equal to the angle DEA, conſequently the angle BFD will be equal to the angle DEA; alſo, (by art. 36.) the angle BDF will be equal to the angle DAE; and ſince DF is parallel to EC, and DB parallel to FC, the quadrilateral DFCE will be a parallelogram; and therefore, (by art. 59. cor. 4.) DF will be equal to EC, which, by conſtruction, is equal to AE; ſo in the two triangles BDF DAE, the two angles BFD and BDF in the one, are equal to the two angles DBA and DAE in the other, each to each reſpectively; and the included ſide DF, is equal to the included ſide AE; therefore, (by art. 61. cor. 1.) AD will be equal to DB, and conſequently AB double of AD; alſo (by the ſame) DE will be equal to BF; but DE is alſo (by art 67. cor. 4.) equal to FC; therefore BF and EC together, or BC, will be double of DE.

After the ſame manner it may be proved, that if in the triangle AKG, (fig. 2.) AE be taken equal to a third part of AK, and through E be drawn ED, parallel to KG, and meeting AG in D; then ED will be equal to a third part of GK, and AD equal to a third part of AG.

Likewiſe, if in any triangle ABC, (fig. 3.) upon the ſide AB, be taken AE, equal to one fourth, one fifth, one ſixth, *&c.* of AB, and through E be drawn ED parallel to BC and meeting AC in D; then DE will be one fourth, one fifth, one ſixth, *&c.* of BC, and AD the like part of AC; and, in general, if in any triangle ABC, there be aſſumed a point E on one of its ſides AB, and through that point be drawn a line ED, parallel to one of it ſides BC, and meeting the other ſide AC in D; then whatever part AE is of AB, the ſame part will ED be of BC, and AD of AC.

Cor. Hence it follows, that if in any triangle ABC, there be drawn ED, parallel to one of its ſides BC, and meeting the other two in the points E and D, then AE : AB :: ED : BC :: AD : AC; that is, AE is to AB, as ED is to BC, and that as AD to AC.

72. If any two triangles ABC, fig 4. abc, fig. 5. are ſimilar, or have all the angles of the one equal to all the angles of the other, each to each reſpectively; that is, the the angle CAB equal to the angle cab, and the angle ABC equal to the angle abc, and the angle ACB equal to the angle acb; then the legs oppoſite to the equal angles are proportioned, *viz.* AB : ab :: AC : ac :: and and AB : ab :: BC : bc :: and AC : ac :: BC : bc. On AB of the largeſt triangle ſet off AE equal to ab, and through E draw ED parallel to BC, meeting AC in D; then ſince DE and BC are parallel, and AB croſſing them, the angle AED will (by art. 36.) be equal to the angle ABC, which (by ſuppoſition) is equal to the angle abc, alſo the angle DAE is (by ſuppoſition) equal to the angle cab; ſo in the two triangles AED, abc, the two angles DAE AED of the one, are equal to two angles cab abc of the other, each to each reſpectively, and the included ſide AE is (by conſtruction) equal to the included ſide ab; therefore, (by art. 61. cor. 1.) AD is equal to ac, and DE equal to cb; but ſince, in the triangle ABC, there is drawn DE parallel to BC one of its ſides, and meeting the two other ſides in the points D and E, therefore (by cor. art. 71.) AB : AE :: AC : AD, and AB : AE :: BC : DE, and AC : AD :: BC : DE; and in the three laſt proportions, inſtead of the lines AE, DE, and AD, putting in their equals ab, bc, and ac, we ſhall have AB : ab :: AC : ac, and AB : ab :: BC : bc, and laſtly, AC : ac :: BC : bc.

73. The chord, ſine, tangent, *&c.* of any arc in one circle, is to the chord, ſine, tangent, *&c.* of the ſame arc in another, as the radius of the one is to the radius of the other, fig. 6, 6. Let ABD abd be two circles, BD bd two arcs of theſe circles, equal to one another, or conſiſting of the ſame number of degrees; FD fd the tangents, BD bd the chords, BE be the ſines, *&c.*

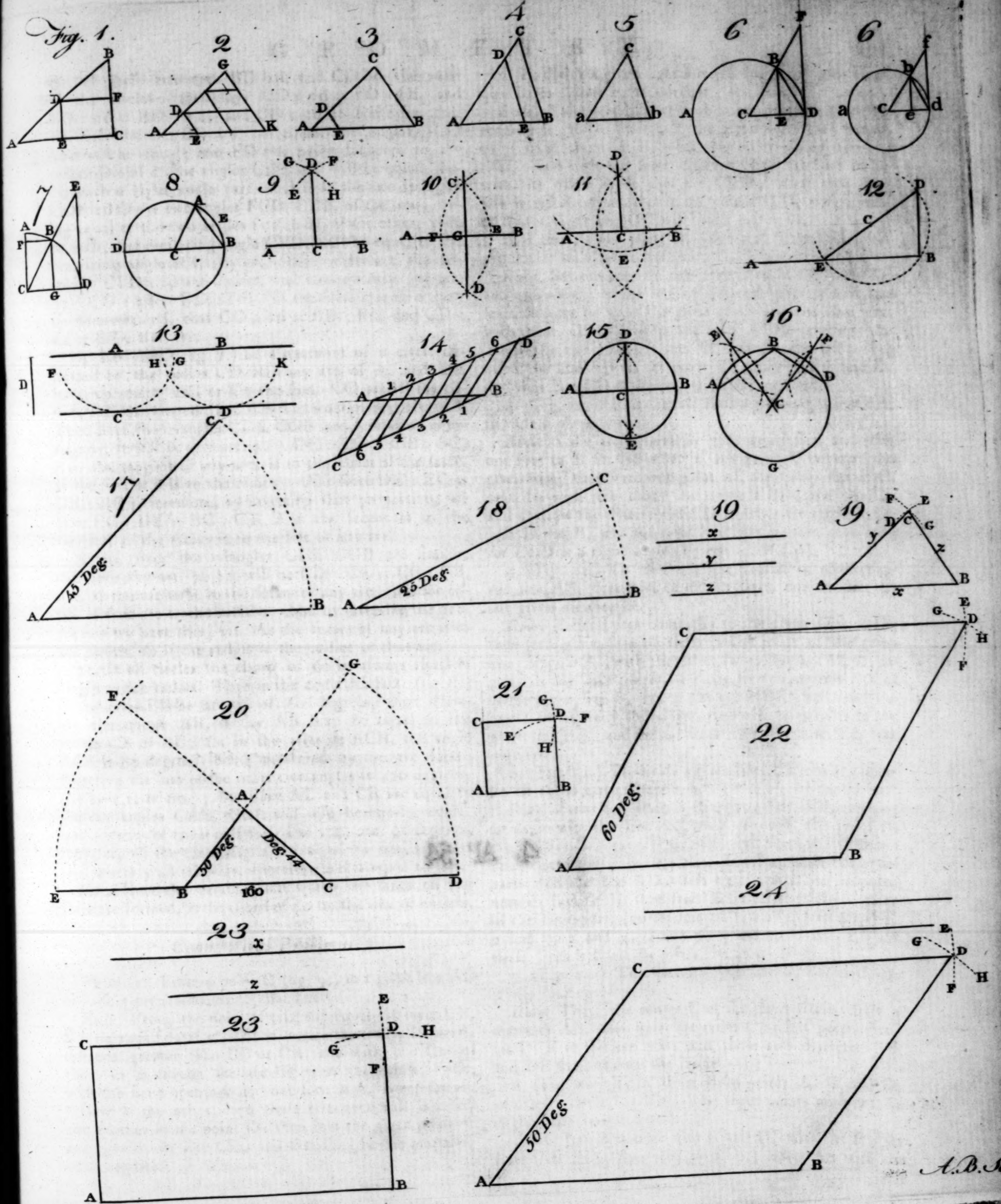
Fig. 1.
A
B
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E
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2
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B
D
K
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C
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C
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E
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17
45 Deg.
A
B
C
18
C
95 Deg.
A
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19
x
y
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E
D
C
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y
z
A
x
B
20
F
G
A
30 Deg.
Deg. 44
E
B
100
C
D
21
C
G
D
F
E
H
A
B
22
E
G
D
H
C
F
60 Deg.
A
B
23
x
z
23
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C
D
H
G
F
A
B
24
E
G
D
C
H
F
50 Deg.
A
B

A. B. Sc.

4 AP 54

&c. of theſe two arcs BD bd, and CD cd the radii of the circles; then ſay, CD : cd :: FD : fd, and CD : cd :: BD : bd, and CD : cd :: BE : be, *&c.* For ſince the arcs BD bd are equal, the angles BCD bcd will be equal; and FD fd, being tangents to the points D and d, the angles CDF cdf will be equal, being each a right angle (art. 22.) ſo in the two triangles CDF cdf, the two angles FCD CDF of the one, being equal to the two angles fcd cdf of the other, each to each, the remaining angle CFD, will be equal to the remaining angle cfd, (by art. 60.); therefore the triangles CFD cfd are ſimilar, and conſequently (by art. 73) CD : cd :: FD : fd. In the ſame manner it may be demonſtrated, that CD : cd :: BD : bd, and CD : cd :: BE : be, *&c.*

74. Let ABD (fig. 7.) be a quadrant of a circle deſcribed by the radius CD BD any arc of it, and BA its complement, BG or CF the ſine, CG or BF the coſine, DE the tangent, and CE the ſecant of that arc BD. Then ſince the triangles CDE CGB are ſimilar or equiangular, it will be (by art. 72.) DE : EC :: GB : BC, *i. e.* the tangent of any arc, is to the ſecant of the ſame, as the ſine of it is to the radius. Alſo ſince DE : EC :: GB : BC; therefore, by inverting that proportion, we have EC : DE :: BC : GB, *i e.* the ſecant is to the tangent, as the radius is to the ſine of any arc.

Again, ſince the triangles CDE CGB are ſimilar, therefore (by art. 72.) it will be CD : CE :: CG : CB, *i. e.* as the radius is to the ſecant of any arc, ſo is the coſine of that arc to the radius. And by inverting the proportion we have this, *viz.* As the ſecant of any arc is to the radius, ſo is the radius to the coſine of that arc.

75. In all circles the chord of 60 is always equal in length to the radius. Thus in the circle AEBD, (fig. 8.) if the arc AEB be an arc of 60 degrees, then drawing the chord AB, I ſay AB ſhall be equal to the radius CB or AC; for in the triangle ACB, the angle ACB is 60 degrees, being meaſured by the arc AEB; therefore the ſum of the other two angles is 120 degrees, (by *cor.* 1. of 60.); but ſince AC and CB are equal to the two angles CAB, CBA will alſo be equal; conſequently each of them half their ſum 120, *viz.* 60 degrees; therefore all the three angles are equal to one another, conſequently all the legs, therefore AB is equal to CB.

Cor. Hence the radius from which the lines on any ſcale are formed, is the chord of 60 on the line of chords.

Geometrical Problems.

PROB. 1. From a point C (fig. 9.) in a given line AB to raiſe a perpendicular to that line.

Rule. From the point C take the equal diſtances CB, CA on each ſide of it. Then ſtretch the compaſſes to any diſtance greater than CB or CA, and with one foot of them in B, ſweep the arc EF with the other; again, with the ſame opening, and one foot in A, ſweep the arc GH with the other, and theſe two arcs will interſect one another in the point D; then join the given points C and D with the line CD, and that ſhall be the perpendicular required.

2. To divide a given right line AB (fig. 10.) into two equal parts; that is, to biſect it.

Rule. Take any diſtance with your compaſſes that you are ſure is greater than half the given line; then ſetting one foot of them in B, with the other ſweep the arc DFC; and with the ſame diſtance, and one foot in A, with the other ſweep the arc CED; theſe two arcs will interſect one another in the points C D, which joined by the right line DC will biſect AB in G.

3. From a given point D, (fig. 11.) to let fall a perpendicular on a given line AB.

Rule. Set one foot of the compaſſes in the point D, and extend the other to any diſtance greater than the leaſt diſtance between the given point and the line, and with that extent ſweep the arc AEB, cutting the line in the two points A and B, then (by the laſt prob.) biſect the line AB in the point C, laſtly join C and D, and that line CD is the perpendicular required.

4. (Fig. 12.) Upon the end B of a given right line BA, to raiſe a perpendicular.

Rule. Take any extent in your compaſſes, and with one foot in B fix the other in any point C without the given line; then with one point of the compaſſes in C, deſcribe with the other the circle EBD, and thro' E and C draw the diameter ECD meeting the circle in D; join D and B, and the right line DB is that required; for EBD is a right angle (by *cor.* 4. of 63.).

5. (Fig. 13.) To draw one line parallel to another given line AB, that ſhall be diſtant from one another by any given diſtance D.

Rule. Extend your compaſſes to the given diſtance D; then ſetting one foot of them in any point of the given line (ſuppoſe A), with the other ſweep the arc FCG; again, at the ſame extent, and one foot in any other point of the given line B, ſweep the arc HDK, and draw the line CD touching them, and that will be parallel to the given line AB, and diſtant from it by the line D as was required.

6. (Fig. 14.) To divide a given line AB into any number of equal parts, ſuppoſe 7.

Rule. From the point A draw any line AD, making an angle with the line AB, then through the point B, draw a line BC parallel to AD; and from A, with any ſmall opening of the compaſſes, ſet off a number of equal parts (on the line AD,) leſs by one than the propoſed number (here 6.); then from B ſet off the ſame number of the ſame parts (on the line BC); laſtly, join 6 and 1, 2 and 5, 3 and 4, 4 and 3, 5 and 2, 6 and 1, and theſe lines will cut the given line as required.

7. (Fig. 15.) To quarter a given circle, or to divide it into four equal parts.

Rule. Thro' the centre C of the given circle, draw a diameter AB, then upon the point C raiſe a perpendicular DCE to the line AB; and theſe two diameters AB and DE ſhall quarter the circle.

8 (Fig. 16.) Thro' three given points A, B, and D, to draw a circle. (*Note*, The three points muſt not lie in the ſame ſtraight line.)

Rule. Join A and B, alſo B and D, with the ſtreight lines AB BD; then (by prob. 2.) biſect AB with the line EC, alſo BD with the line FC, which two lines will cut one another in ſome point C; that is the centre of the circle required: then fixing one point of your compaſſes in D, and ſtretching the other to A, deſcribe the circle ABDG, which will paſs thro' the three points given. The reaſon of this is plain from cor. 1. of art. 64.

9. (Fig 17.) From the point A of the given line AB, to draw another line (ſuppoſe AC) that ſhall make with AB an angle of any number of degrees, ſuppoſe 45.

Rule. Let the given line AB be produced, then take off your ſcale the length of the chord of 60 degrees, which is equal to the radius of the circle the ſcale was made for (by art. 75.); and ſetting one foot in A, with the other ſweep of the arc BC; then with your compaſſes take from your ſcale the chord of 45 degrees, and ſet off that diſtance from B to C. Laſtly, join A and C, and the line AC is that required. For the angle CAB, which is meaſured by the arc BC, is an angle of 45 degrees, as was required.

10. An angle BAC (fig. 18.) being given, to find how many degrees it contains.

Rule. With your compaſſes take the length of your chord of 60 from your ſcale. Then, ſetting one foot of them in A, with the other ſweep the arc BC, which is the arc comprehended between the two legs AB, AC produced if needful. Laſtly, take with your compaſſes the diſtance BC, and applying it to your line of chords on the ſcale, you will find how many degrees the arc BC contains, and conſequently the degrees of the angle BAC which was required.

11. Three lines x, y, and z being given, (fig. 19. 19.) to form a triangle of them; but any two of theſe lines taken together muſt always be greater than the third.

Rule. Make any one of them, as x, the baſe; then with your compaſſes take another of them, as z, and ſetting one foot in one end of the line x, as B, with the other ſweep the arc DE; and taking with your compaſſes the length of the other y, ſet one foot of them in A, the other end of the line x, and with the other ſweep the arc FG, which will cut the other in C; laſtly, join CA and CB, and the triangle CAB is that required.

12. To make a triangle, having one of its legs of any number of equal parts (ſuppoſe 160), and one of the angles at that leg 50 degrees, and the other 44 degrees.

Rule. Draw an indefinite line ED, (fig. 20.) then take off the line of equal parts with your compaſſes, 160 of them, and ſet them on the indefinite line, as BC; then (by prob. 9.) draw BA, making the angle ABC of 50 degrees, and (by the ſame) draw from C the line AC, making the angle ACB of 44 degrees; which two lines will meet one another in A, and the triangle ABC is that required. See TRIGONOMETRY.

13. Upon a given line AB (fig. 21.) to make a ſquare.

Rule. Upon the extremity A of the given line AB, raiſe a perpendicular AC (by prob. 4.); then take AC equal to AB, and with that extent, ſetting one foot of the compaſſes in C, ſweep with the other foot the arc GH; then with the ſame extent, and one foot in B, with the other ſweep the arc EF, which will meet the former in ſome point D; laſtly, join C and D, D and B, and the figure ABDC will be the ſquare required.

14. On a given line AB (fig. 22.) to draw a rhomb that ſhall have one of its angles equal to any number of degrees, ſuppoſe 60 degrees.

Rule. From the point A of the given line AB, draw the line AC, making the angle CAB of 60 degrees, (by prob. 9.) then take AC equal to AB, and with that extent, fixing one foot of the compaſſes in B, with the other deſcribe the arc GH; and at the ſame extent, fixing one foot of the compaſſes in C, with the other deſcribe the arc EF cutting the former in D; laſtly, join CD and DB, and the figure ACDB is that required.

15. Given two lines x and z, of theſe two to make a rectangle.

Rule Draw a line, as AB, (fig. 23. 23.) equal in length to one of the given lines x; and on the extremity A of that line, raiſe a perpendicular AC, on which take AC equal to the other line z; then take with your compaſſes the length of the line AB, and at that extent, fixing one foot of them in C, with the other ſweep the arc EF; and alſo taking with your compaſſes the extent of the line AC, fix one foot of them in B, and with the other ſweep the arc GH, which will meet the former in D; laſtly, join CD and BD, and the figure ABDC will be that required.

16. Two lines x and z being given, of theſe to form a rhomboides that ſhall have one of its angles any number of degrees, ſuppoſe 50.

Rule. Draw a line AB (fig. 24. 24.) equal in length to one of the lines, as x; then draw the line AC, making with the former the angle BAC equal to the propoſed, ſuppoſe 50 degrees, and on that line take AC equal to the given line z, then with your compaſſes take the length of AB, and fixing one foot in C, ſweep the arc EF; alſo, taking the length of AC, and ſetting one foot in B, with the other ſweep the arc GH, which will cut the former in D; then join CD and DB, ſo the figure ACDB will be that required.

PART II.

THE APPLICATION OF THE FOREGOING PRINCIPLES TO THE MENSURATION OF SURFACES, SOLIDS, *&c.*

Of the Menſuration of Lines and Angles.

A Line, or length, to be meaſured, whether it be diſtance, height, or depth, is meaſured by a line leſs than it. With us the leaſt meaſure of length is an inch: not that we meaſure no line leſs than it, but becauſe we do not uſe the name of any meaſure below that of an inch; expreſſing leſſer meaſures by the fractions of an inch: and in this treatiſe we uſe decimal fractions as the eaſieſt. Twelve inches make a foot; three feet and an

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Plate XCV.

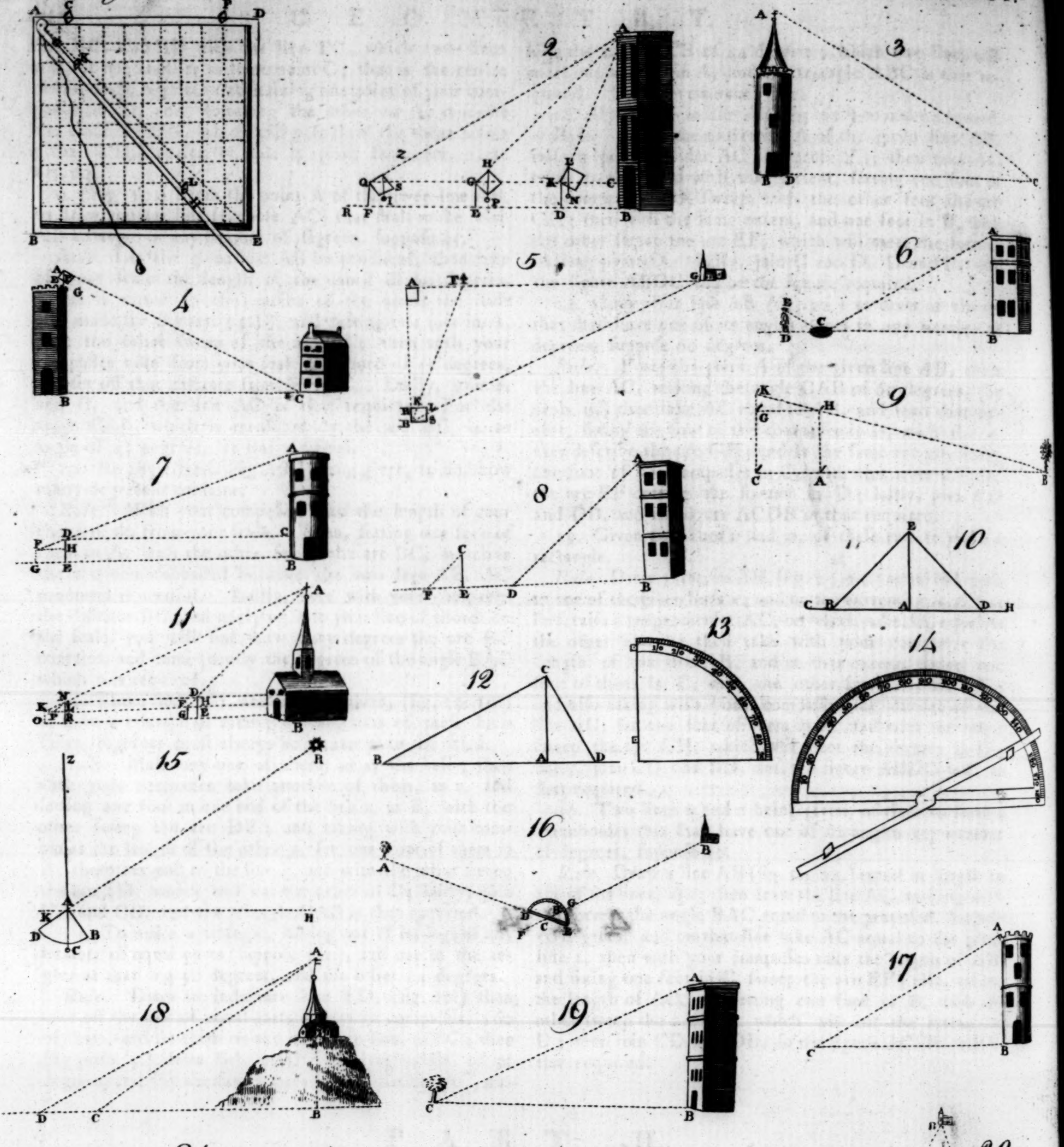
Fig. 1.
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A. Bell Sculp^t

inch make the Scots ell; ſix ells make a fall; forty falls make a furlong; eight furlongs make a mile: ſo that the Scots miles is 1184 paces, accounting every pace to be five feet. Theſe things are according to the ſtatutes of Scotland; notwithſtanding which, the glaziers uſe a foot of only eight inches; and other artiſts for the moſt part uſe an Engliſh foot, on account of the ſeveral ſcales marked on the Engliſh foot-meaſure for their uſe. But the Engliſh foot is ſomewhat leſs than the Scots; ſo that 185 of theſe make 186 of thoſe.

Lines, to the extremities and any intermediate point of which you have eaſy acceſs, are meaſured by applying to them the common meaſure a number of times. But lines, to which you cannot have ſuch acceſs, are meaſured by methods taken from geometry; the chief whereof we ſhall here endeavour to explain. The firſt is by the help of the geometrical ſquare.

“ As for the Engliſh meaſures, the yard is three feet, or thirty-ſix inches. A pole is ſixteen feet and a half, or five yards and a half. The chain, commonly called *Gunter's chain*, is four poles, or twenty-two yards, that is, ſixty ſix feet. An Engliſh ſtatute-mile is fourſcore chains, or 1760 yards, that is, 5280 feet.

“ The chain (which is now much in uſe, becauſe it is very convenient for ſurveying) is divided into a hundred links, each of which is $7\frac{92}{100}$ of an inch: whence it is eaſy to reduce any number of thoſe links to feet, or any number of feet to links.

“ A chain that may have the ſame advantages in ſurveying in Scotland, as Gunter's chain has in England, ought to be in length ſeventy-four feet, or twenty-four Scots ells, if no regard is had to the difference of the Scots and Engliſh foot above mentioned. But, if regard is had to that difference, the Scots chain ought to conſiſt of $74\frac{2}{5}$ Engliſh feet, or 74 feet 4 inches and $\frac{4}{5}$ of an inch. This chain being divided into an hundred links, each of thoſe links is 8 inches and $\frac{928}{1000}$ of an inch. In the following table, the moſt noted meaſures are expreſſed in Engliſh inches and decimals of an inch.”

	Engliſh inch.	*Dec.*
The Engliſh foot, is	12	000
The Paris foot,	12	788
The Rhindland foot, meaſured by Mr Picart,	12	362
The Scots foot,	12	065
The Amſterdam foot, by Snellius and Picart,	11	172
The Dantzick foot, by Hevelius,	11	297
The Daniſh foot, by Mr Picart,	12	465
The Swediſh foot, by the ſame,	11	692
The Bruſſels foot, by the ſame,	10	828
The Lyons foot, by Mr Auzout,	13	458
The Bononian foot, by Mr Caſſini,	14	938
The Milan foot, by Mr Auzout,	15	631
The Roman palm uſed by merchants, according to the ſame,	9	791
The Roman palm uſed by architects,	8	779
The palm of Naples, according to Mr Auzout,	10	314
The Engliſh yard,	36	000
The Engliſh ell,	45	000
The Scots ell,	37	200
	Inch.	*Dec.*
The Paris aune uſed by mercers, according to Mr Picart,	46	786
The Paris aune uſed by drapers, according to the ſame,	46	680
The Lyons aune, by Mr Auzout,	46	570
The Geneva aune,	44	760
The Amſterdam ell,	26	800
The Daniſh ell, by Mr Picart,	24	930
The Swediſh ell,	23	380
The Norway ell,	24	510
The Brabant or Antwerp ell,	27	170
The Bruſſels ell,	27	260
The Bruges ell,	27	550
The brace of Bononia, according to Auzout,	25	200
The brace uſed by architects in Rome,	30	730
The brace uſed in Rome by merchants,	34	270
The Florence brace uſed by merchants, according to Picart,	22	910
The Florence geographical brace,	21	570
The vara of Seville,	33	127
The vara of Madrid,	39	166
The vara of Portugal,	44	031
The cavedo of Portugal,	27	354
The ancient Roman foot,	11	632
The Perſian ariſh, according to Mr Græves,	38	364
The ſhorter pike of Conſtantinople, according to the ſame,	25	576
Another pike of Conſtantinople, according to Meſſ. Mallet and De la Porte,	27	920

PROPOSITION I.

Prob. *To deſcribe the ſtructure of the geometrical ſquare.*—The geometrical ſquare is made of any ſolid matter, as braſs or wood, or of any four plain rulers joined together at right angles, (as in Plate XCV. fig. 1.) where A is the centre, from which hangs a thread with a ſmall weight at the end, ſo as to be directed always to the centre. Each of the ſides BE and DE is divided into an hundred equal parts, or (if the ſides be long enough to admit of it) into a thouſand parts; C and F are two ſights, fixed on the ſide AD, There is moreover an index GH, which, when there is occaſion, is joined to the centre A, in ſuch manner as that it can move round, and remain in any given ſituation. On this index are two ſights perpendicular to the right line going from the centre of the inſtrument: theſe are K and L. The ſide DE of the inſtrument is called the upright ſide; E the reclining ſide.

PROPOSITION II.

Fig. 2. *To meaſure an acceſſible height*, AB, *by the help of a geometrical ſquare, its diſtance being known.*—Let BR be an horizontal plane, on which there ſtands perpendicularly any line AB: let BD, the given diſtance of the obſervator from the height, be 96 feet; let the height of the obſervator's eye be ſuppoſed 6 feet; and let the inſtrument, held by a ſteady hand, or rather leaning on a ſupport, be directed towards the ſummit A, ſo that one eye (the other being ſhut) may ſee it clearly through the ſights; the perpendicular or plumb line meanwhile hanging free, and touching the ſurface of the inſtrument: let now the perpendicular be ſuppoſed to cut off on the right ſide KN 80 equal parts. It is clear that LKN, ACK, are ſimilar triangles; for the angles LKN, ACK are right angles, and therefore equal; moreover LN and AC are parallel, as being both perpendicular to the horizon; conſequently, (by art. 60. cor. 1. part 1.) the angles KLN, KAC, are equal; wherefore, (by art. 60. cor. 2. of part 1.) the angles LNK, and AKC, are likewiſe equal: ſo that in the triangles NKL, KAC, (by art. 72. of part 1) as NK : KL :: KC (*i. e.* BD) : CA; that is, as 80 to 100, ſo is 96 feet to CA. Therefore, by the rule of three, CA will be found to be 120 feet; and CB, which is 6 feet, being added, the whole height is 126 feet.

But if the diſtance of the obſervator from the height, as BE, be ſuch, that, when the inſtrument is directed as formerly toward the ſummit A, the perpendicular falls on the angle P, oppoſite to H, the centre of the inſtrument, and BE or CG be given of 120 feet; CA will alſo be 120 feet. For in the triangles HGP, ACG, equiangular, as in the preceding caſe, as PG : GH : : GC : CA. But PG is equal to GH; therefore GC is likewiſe equal to CA: that is, CA will be 120 feet, and the whole height 126 feet as before.

Let the diſtance BF be 300 feet, and the perpendicular or plumb line cut off 40 equal parts from the reclining ſide: Now, in this caſe, the angles QAC, QZI, are equal, and the angles QZI, ZIS, are equal; therefore the angle ZIS is equal to the angle QAC. But the angles ZSI QCA are equal, being right angles; therefore, in the equiangular triangles ACQ, SZI, it will be, as ZS : SI : : CQ : CA; that is, as 100 to 40, ſo is 300 to CA. Wherefore, by the rule of three, CA will be found to be of 102 feet. And, by adding the height of the obſervator, the whole BA will be 126 feet. Note, that the height is greater than the diſtance, when the perpendicular cuts the right ſide, and leſs if it cut the reclined ſide; and that the height and diſtance are equal, if the perpendicular fall on the oppoſite angle.

SCHOLIUM.

If the height of a tower, to be meaſured as above, end in a point, (as in fig. 3.) the diſtance of the obſervator oppoſite to it, is not CD, but is to be accounted from the perpendicular to the point A; that is, to CD muſt be added the half of the thickneſs of the tower, *viz.* BD: which muſt likewiſe be underſtood in the following propoſitions, when the caſe is ſimilar.

PROPOSITION III.

Fig. 4. *From the height of a tower* AB *given, to find a diſtance on the horizontal plane* BC, *by the geometrical ſquare.*—Let the inſtrument be ſo placed, as that the mark C in the oppoſite plane may be ſeen through the ſights; and let it be obſerved how many parts are cut off by the perpendicular. Now, by what hath been already demonſtrated, the triangles AEF, ABC, are ſimilar; therefore, it will be as EF to AE, ſo AB (compoſed of the height of the tower BG, and of the height of the centre of the inſtrument A, above the tower BG) to the diſtance BC. Wherefore, if, by the rule of three, you ſay, as EF to AE, ſo is AB to BC, it will be the diſtance ſought.

PROPOSITION IV.

Fig. 5. *To meaſure any diſtance at land or ſea, by the geometrical ſquare.*—In this operation, the index is to be applied to the inſtrument, as was ſhown in the deſcription; and, by the help of a ſupport, the inſtrument is to be placed horizontally at the point A; then let it be turned till the remote point F, whoſe diſtance is to be meaſured, be ſeen through the fixed ſights; and bringing the index to be parallel with the other ſide of the inſtrument, obſerve by the ſights upon it any acceſſible mark B, at a ſenſible diſtance: then carrying the inſtrument to the point B, let the immoveable ſights be directed to the firſt ſtation A, and the ſights of the index to the point F. If the index cut the right ſide of the ſquare, as in K, in the two triangles BRK, and BAF, which are æquiangular, it will be as BR to RK, ſo BA (the diſtance of the ſtations to be meaſured with a chain) to AF; and the diſtance AF ſought will be found by the rule of three. But if the index cut the reclined ſide of the ſquare in any point L, where the diſtance of a more remote point is ſought; in the triangles BLS, BAG, the ſide LS ſhall be to SB, as BA to AG, the diſtance ſought; which accordingly will be found by the rule of three.

PROPOSITION V.

Fig. 6. *To meaſure an acceſſible height by means of a plain mirror.*—Let AB be the height to be meaſured; let the mirror be placed at C, in the horizontal plane BD, at a known diſtance BC; let the obſerver go back to D, till he ſee the image of the ſummit in the mirror, at a certain point of it, which he muſt diligently mark; and let DE be the height of the obſervator's eye. The triangles ABC and EDC are equiangular; for the angles at D and B are right angles; and ACB, ECD, are equal, being the angles of incidence and reflexion of the ray AC, as is demonſtrated in optics; wherefore the remaining angles at A and E are alſo equal: therefore it will be, as CD to DE, ſo CB to BA; that is, as the diſtance of the obſervator from the point of the mirror in the right line betwixt the obſervator and the height, is to the height of the obſervator's eye, ſo is the diſtance of the tower from that point of the mirror, to the height of the tower ſought; which therefore will be found by the rule of three.

Note 1. The obſervation will be more exact, if, at the point D, a ſtaff be placed in the ground perpendicularly, over the top of which the obſervator may ſee a point of the glaſs exactly in a line betwixt him and the tower.

Note 2. In place of a mirror may be uſed the ſurface of water contained in a veſſel, which naturally becomes parallel to the horizon.

PROPOSITION VI.

Fig. 7. *To meaſure an acceſſible height* AB *by means of two ſtaffs.*—Let there be placed perpendicularly in the ground a longer ſtaff DE, likewiſe a ſhorter one FG, ſo as the obſervator may ſee A, the top of the height to be meaſured, over the ends D F of the two ſtaffs; let FH and DC, parallel to the horizon, meet DE and AB in H and C; then the triangles FHD, DCA, ſhall be

equiangular; for the angles at C and H are right ones; likewiſe the angle A is equal to the angle FDH; wherefore the remaining angles DFH, and ADC, are alſo equal: Wherefore, as FH, the diſtance of the ſtaffs, to HD, the exceſs of the longer ſtaff above the ſhorter; ſo is DC, the diſtance of the longer ſtaff from the tower, to CA, the exceſs of the height of the tower above the longer ſtaff. And thence CA will be found by the rule of three.

To which if the length DE be added, you will have the whole height of the tower BA.

SCHOLIUM.

FIG. 8. Many other methods may be occaſionally contrived for meaſuring an acceſſible height. For example, from the given length of the ſhadow BD, to find out the height AB, thus: Let there be erected a ſtaff CE perpendicularly, producing the ſhadow EF: The triangles ABD, CEF, are equiangular; for the angles at B and E are right; and the angles ADB and CFE are equal, each being equal to the angle of the ſun's elevation above the horizon: Therefore, as EF, the ſhadow of the ſtaff, to EC, the ſtaff itſelf; ſo BD, the ſhadow of the tower, to BA, the height of the tower. Though the plane on which the ſhadow of the tower falls be not parallel to the horizon, if the ſtaff be erected in the ſame plane, the rule will be the ſame.

PROPOSITION VII.

To meaſure an inacceſſible height by means of two ſtaffs.—Hitherto we have ſuppoſed the height to be acceſſible, or that we can come at the lower end of it; now if, becauſe of ſome impediment, we cannot get to a tower, or if the point whoſe height is to be found out be the ſummit of a hill, ſo that the perpendicular be hid within the hill; if, for want of better inſtruments, ſuch an inacceſſible height is to be meaſured by means of two ſtaffs, let the firſt obſervation be made with the ſtaffs DE and FG, (as in prop. 6.); then the obſervator is to go off in a direct line from the height and firſt ſtation, till he come to the ſecond ſtation; where (fig. 11.) he is to place the longer ſtaff perpendicularly at RN, and the ſhorter ſtaff at KO, ſo that the ſummit A may be ſeen along their tops; that is, ſo that the points KNA may be in the ſame right line. Through the point N, let there be drawn the right line NP parallel to FA: Wherefore in the triangles KNP, KAF, the angles KNP KAF are equal, alſo the angle AKF is common to both; conſequently the remaining angle KPN is equal to the remaining angle KFA. And therefore, PN : FA :: KP : KF. But the triangles PNL, FAS are ſimilar; therefore, PN : FA :: NL : SA. Therefore, (by the 11. 5. Eucl.) KP : KF :: NL : SA. Thence, alternately, it will be, as KP (the exceſs of the greater diſtance of the ſhort ſtaff from the long one above its leſſer diſtance from it) to NL, the exceſs of the longer ſtaff above the ſhorter; ſo KF, the diſtance of the two ſtations of the ſhorter ſtaff to SA the exceſs of the height ſought above the height of the ſhorter ſtaff. Wherefore SA will be found by the rule of three. To which let the height of the ſhorter ſtaff be added, and the ſum will give the whole inacceſſible height BA.

Note 1. In the ſame manner may an inacceſſible height be found by a geometrical ſquare, or by a plain ſpeculum. But we ſhall leave the rules to be found out by the ſtudent, for his own exerciſe.

Note 2. That by the height of the ſtaff we underſtand its height above the ground in which it is fixed.

Note 3. Hence depends the method of uſing other inſtruments invented by geometricians; for example, of the geometrical croſs: And if all things be juſtly weighed, a like rule will ſerve for it as here. But we incline to touch only upon what is moſt material.

PROPOSITION VIII.

FIG. 9. *To meaſure the diſtance* AB, *to one of whoſe extremities we have acceſs, by the help of four ſtaffs.*—Let there be a ſtaff fixed at the point A; then going back at ſome ſenſible diſtance in the ſame right line, let another be fixed in C, ſo as that both the points A and B be covered and hid by the ſtaff C: likewiſe going off in a perpendicular from the right line CB, at the point A, (the method of doing which ſhall be ſhown in the following *ſcholium*), let there be placed another ſtaff at H; and in the right line CKG (perpendicular to the ſame CB, at the point B), and at the point of it K, ſuch that the points K, H, and B may be in the ſame right line, let there be fixed a fourth ſtaff. Let there be drawn, or let there be ſuppoſed to be drawn, a right line GH parallel to CA. The triangles KGH, HAB, will be equiangular; for the angles HAB KGH are right angles. Alſo the angles ABH, KHG are equal; wherefore, as KG (the exceſs of CK above AH) to GH, or to CA, the diſtance betwixt the firſt and ſecond ſtaff; ſo is AH, the diſtance betwixt the firſt and third ſtaff, to AB the the diſtance ſought.

SCHOLIUM.

FIG. 10. To draw on a plane a right line AE perpendicular to CH, from a given point A; take the right lines AB, AD, on each ſide equal; and in the points B and D, let there be fixed ſtakes, to which let there be tied two equal ropes BE, DE, or one having a mark in the middle, and holding in your hand their extremities joined, (or the mark in the middle, if it be but one), draw out the ropes one the ground; and then, where the two ropes meet, or at the mark, when by it the rope is fully ſtretched, let there be placed a third ſtake at E; the right line AE will be perpendicular to CH in the point A (prob. 1. of part. i.). In a manner not unlike to this, may any problems that are reſolved by the ſquare and compaſſes, be done by ropes and a cord turned round as a radius.

PROPOSITION IX.

FIG. 12. *To meaſure the diſtance* AB, *one of whoſe extremities is acceſſible.*—From the point A, let the right line AC of a known length be made perpendicular to AB, (by the preceding *ſcholium*): likewiſe draw the right line CD perpendicular to CB, meeting the right line AB in D: then as DA : AC :: AC : AB. Wherefore, when DA and AC are given, AB will be found by the rule of three.

SCHOLIUM.

All the preceding operations depend on the equality of ſome angles of triangles, and on the ſimilarity of the triangles ariſing from that equality. And on the ſame principles depend innumerable other operations which a geometrician will find out of himſelf, as is very obvious. However, ſome of theſe operations require ſuch exactneſs in the work, and without it are ſo liable to errors, that, *cæteris paribus*, the following operations, which are performed by a trigonometrical calculation, are to be preferred; yet could we not omit thoſe above, being moſt eaſy in practice, and moſt clear and evident to thoſe who have only the firſt elements of geometry. But if you are provided with inſtruments, the following operations are more to be relied upon. We do not inſiſt on the eaſieſt caſes to thoſe who are ſkilled in plain trigonometry, which is indeed neceſſary to any one who would apply himſelf to practice. See TRIGONOMETRY.

PROPOSITION X.

FIG. 13. *To deſcribe the conſtruction and uſe of the geometrical quadrant.*—The geometrical quadrant is the fourth part of a circle divided into ninety degrees, to which two ſights are adapted, with a perpendicular or plumb-line hanging from the centre. The general uſe of it is for inveſtigating angles in a vertical plane, comprehended under right lines going from the centre of the inſtrument, one of which is horizontal, and the other is directed to ſome viſible point. This inſtrument is made of any ſolid matter as wood, copper, *&c.*

PROPOSITION XI.

FIG. 14. *To deſcribe and make uſe of the graphometer.*—The graphometer is a ſemicircle made of any hard matter, of wood, for example, or braſs, divided into 180 degrees; ſo fixed on a *fulcrum*, by means of a braſs ball and ſocket, that it eaſily turns about, and retains any ſituation; two ſights are fixed on its diameter. At the centre there is commonly a magnetical needle in a box. There is likewiſe a moveable ruler, which turns round the centre, and retains any ſituation given it. The uſe of it is to obſerve any angle, whoſe vertex is at the centre of the inſtrument in any plane, (though it is moſt commonly horizontal, or nearly ſo), and to find how many degrees it contains.

PROPOSITION XII.

FIG. 15. and 16. *To deſcribe the manner in which angles are meaſured by a quadrant or graphometer.*—Let there be an angle in a vertical plane, comprehended between a line parallel to the horizon HK, and the right line RA, coming from any remarkable point of a tower or hill, or from the ſun, moon, or a ſtar. Suppoſe that this angle RAH is to be meaſured by the quadrant: let the inſtrument be placed in the vertical plane, ſo as that the centre A may be in the angular point: and let the ſights be directed towards the object at R, (by the help of the ray coming from it, if it be the ſun or moon, or by the help of the viſual ray, if it is any thing elſe), the degrees and minutes in the arc BC cut off by the perpendicular, will meaſure the angle RAH required. For, from the make of the quadrant, BAD is a right angle; therefore BAR is likewiſe right, being equal to it. But, becauſe HK is horizontal, and AC perpendicular, HAC will be a right angle; and therefore equal alſo to BAR. From thoſe angles ſubtract the part HAB that is common to both; and there will remain the angle BAC equal to the angle RAH. But the arc BC is the meaſure of the angle BAC; conſequently, it is likewiſe the meaſure of the angle RAH.

Note, That the remaining arc on the quadrant DC is the meaſure of the angle RAZ, comprehended between the foreſaid right line RA and AZ which points to the zenith.

Let it now be required to meaſure the angle ACB (fig. 16) in any plane, comprehended between the right-lines AC and BC, drawn from two points A and B, to the place of ſtation C. Let the graphometer be placed at C, ſupported by its *fulcrum* (as was ſhown above); and let the immoveable ſights on the ſide of the inſtrument DE be directed towards the point A; and likewiſe (while the inſtrument remains immoveabe) let the ſights of the ruler FG (which is moveable about the centre C) be directed to the point B. It is evident, that the moveable ruler cuts off an arc DH, which is the meaſure of the angle ACB ſought. Moreover, by the ſame method, the inclination of CE, or of FG, may be obſerved with the meridian line, which is pointed out by the magnetic needle incloſed in the box, and is moveable about the centre of the inſtrument, and the meaſure of this inclination or angle found in degrees.

PROPOSITION XIII.

FIG. 17. *To meaſure an acceſſible height by the geometrical quadrant.*—By the 12th prop. of this part, let the angle C be found by means of the quadrant. Then in the triangle ABC, right-angled at B, (BC being ſuppoſed the horizontal diſtance of the obſervator from the tower), having the angle at C, and the ſide BC, the required height BA will be found by the 3d caſe of plain trigonometry. See TRIGONOMETRY.

PROPOSITION XIV.

FIG. 18. *To meaſure an inacceſſible height by the geometrical quadrant.*—Let the angle ACB be obſerved with the quadrant (by the 12th prop. of this part;) then let the obſerver go from C to the ſecond ſtation D, in the right line BCD (provided BCD be a horizontal plane); and after meaſuring this diſtance CD, take the angle ADC likewiſe with the quadrant. Then, in the triangle ACD, there is given the angle ADC, with the angle ACD; becauſe ACB was given before: therefore (by art. 59. of Part I.) the remaining angle CAD is given likewiſe. But the ſide CD is likewiſe given, being the diſtance of the ſtation C and D; therefore (by the firſt caſe of oblique-angled triangles in trigonometry) the ſide AC will be found. Wherefore, in the right-angled triangle ABC, all the angles and the hypotheneuſe AC are given; conſequently, by the fourth caſe of trigonometry, the height ſought AB will be found; as alſo (if you pleaſe) the diſtance of the ſtation C, from AB the perpendicular within the hill or inacceſſible height.

PROPOSITION XV.

FIG. 19. *From the top of a given height, to meaſure the diſtance BC.*—Let the angle BAC be obſerved by the 12th prop. of this; wherefore in the triangle ABC, right-angled at B, there is given by obſervation the angle at A; whence (by the 59th art. of Part I.) there will alſo be given the angle BCA: moreover the ſide AB (being the height of the tower) is ſuppoſed to be given.

Wherefore,

4 AP 54

Plate XCVI.

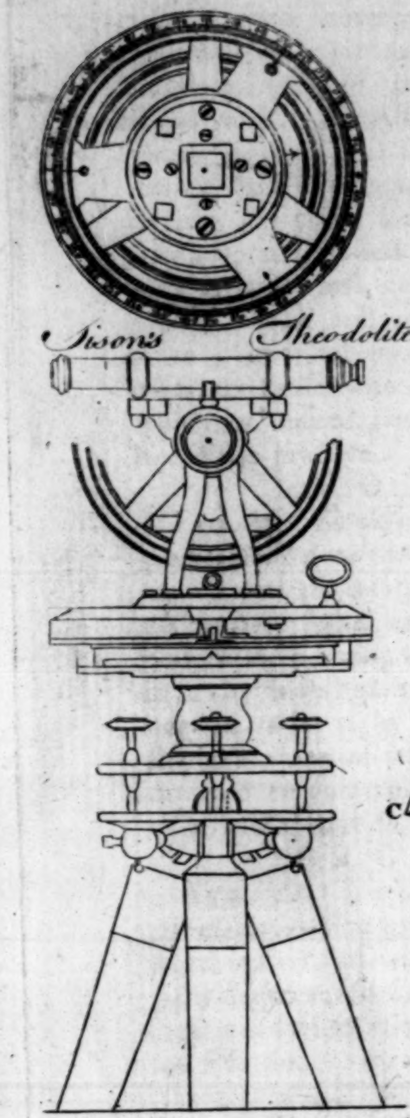
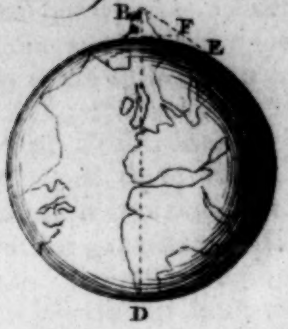

Sison's Theodolite

Fig. 1.


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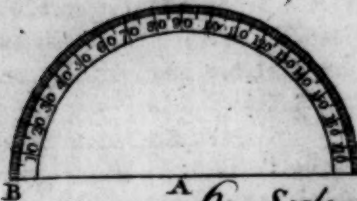

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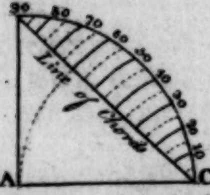
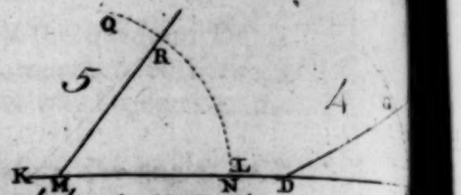

B
Line of Chords
A
C

5 4


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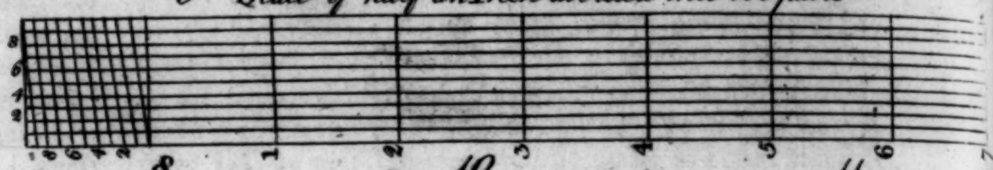
Scale of half an Inch divided into 100 parts


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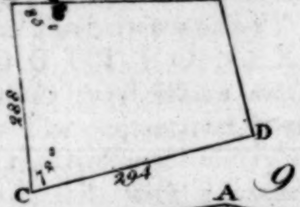
B
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A
288
D
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294

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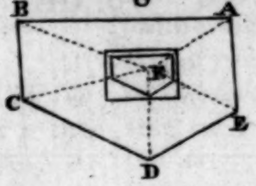

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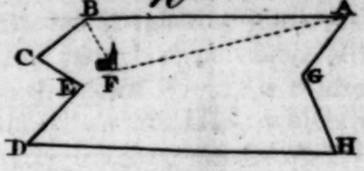

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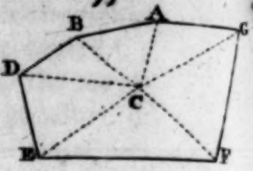

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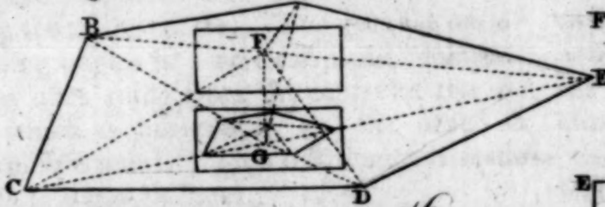

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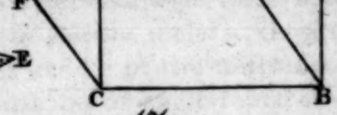

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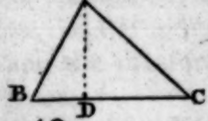

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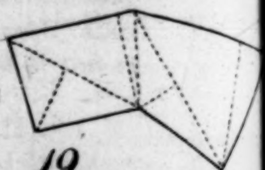

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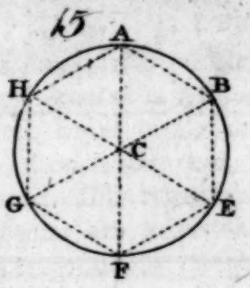

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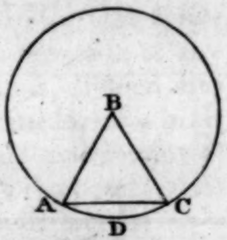

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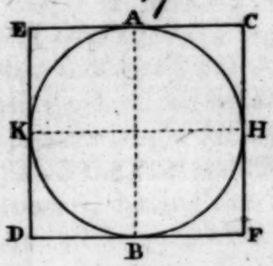

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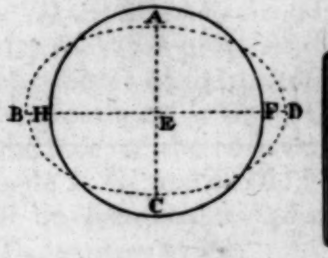

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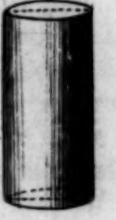

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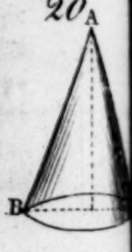

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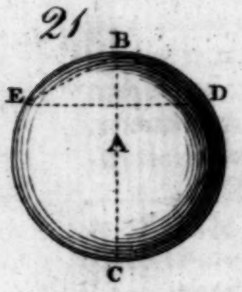

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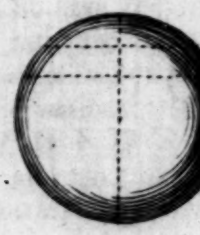

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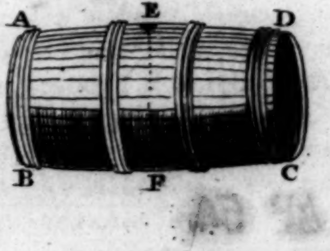

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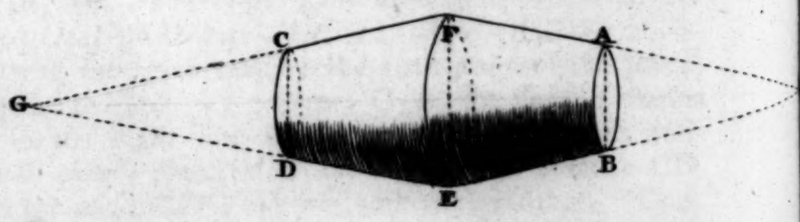

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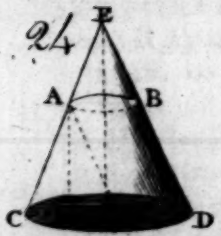

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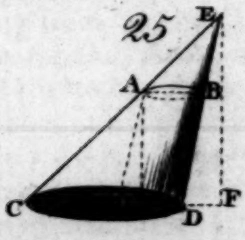

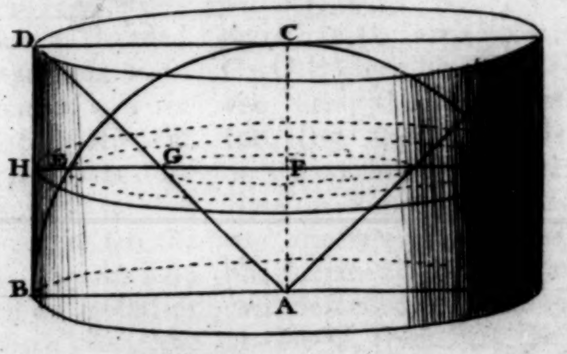

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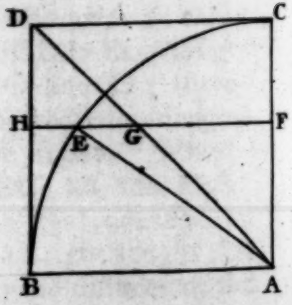

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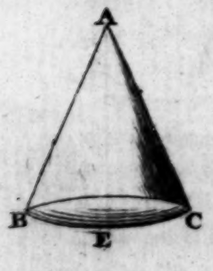

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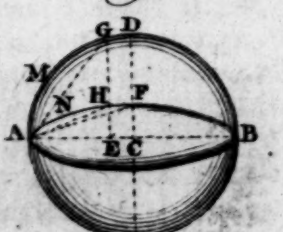
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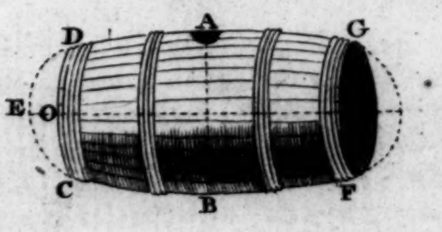

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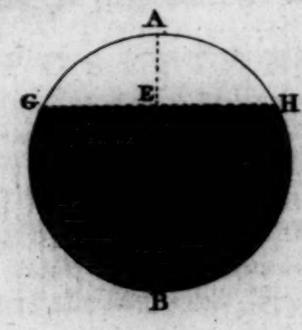

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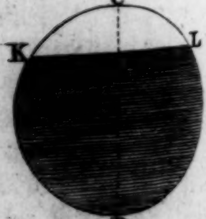

A Bell Sculp.

Wherefore, by the 3d caſe of trigonometry, BC, the diſtance ſought, will be found.

PPOPOSITION XVI.

Fig. 20. *To meaſure the diſtance of two places* A *and* B, *of which one is acceſſible, by the graphometer.*—Let there be erected at two points A and C, ſufficiently diſtant, two viſible ſigns; then (by the 12th prop. of this part) let the two angles BAC, BCA be taken by the graphometer. Let the diſtance of the ſtations A and C be meaſured with a chain. Then the third angle B being known, and the ſide AC being likewiſe known; therefore, by the firſt caſe of trigonometry, the diſtance required, AB, will be found.

PROPOSITION XVII.

Fig. 21. *To meaſure by the graphometer, the diſtance of two places, neither of which is acceſſible.*—Let two ſtations C and D be choſen, from each of which the places may be ſeen whoſe diſtance is ſought: let the angles ACD, ACB, BCD, and likewiſe the angles BDC, BDA, CDA, be meaſured by the graphometer; let the diſtance of the ſtations C and D be meaſured by a chain, or (if it be neceſſary) by the preceding practice. Now, in the triangle ACD, there are given two angles ACD and ADC; therefore, the third CAD is likewiſe given; moreover the ſide CD is given; therefore, by the firſt caſe of trigonometry, the ſide AD will be found. After the ſame manner, in the triangle BCD, from all the angles and one ſide CD given, the ſide BD is found. Wherefore, in the triangle ADB, from the given ſides DA and DB, and the angle ADB contained by them, the ſide AB (the diſtance ſought) is found by the 4th caſe of trigonometry of oblique-angled triangles.

PROPOSITION XVIII.

Fig. 22. *It is required by the graphometer and quadrant, to meaſure an acceſſible height* AB, *placed ſo on a ſteep, that one can neither go near it in an horizontal plane, nor recede from it, as we ſuppoſed in the ſolution of the 14th Prop.*—Let there be choſen any ſituation as C, and another D; where let ſome mark be erected: let the angles ACD and ADC be found by the graphometer; then the third angle DAC will be known. Let the ſide CD, the diſtance of the ſtations, be meaſured with a chain, and thence (by trigon.) the ſide AC will be found. Again, in the triangle ACB, right-angled at B, having found by the quadrant the angle ACB, the other angle CAB is known likewiſe: but the ſide AC in the triangle ADC is already known; therefore the height required AB will be found by the 4th caſe of right-angled triangles. If the height of the tower is wanted, the angle BCF will be found by the quadrant; which being taken from the angle ACB already known, the angle ACF will remain: but the angle FAC was known before; therefore the remaining angle AFC will be known. But the ſide AC was alſo known before; therefore, in the triangle AFC, all the angles and one of the ſides AC being known, AF, the height of the tower above the hill, will be found by trigonometry.

SCHOLIUM.

It were eaſy to add many other methods of meaſuring heights and diſtances; but, if what is above be underſtood, it will be eaſy (eſpecially for one that is verſed in the elements) to contrive methods for this purpoſe, according to the occaſion: ſo that there is no need of adding any more of this ſort. We ſhall ſubjoin here a method by which the diameter of the earth may be found out.

PROPOSITION XIX.

Plate CXVI. Fig. 1. *To find the diameter of the earth from one obſervation.*—Let there be choſen a high hill AB, near the ſea-ſhore, and let the obſervator on the top of it, with an exact quadrant divided into minutes and ſeconds by tranſverſe diviſions, and fitted with a teleſcope in place of the common ſights, meaſure the the angle ABE contained under the right line AB, which goes to the centre, and the right line BE drawn to the ſea, a tangent to the globe at E; let there be drawn from A perpendicular to BD, the line AF meeting BE in F. Now in the right-angled triangle BAF all the angles are given, alſo the ſide AB, the height of the hill; which is to be found by ſome of the foregoing methods, as exactly as poſſible; and (by trigonometry) the ſides BF and AF are found. But, by cor. 36th 3. Eucl. AF is equal to FE; therefore BE will be known. Moreover, by 36th 3. Eucl. the rectangle under BA and BD is equal to the ſquare of BE. And thence, by 17th, 6. Eucl. as AB : BE :: BE : BD. Therefore, ſince AB and BE are already given, BD will be found by 11th, 6. Eucl. or by the rule of three; and ſubtracting BA, there will remain AD the diameter of the earth ſought.

SCHOLIUM.

Many other methods might be propoſed for meaſuring the diameter of the earth. The moſt exact is that propoſed by Mr Picart of the academy of ſciences at Paris.

“ According to Mr Picart, a degree of the meridian at the latitude of 49° 21′, was 57,060 French toiſes, each of which contains ſix feet of the ſame meaſure; from which it follows, that, if the earth be an exact ſphere, the circumference of a great circle of it will be 123,249,600 Paris feet, and the ſemidiameter of the earth 19,615,800 feet: but the French mathematicians, who of late have examined Mr Picart's operations, aſſure us, That the degree in that latitude is 57,183 toiſes. They meaſured a degree in Lapland, in the latitude of 66° 20′, and found it of 57,438 toiſes. By comparing theſe degrees, as well as by the obſervations on pendulums, and the theory of gravity, it appears that the earth is an oblate ſpheroid; and (ſuppoſing thoſe degrees to be accurately meaſured) the axis or diameter that paſſes through the poles will be to the diameter of the equator, as 177 to 178, or the earth will be 22 miles higher at the equator than at the poles. A degree has likewiſe been meaſured at the equator, and found to be conſiderably leſs than at the latitude of Paris; which confirms the oblate figure of the earth. But an account of this laſt menſuration has not been publiſhed as yet. If the earth was of an uniform denſity from the ſurface to the centre, then, according to the theory of gravity, the meridian would be an exact ellipſis, and the axis would be to the diameter of the equator as 230 to 231; and the difference of the ſemidiameter of the equator and ſemiaxis about 17 miles.”

In what follows, a figure is often to be laid down on paper, like to another figure given; and becauſe this likeneſs conſiſts in the equality of their angles, and in the ſides having the ſame proportion to each other (by the definitions of the 6th of Eucl.) we are now to ſhew what methods practical geometricians uſe for making on paper an angle equal to a given angle, and how they conſtitute the ſides in the ſame proportion. For this purpoſe they make uſe of a protractor, (or, when it is wanting, a line of chords), and of a line of equal parts.

PROPOSITION XX.

FIG. 2. 3. 4. 5. and 6. *To deſcribe the conſtruction and uſe of the protractor, of the line of chords, and of the line of equal parts.*--The protractor is a ſmall ſemicircle of braſs, or ſuch ſolid matter. The ſemicircumference is divided into 180 degrees. The uſe of it is, to draw angles on any plane, as on paper, or to examine the extent of angles already laid down. For this laſt purpoſe, let the ſmall point in the centre of the protractor be placed above the angular point, and let the ſide AB coincide with one of the ſides that contain the angle propoſed; the number of degrees cut off by the other ſide, computing on the protractor from B, will ſhow the quantity of the angle that is to be meaſured.

But if an angle is to be made of a given quantity on a given line, and at a given point of that line, let AB coincide with the given line, and let the centre A of the inſtrument be applied to that point. Then let there be a mark made at the given number of degrees; and a right line drawn from that mark to the given point, will conſtitute an angle with the given right line of the quantity required; as is manifeſt.

This is the moſt natural and eaſy method, either for the extent of an angle on paper, or for deſcribing on paper an angle of a given quantity.

But when there is ſcarcity of inſtruments, or becauſe a line of chords is more eaſily carried about, (being deſcribed on a ruler on which there are many other lines beſides), practical geometricians frequently make uſe of it. It is made thus: let the quadrant of a circle be divided into 90 degrees; (as in fig. 4.) The line AB is the chord of 90 degrees; the chord of every arc of the quadrant is transferred to this line AB, which is always marked with the number of degrees in the correſponding arc.

Note, that the chord of 60 degrees is equal to the radius, by corol. 15. 4th Eucl. If now a given angle EDF is to be meaſured by the line of chords from the centre D, with the diſtance DG, (the chord of 60 degrees,) deſcribe the arch GF; and let the points G and F be marked where this arch interſects the ſides of the angle. Then if the diſtance GF, applied on the line of chords from A to B, gives (for example) 25 degrees, this ſhall be the meaſure of the angle propoſed.

When an obtuſe angle is to be meaſured with this line, let its complement to a ſemicircle be meaſured, and thence it will be known. It were eaſy to transfer to the diameter of a circle the chords of all arches to the extent of a ſemicircle; but ſuch are rarely found marked upon rules.

But now, if an angle of a given quantity, ſuppoſe of 50 degrees, is to be made at a given point M of the right line KL (fig. 6.) From the centre M, and the diſtance MN, equal to the chord of 60 degrees, deſcribe the arc QN. Take off an arc NR, whoſe chord is equal to that of 50 degrees on the line of chords; join the points M and R; and it is plain that MR ſhall contain an angle of 50 degrees with the line KL propoſed.

But ſometimes we cannot produce the ſides, till they be of the length of a chord of 60 degrees on our ſcale; in which caſe it is fit to work by a circle of proportions (that is a ſector), by which an arc may be made of a given number of degrees to any radius.

The quantities of angles are likewiſe determined by other lines uſually marked upon rules, as the lines of ſines, tangents, and ſecants; but, as theſe methods are not ſo eaſy or ſo proper in this place, we omit them.

To delineate figures ſimilar or like to others given, beſides the equality of the angles, the ſame proportion is to be preſerved among the ſides of the figure that is to be delineated, as is among the ſides of the figures given. For which purpoſe, on the rules uſed by artiſts, there is a line divided into equal parts, more or leſs in number, and greater or leſſer in quantity, according to the pleaſure of the maker.

A foot is divided into inches; and an inch, by means of tranſverſe lines, into 100 equal parts: ſo that with this ſcale, any number of inches, below twelve, with any part of an inch, can be taken by the compaſſes, providing ſuch part be greater than the one hundredth part of an inch. And this exactneſs is very neceſſary in delineating the plans of houſes, and in other caſes.

PROPOSITION XXI.

FIG. 7. *To lay down on paper, by the protractor or line of chords, and line of equal parts, a right-lined figure like to one given, providing the angles and ſides of the figure given be known by obſervation or menſuration.*—For example, ſuppoſe that it is known that in a quadrangular figure, one ſide is of 235 feet, that the angle contained by it and the ſecond ſide is of 84°, the ſecond ſide of 288 feet, the angle contained by it and the third ſide of 72°, and that the third ſide is 294 feet. Theſe things being given, a figure is to be drawn on paper like to this quadrangular figure. On your paper, at a proper point A, let a right line be drawn, upon which take 235 equal parts, as AB. The part repreſenting a foot is taken greater or leſſer, according as you would have your figure greater or leſs. In the adjoining figure, the 100th part of an inch is taken for a foot. And accordingly an inch divided into 100 parts, and annexed to the figure, is called a ſcale of 100 feet. Let there be made at the point B (by the preceding prop.) an angle ABC of 85°, and let BC be taken of 288 parts like to the former. Then let the angle BCD be made of 72°, and the ſide CD of 294 equal parts. Then let the ſide AD be drawn; and it will compleat the figure like to the figure given. The meaſures of the angle A and D can be known by the protractor or line of chords, and the ſide AD by the line of equal parts; which will exactly anſwer to the correſponding angles and to the ſide of the primary figure.

After the very ſame manner, from the ſides and angles given, which bound any right-lined figure, a figure like to it may be drawn, and the reſt of its ſides and angles be known.

COROL.

COROLLARY.

Hence any trigonometrical problem in right-lined triangles, may be reſolved by delineating the triangle from what is given concerning it, as in this propoſition. The unknown ſides are examined by a line of equal parts, and the angles by a protractor or line of chords.

PROPOSITION XXII.

The diameter of a circle being given, to find its circumference nearly.—The periphery of any polygon inſcribed in the circle is leſs than the circumference, and the periphery of any polygon deſcribed about a circle is greater than the circumference. Whence Archimedes firſt diſcovered that the diameter was in proportion to the circumference, as 7 to 22 nearly; which ſerves for common uſe. But the moderns have computed the proportion of the diameter to the circumference to greater exactneſs. Suppoſing the diameter 100, the periphery will be more than 314, but leſs than 315. The diameter is more nearly to the circumference, as 113 to 355. But Ludolphus van Cuelen exceeded the labours of all; for by immenſe ſtudy he found, that, ſuppoſing the diameter
100,000,000,000,000,000,000,000,000,000,000,
the periphery will be leſs than
314,159,265,358,979,323.846,264,338,327,951,
but greater than
314,159,265,358,979,323,846,264,338,327,950;
whence it will be eaſy, any part of the circumference being given in degrees and minutes, to aſſign it in parts of the diameter.

Of Surveying and Meaſuring of LAND.

Hitherto we have treated of the meaſuring of angles and ſides, whence it is abundantly eaſy to lay down a field, a plane, or an entire country: for to this nothing is requiſite but the protraction of triangles, and of other plain figures, after having meaſured their ſides and angles. But as this is eſteemed an important part of practical geometry, we ſhall ſubjoin here an account of it with all poſſible brevity; ſuggeſting withal, that a ſurveyor will improve himſelf more by one day's practice, than by a great deal of reading.

PROPOSITION XXIII.

To explain what ſurveying is, and what inſtruments Surveyors uſe.—Firſt, it is neceſſary that the ſurveyor view the field that is to be meaſured, and inveſtigate its ſides and angles, by means of an iron chain (having a particular mark at each foot of length, or at any number of feet, as may be moſt convenient for reducing lines or ſurfaces to the received meaſures), and the graphometer deſcribed above. Secondly, It is neceſſary to delineate the field *in plano*, or to form a map of it; that is, to lay down on paper a figure ſimilar to the field; which is done by the protractor (or line of chords) and of the line of equal parts. Thirdly, It is neceſſary to find out the area of the field ſo ſurveyed and repreſented by a map: Of this laſt we are to treat below.

The ſides and angles of ſmall fields are ſurveyed by the help of a plain table; which is generally of an oblong rectangular figure, and ſupported by a *fulcrum*, ſo as to turn every way by means of a ball and ſocket. It has a moveable frame, which ſurrounds the board, and ſerves to keep a clean paper put on the board cloſe and tight to it. The ſides of the frame facing the paper are divided into equal parts every way. The board hath beſides a box with a magnetic needle, and moreover a large index with two ſights. On the edge of the frame of the board are marked degrees and minutes, ſo as to ſupply the room of a graphometer.

PROPOSITION XXIV.

Fig. 8. *To delineate a field by the help of a plain-table, from one ſtation whence all its angles may be ſeen, and their diſtances meaſured by a chain.*—Let the field that is to be laid down be ABCDE. At any convenient place F, let the plain-table be erected; cover it with clean paper, in which let ſome point near the middle repreſent the ſtation. Then applying at this place the index with the ſights, direct it ſo as that through the ſights ſome mark may be ſeen at one of the angles, ſuppoſe A; and from the point F, repreſenting the ſtation, draw a faint right line along the ſide of the index: then, by the help of the chain, let FA the diſtance of the ſtation from the foreſaid angle be meaſured. Then taking what part you think convenient for a foot or pace from the line of equal parts, ſet off on the faint line the parts correſponding to the line FA that was meaſured; and let there be a mark made repreſenting the angle of the field A. Keeping the table immoveable, the ſame is to be done with the reſt of the angles; then right lines joining thoſe marks ſhall include a figure like to the field, as is evident from 5. 6. Eucl.

COROLLARY.

The ſame thing is done in like manner by the graphometer: for having obſerved in each of the triangles, AFB, BFC, CFD, &c. the angle at the ſtation F, and having meaſured the lines from the ſtation to the angles of the field, let ſimilar triangles be protracted on paper (by the 21. prop. of this) having their common vertex in the point of ſtation. All the lines, excepting thoſe which repreſent the ſides of the field, are to be drawn faint or obſcure.

Note 1. When a ſurveyor wants to lay down a field, let him place diſtinctly in a regiſter all the obſervations of the angles, and the meaſures of the ſides, until, at time and place convenient, he draw out the figure on paper.

Note 2. The obſervations made by the help of the graphometer are to be examined: for all the angles about the point F ought to be equal to four right ones. (by cor. 2. art. 30. of part I.)

PROPOSITION XXV.

Fig. 9. *To lay down a field by means of two ſtations, from each of which all the angles can be ſeen, by meaſuring only the diſtance of the ſtations.*—Let the inſtrument be placed at the ſtation F: and having choſen a point repreſenting it upon the paper which is laid upon the plain-table, let the index be applied at this point, ſo as to be moveable about it. Then let it be directed ſucceſſively to the ſeveral angles of the field: and when any angle is ſeen through the ſights, draw an obſcure line along the ſide of the index. Let the index, with the ſights, be directed after the ſame manner to the ſtation G: on the obſcure line drawn along its ſide, pointing to

A, ſet off from the ſcale of equal parts a line correſponding to the meaſured diſtance of the ſtations, and this will determine the point G. Then remove the inſtrument to the ſtation G, and applying the index to the line repreſenting the diſtance of the ſtations, place the inſtrument ſo that the firſt ſtation may be ſeen through the ſights. Then the inſtrument remaining immoveable, let the index be applied at the point repreſenting the ſecond ſtation G, and be ſucceſſively directed by means of its ſights, to all the angles of the field, drawing (as before) obſcure lines: and the interſection of the two obſcure lines that were drawn to the ſame angle from the two ſtations will always repreſent that angle on the plan. Care muſt be taken that thoſe lines be not miſtaken for one another. Lines joining thoſe interſections will form a figure on the paper like to the field.

SCHOLIUM.

It will not be difficult to do the ſame by the graphometer, if you keep a diſtinct account of your obſervations of the angles made by the line joining the ſtations, and the lines drawn from the ſtations to the reſpective angles of the field. And this is the moſt common manner of laying down whole countries. The tops of two mountains are taken for two ſtations, and their diſtance is either meaſured by ſome of the methods mentioned above, or is taken according to common repute. The ſights are ſucceſſively directed towards cities, churches, villages, forts, lakes, turnings of rivers, woods, &c.

Note, The diſtance of the ſtations ought to be great enough, with reſpect to the field that is to be meaſured; ſuch ought to be choſen as are not in a line with any angle of the field. And care ought to be taken likewiſe that the angles, for example, FAG, FDG, &c. be neither very acute, nor very obtuſe. Such angles are to be avoided as much as poſſible; and this admonition is found very uſeful in practice.

PROPOSITION XXVI.

FIG. 10. *To lay down any field, however irregular its figure may may be, by the help of the graphometer.*—Let ABCEDHG be ſuch a field. Let its angles (in going round it) be obſerved with a graphometer (by the 12. of this) and noted down; let its ſides be meaſured with a chain; and (by what was ſaid on the 21. of this) let a figure like to the given field be protracted on paper. If any mountain is in the circumference, the horizontal line hid under it is to be taken for a ſide, which may be found by two or three obſervations according to ſome of the methods deſcribed above; and its place on the map is to be diſtinguiſhed by a ſhade, that it may be known a mountain is there.

If not only the circumference of the field is to be laid down on the plan, but alſo its contents, as villages, gardens, churches, public roads, we muſt proceed in this manner.

Let there be (for example) a church F, to be laid down in the plan. Let the angles ABF BAF be obſerved and protracted on paper in their proper places, the interſection of the two ſides BF and AF will give the place of the church on the paper: Or, more exactly, the lines BF AF being meaſured, let circles be deſcribed from the centres B and A, with parts from the ſcale correſponding to the diſtances BF and AF, and the place of the church will be at their interſection.

Note 1. While the angles obſerved by the graphometer are taken down, you muſt be careful to diſtinguiſh the external angles, as E and G, that they may be rightly protracted afterwards on paper.

Note 2. Our obſervations of the angles may be examined by computing if all the internal angles make twice as many right angles, four excepted, as there are ſides of the figure: (for this is demonſtrated by 32. 1. Eucl.) But in place of any external angle DEC, its complement to a circle is to be taken.

PROPOSITION XXVII.

FIG. 11. *To lay down a plain field without inſtruments.*—If a ſmall field is to be meaſured, and a map of it to be made, and you are not provided with inſtruments; let it be ſuppoſed to be divided into triangles, by right-lines, as in the figure; and after meaſuring the three ſides of any of the triangles, for example of ABC, let its ſides be laid down from a convenient ſcale on paper, (by the 22. of this.) Again, let the other two ſides BD CD of the triangle CBD be meaſured and protracted on the paper by the ſame ſcale as before. In the ſame manner proceed with the reſt of the triangles of which the field is compoſed, and the map of the field will be perfected; for the three ſides of a triangle determine the triangle; whence each triangle on the paper is ſimilar to its correſpondent triangle in the field, and is ſimilarly ſituated; conſequently the whole figure is like to the whole field.

SCHOLIUM.

If the field be ſmall, and all its angles may be ſeen from one ſtation, it may be very well laid down by the plain-table, (by the 24. of this). If the field be larger, and have the requiſite conditions, and great exactneſs is not expected, it likewiſe may be plotted by means of the plain-table, or by the graphometer, (according to the 25. of this; but in fields that are irregular and mountainous, when an exact map is required, we are to make uſe of the graphometer, (as in the 26. of this,) but rarely of the plain-table.

Having protracted the bounding lines, the particular parts contained within them may be laid down by the proper operations for this purpoſe, (delivered in the 26th propoſition; and the method deſcribed in the 27th propoſition may be ſometimes of ſervice;) for we may truſt more to the meaſuring of ſides, than to the obſerving of angles. We are not to compute four-ſided and many ſided figures till they are reſolved into triangles: for the ſides do not determine thoſe figures.

In the laying down of cities, or the like, we may make uſe of any of the methods deſcribed above that may be moſt convenient.

The map being finiſhed, it is transferred on clean paper, by putting the firſt ſketch above it, and marking the angles by the point of a ſmall needle. Theſe points being joined by right lines, and the whole illuminated by colours proper to each part, and the figure of the mariners compaſs being added to diſtinguiſh the north and ſouth, with a ſcale on the margin, the map or plan will be finiſhed and neat.

We have thus briefly and plainly treated of ſurveying, and ſhown by what inſtruments it is performed; having avoided thoſe methods which depend on the magnetic needle, not only becauſe its direction may vary in different places of a field (the contrary of this at leaſt doth not appear,) but becauſe the quantity of an angle obſerved by it cannot be exactly known; for an error of two or three degrees can ſcarcely be avoided in taking angles by it.

As for the remaining part of ſurveying, whereby the area of a field already laid down on paper is found in acres, roods, or any other ſuperficial meaſures; this we leave to the following ſection, which treats of the menſuration of ſurfaces.

“ Beſides the inſtruments deſcribed above, a ſurveyor ought to be provided with an off-ſet ſtaff equal in length to ten links of the chain, and divided into ten equal parts. He ought likewiſe to have ten arrows or ſmall ſtraight ſticks near two feet long, ſhod with iron ferrils. When the chain is firſt opened, it ought to be examined by the off-ſet ſtaff. In meaſuring any line, the leader of the chain is to have the ten arrows at firſt ſetting out. When the chain is ſtretched in the line, and the near end touches the place from which you meaſure, the leader ſticks one of the ten arrows in the ground, at the far end of the chain. Then the leader leaving the arrow, proceeds with the chain another length; and the chain being ſtretched in the line, ſo that the near end touches the firſt arrow, the leader ſticks down another arrow at his end of the chain. The line is preſerved ſtraight, if the arrows be always ſet ſo as to be in a right line with the place you meaſure from, and that to which you are going. In this manner they proceed till the leader have no more arrows. At the eleventh chain, the arrows are to be carried to him again, and he is to ſtick one of them into the ground, at the end of the chain. And the ſame is to be done at the 21. 31. 41. *&c.* chains, if there are ſo many in a right line to be meaſured. In this manner you can hardly commit an error in numbering the chains, unleſs of ten chains at once.

“ The off-ſet ſtaff ſerves for meaſuring readily the diſtances of any things proper to be repreſented in your plan, from the ſtation-line while you go along. Theſe diſtances ought to be entered into your field-book, with the correſponding diſtances from the laſt ſtation, and proper remarks, that you may be enabled to plot them juſtly, and be in no danger of miſtaking one for another when you extend your plan. The field-book may be conveniently divided into five columns. In the middle column the angles at the ſeveral ſtations taken by the theodolite are to be entered, with diſtances from the ſtations. The diſtances taken by the off-ſet ſtaff, on either ſide of the ſtation-line, are to be entered into columns on either ſide of the middle column, according to their poſition with reſpect to that line. The names and characters of the objects, with proper remarks, may be entered in columns on either ſide of theſe laſt.

“ Becauſe, in the place of the graphometer deſcribed by our author, ſurveyors now make uſe of the theodolite, we ſhall ſubjoin a deſcription of Mr Siſſon's lateſt improved theodolite from Mr Gardner's practical ſurveying improved. See a figure of it in Plate XCVI.

“ In this inſtrument, the three ſtaffs, by braſs ferrils at top, ſcrew into bell-metal joints, that are moveable between braſs pillars, fixed in a ſtrong braſs plate; in which, round the centre, is fixed a ſocket with a ball moveable in it, and upon which the four ſcrews preſs, that ſet the limb horizontal: Next above is another ſuch plate, through which the ſaid ſcrews paſs, and on which, round the centre, is fixed a fruſtum of a cone of bell-metal, whoſe axis (being connected with the centre of the bell) is always perpendicular to the limb, by means of a conical braſs ferril fitted to it, whereon is fixed the compaſs-box; and on it the limb, which is a ſtrong bell-metal ring, whereon are moveable three braſs indexes; in whoſe plate are fixed four braſs pillars, that, joining at top, hold the centre pin of the bell-metal double ſextant, whoſe double index is fixed on the centre of the ſame plate: Within the double ſextant is fixed the ſpirit-level, and over it the teleſcope.

“ The compaſs box is graved with two diamonds for north and ſouth, and with 20 degrees on both ſides of each, that the needle may be ſet to the variation, and its error alſo known.

“ The limb has two *fleurs de luce* againſt the diamonds in the box, inſtead of 180 each; and is curiouſly divided into whole degrees, and numbered to the left hand at every ten to twice 180, having three indexes diſtant 120, (with Nonius's diviſions on each for the decimals of a degree), that are moved by a pinion fixed below one of them, without moving the limb; and in another is a ſcrew and ſpring under, to fix it to any part of the limb. It has alſo diviſions numbered, for taking the quarter girt in inches of round timber at the middle height, when ſtanding ten feet horizontally diſtant from its centre; which at 20 muſt be doubled, and at 30 tripled; to which a ſhorter index is uſed, having Nonius's diviſions for the decimals of an inch; but an abatement muſt be made for the bark, if not taken off.

“ The double ſextant is divided on one ſide from under its centre (when the ſpirit-tube and teleſcope are level) to above 60 degrees each way, and numbered at 10, 20, *&c.* and the double index (through which it is moveable) ſhews on the ſame ſide the degree and decimal of any altitude or depreſſion to that extent by Nonius's diviſions: On the other ſide are diviſions numbered, for taking the upright height of timber, *&c.* in feet, when diſtant 10 feet; which at 20 muſt be doubled, and at 30 tripled; and alſo the quantities for reducing hypothenuſal lines to horizontal It is moveable by a pinion fixed in the double index.

“ The teleſcope is a little ſhorter than the diameter of the limb, that a fall may not hurt it; yet it will magnify as much, and ſhew a diſtant object as perfect, as moſt of triple its length. In its focus are very fine croſs wires, whoſe interſection is in the plane of the double ſextant; and this was a whole circle, and turned in a lathe to a true plane, and is fixed at right angles to the limb; ſo that, whenever the limb is ſet horizontal, (which is readily done by making the ſpirit-tube level over two ſcrews, and the like over the other two), the double ſextant and teleſcope are moveable in a vertical plane; and then every angle taken on the limb (though the teleſcope be never ſo much elevated or depreſſed) will be an angle in the plane of the horizon. And this is abſolutely neceſſary in plotting a horizontal plane.

“If the lands to be plotted are hilly, and not in any one plane, the lines meaſured cannot be truly laid down on paper, without being reduced to one plance, which muſt be the horizontal, becauſe angles are taken in that plane.—

“In viewing your objects, if they have much altitude or depreſſion, either write down the degree and decimal ſhewn on the double ſextant, or the links ſhewn on the back ſide; which laſt ſubtracted from every chain in the ſtation-line, leaves the length in the horizontal plane. But if the degree is taken, the following table will ſhew the quantity.

A table of the links to be ſubtracted out of every chain in hypothenuſal lines of ſeveral degrees altitude, or depreſſion, for reducing them to horizontal.

Degrees.	*Links.*	*Degrees.*	*Links.*	*Degrees.*	*Links.*
4,05	$\frac{1}{4}$	14,07	3	23,074	8
5,73	$\frac{1}{2}$	16,26	4	24,495	9
7,02	$\frac{3}{4}$	18,195	5	25,84	10
8,11	1	19,95	6	27,13	11
11,48	2	21,565	7	28,36	12

“Let the firſt ſtation-line really meaſure 1107 links, and the angle of altitude or depreſſion be 19°, 95; looking in the table you will find againſt 19°, 95, is 6 links. Now 6 times 11 is 66; which ſubtracted from 1107, leaves 1041, the true length to be laid down in the plan.

“It is uſeful in ſurveying, to take the angles, which the bounding lines form, with the magnetic needle, in order to check the angles of the figure, and to plot them conveniently afterwards.”

Of the Surfaces of Bodies.

THE ſmalleſt ſuperficial meaſure with us is a ſquare inch; 144 of which make a ſquare foot. Wrights make uſe of theſe in the meaſuring of deals and planks; but the ſquare foot which the glaziers uſe in meaſuring of glaſs, conſiſts only of 64 ſquare inches. The other meaſures are, firſt, the ell ſquare; ſecondly, the fall, containing 36 ſquare ells; thirdly, the rood, containing 40 falls; fourthly, the acre, containing 4 roods. Slaters, maſons, and paviours, uſe the ell-ſquare and the fall; ſurveyors of land uſe the ſquare ell, the fall, the rood, and the acre.

The ſuperficial meaſures of the Engliſh are, firſt, the ſquare foot; ſecondly, the ſquare yard, containing 9 ſquare feet, for their yard contains only 3 feet; thirdly, the pole, containing $30\frac{1}{4}$ ſquare yards; fourthly, the rood, containing 40 poles; fifthly, the acre, containing 4 roods. And hence it is eaſy to reduce our ſuperficial meaſures to the Engliſh, or theirs to ours.

“In order to find the content of a field, it is moſt convenient to meaſure the lines by the chains deſcribed above, p. 693. that of 22 yards for computing the Engliſh acres, and that of 24 Scots ells for the acres of Scotland. The chain is divided into 100 links, and the ſquare of the chain is 10,000 ſquare links; ten ſquares of the chain, or 100,000 ſquare links, give an acre. Therefore, if the area be expreſſed by ſquare links, divide by 100,000, or cut off five decimal places, and the quotient ſhall give the area in acres and decimals of an acre. Write the entire acres apart; but multiply the decimals of an acre by 4, and the product ſhall give the remainder of the area in roods and decimals of a rood. Let the entire roods be noted apart after the acres; then multiply the decimals of a rood by 40, and the product ſhall give the remainder of the area in falls or poles. Let the entire falls or poles be then writ after the roods, and multiply the decimals of a fall by 36, if the area is required in the meaſures of Scotland; but multiply the decimals of a pole by $30\frac{1}{4}$, if the area is required in the meaſures of England, and the product ſhall give the remainder of the area in ſquare ells in the former caſe, but in ſquare yards in the latter. If, in the former caſe, you would reduce the decimals of the ſquare ell to ſquare feet, multiply them by 9.50694; but, in the latter caſe, the decimals of the Engliſh ſquare yard are reduce to ſquare feet, by multiplying them by 9.

“Suppoſe, for example, that the area appears to contain 12.65842 ſquare links of the chain of 24 ells; and that this area is to be expreſſed in acres, roods, falls, *&c.* of the meaſures of Scotland. Divide the ſquare links by 100,000, and the quotient 12.65842 ſhows the area to contain 12 acres $\frac{65842}{100000}$ of an acre. Multiply the decimal part by 4, and the product 2.63368 gives the remainder in roods and decimals of a rood. Thoſe decimals of the rood being multipled by 40, the product gives 25.3472 falls. Multiply the decimals of the fall by 36, and the product gives 12.4992 ſquare ells. The decimals of the ſquare ell multiplied by 9.50994 give 4.7458 ſquare feet. Therefore the area propoſed amounts to 12 acres, 2 roods, 25 falls, 12 ſquare ells, and $4\frac{7458}{10000}$ ſquare feet.

“But if the area contains the ſame number of ſquare links of Gunter’s chain, and is to be expreſſed by Engliſh meaſures, the acres and roods are computed in the ſame manner as in the former caſe. The poles are computed as the falls. But the decimals of the pole, *viz.* $\frac{3472}{10000}$, are to be multiplied by $30\frac{1}{4}$ (or 30.25), and the product gives 10.5028 ſquare yards. The decimals of the ſquare yard, multiplied by 9, give 4.5252 ſquare feet; therefore, in this caſe, the area is in Engliſh meaſure 12 acres, 2 roods, 25 poles, 10 ſquare yards, and $4\frac{5252}{10000}$ ſquare feet.

“The Scots acre is to the Engliſh acre, by ſtatute, as 100,000 to 78,694, if we have regard to the difference betwixt the Scots and Engliſh foot above mentioned. But it is cuſtomary in ſome parts of England

“ to have 18, 21 *&c.* feet to a pole, and 160 ſuch poles “ to an acre; whereas, by the ſtatute, 16$\frac{1}{2}$ feet make a “ pole. In ſuch caſes the acre is greater in the dupli- “ cate ratio of the number of feet to a pole.

“ They who meaſure land in Scotland by an ell of 37 “ Engliſh inches, make the acre leſs than the true Scots “ acre by 593$\frac{6}{10}$ ſquare Engliſh feet, or by about $\frac{1}{93}$ of “ the acre.

“ An huſband-land contains 6 acres of ſock and ſythe- “ land, that is, of land that may be tilled with a plough, “ and mown with a ſythe; 13 acres of arable land make “ an oxgang or oxengate; four oxengate make a pound- “ land of old extent (by a decree of the Exchequer, “ March 11. 1585), and is called *librata terræ.* A “ forty-ſhilling land of old extent contains eight oxgang, “ or 104 acres.

“ The arpent, about Paris, contains 32400 ſquare Pa- “ ris feet, and is equal to 2$\frac{2}{3}$ Scots roods, or $\frac{37}{100}$ Eng- “ liſh roods.

“ The *actus quadratus*, according to Varro, Collu- “ mella, *&c.* was a ſquare of 120 Roman feet. The “ *jugerum* was the double of this. It is to the Scots a- “ cre as 10,000 to 20,456, and to the Engliſh acre as “ 10,000 to 16,097. It was divided (like the *as*) into “ 12 *unciæ*, and the *uncia* into 24 *ſcrupula*.”—This, with the three preceding paragraphs, are taken from an ingenious manuſcript, written by Sir Robert Stewart profeſſor of natural philoſophy. The greateſt part of the table in p. 693. was taken from it likewiſe.

PROPOSITION XXVIII.

FIG. 12. *To find out the area of a rectangular parallelogram* ABCD.—Let the ſide AB, for example, be 5 feet long, and BC (which conſtitutes with BA a right angle at B) be 17 feet. Let 17 be multiplied by 5, and the product 85 will be the number of ſquare feet in the area of the figure ABCD. But if the parallelogram propoſed is not rectangular as BEFC, its baſe BC multiplied into its perpendicular height AB (not into its ſide BE) will give its area. This is evident from art. 68. of part 1.

PROPOSITION XXIX.

FIG. 13. *To find the area of a given triangle.*—Let the triangle BAC be given, whoſe baſe BC is ſuppoſed 9 feet long: let the perpendicular AD be drawn from the angle A oppoſite to the baſe, and let us ſuppoſe AD to be four feet. Let the half of the perpendicular be multiplied into the baſe, or the half of the baſe into the perpendicular, or take the half of the product of the whole baſe into the perpendicular, the product gives 18 ſquare feet for the area of the given triangle.

But if only the ſides are given, the perpendicular is found either by protracting the triangle, or by 12th and 13th 2. Eucl. or by trigonometry. But how the area of a triangle may may be found from the given ſides only, ſhall be ſhewn in the 31ſt prop.

PROPOSITION XXX.

FIG. 14. *To find the area of any rectilineal figure.*—If the figure be irregular, let it be reſolved into triangles; and drawing perpendiculars to the baſes in each of them, let the area of each triangle be found by the preceding prop. and the ſum of theſe areas will give the area of the figure.

SCHOLIUM 1.

In meaſuring boards, planks, and glaſs, their ſides are to be meaſured by a foot-rule divided into 100 equal parts; and after multiplying the ſides, the decimal fractions are eaſily reduced to leſſer denominations. The menſuration of theſe is eaſy, when they are rectangular parallelograms.

SCHOLIUM 3.

If a field is to be meaſured, let it firſt be plotted on paper, by ſome of the methods above deſcribed, and let the figure ſo laid down be divided into triangles, as was ſhown in the preceding propoſition.

The baſe of any triangle, or the perpendicular upon the baſe, or the diſtance of any two points of the field, is meaſured by applying it to the ſcale according to which the map is drawn.

SCHOLIUM 3.

But if the field given be not in a horizontal plane, but uneven and mountainous, the ſcale gives the horizontal line between any two points, but not their diſtance meaſured on the uneven ſurface of the field. And indeed it would appear, that the horizontal plane is to be accounted the area of an uneven and hilly country. For if ſuch ground is laid out for building on, or for planting with trees, or bearing corn, ſince theſe ſtand perpendicular to the horizon, it is plain, that a mountainous country cannot be conſidered as of greater extent for thoſe uſes than the horizontal plane; nay, perhaps, for nouriſhing of plants, the horizontal plane may be preferable.

If, however, the area of a figure, as it lies regularly on the ſurface of the earth, is to be meaſured, this may be eaſily done by reſolving it into triangles as it lies. The ſum of their areas will be the area ſought; which exceeds the area of the horizontal figure more or leſs, according as the field is more or leſs uneven.

PROPOSITION XXXI.

FIG. 13. *The ſides of a triangle being given, to find the area, without finding the perpendicular.*—Let all the ſides of the triangle be collected into one ſum; from the half of which let the ſides be ſeparately ſubtracted, that three differences may be found betwixt the foreſaid half ſum and each ſide; then let theſe three differences and the half ſum be multiplied into one another, and the ſquare root of the product will give the area of the triangle. For example, let the ſides be 10, 17, 21; the half of their ſum is 24; the three differences betwixt this half ſum and the three ſides, are 14, 7, and 3. The firſt being multiplied by the ſecond, and their product by the third, we have 294 for the product of the differences; which multiplied by the foreſaid half ſum 24, gives 7056; the ſquare root of which 84 is the area of the triangle. The demonſtration of this, for the ſake of brevity, we omit. It is to be found in ſeveral treatiſes, particularly in Clavius's Practical Geometry.

PROPOSITION XXXII.

FIG. 15. *The area of the ordinate figure* ABEFGH *is equal to the product of the half circumference of the polygon, multiplied into the perpendicular drawn from the centre of the circumſcribed circle to the ſide of the polygon.*—For the ordinate figure can be reſolved into as many equal triangles, as there are ſides of the

figure; and ſince each triangle is equal to the product of half the baſe into the perpendicular, it is evident that the ſum of all the triangles together, that is the polygon, is equal to the product of half the ſum of the baſes (that is the half of the circumference of the polygon) into the common perpendicular height of the triangles drawn from the centre C to one of the ſides; for example, to AB.

PROPOSITION XXXIII.

FIG. 16. *The area of a circle is found by multiplying the half of the periphery into the radius: or the half of the radius into the periphery.*—For a circle is not different from an ordinate or regular polygon of an infinite number of ſides, and the common height of the triangles into which the polygon or circle may be ſuppoſed to be divided is the radius of the circle.

Were it worth while, it were eaſy to demonſtrate accurately this propoſition, by means of the inſcribed and circumſcribed figures, as is done in the 5th prop. of the treatiſe of Archimedes concerning the dimenſions of the circle.

COROLLARY.

Hence alſo it appears, that the area of the ſector ABCD is produced by multiplying the half of the arc into the radius, and likewiſe that the area of the ſegment of the circle ADC is found by ſubtracting from the area of the ſector the area of the triangle ABC.

PROPOSITION XXXIV.

FIG. 17. *The circle is to the ſquare of the diameter, as 11 to 14 nearly.*—For if the diameter AB be ſuppoſed to be 7, the circumference AHBK will be almoſt 22 (by the 22d prop. of this part), and the area of the ſquare DC will be 49; and, by the preceding prop. the area of the circle will be $38\frac{1}{2}$: therefore the ſquare DC will be to the inſcribed circle as 49 to $38\frac{1}{2}$, or as 98 to 77, that is, as 14 to 11. *Q. E. D.*

If greater exactneſs is required, you may proceed to any degree of accuracy: for the ſquare DC is to the inſcribed circle, as 1 to $1-\frac{1}{3}+\frac{1}{5}-\frac{1}{7}+\frac{1}{9}-\frac{1}{11}+\frac{1}{13}$, *&c. in infinitum.*

" This ſeries will be of no ſervice for computing the " area of the circle accurately, without ſome further ar- " tifice, becauſe it converges at too ſlow a rate. The " area of the circle will be found exactly enough for " moſt purpoſes, by multiplying the ſquare of the dia- " meter by 7854, and dividing by 10,000, or cutting " off four decimal places from the product; for the area " of the circle is to the circumſcribed ſquare nearly as " 7854 to 10,000."

PROPOSITION XXXV.

FIG. 18. *To find the area of a given ellipſe.*—Let ABCD be an ellipſe, whoſe greater diameter is BD, and the leſſer AC, biſecting the greater perpendicularly in E. Let a mean proportional HF be found (by 13th 6. Eucl.) between AC and BD, and (by the 33d of this) find the area of the circle deſcribed on the diameter HF. This area is equal to the area of the ellipſe ABCD. For becauſe, as BD to AC, ſo the ſquare of BD to the ſquare of HF, (by 2. cor. 20th 6. Eucl.): but (by the 2d 12. Eucl.) as the ſquare of BD to the ſquare of HF, ſo is the circle of the diameter BD to the circle of the diameter HF: therefore as BD to AC, ſo is the circle of the diameter BD to the circle of the diameter HF. And (by the 5th prop. of Archimedes of ſpheroids) as the greater diameter BD to the leſſer AC, ſo is the circle of the diameter BD to the ellipſe ABCD. Conſequently (by the 11th 5. Eucl.) the circle of the diameter BD will have the ſame proportion to the circle of the diameter HF, and to the ellipſe ABCD. Therefore, (by 9th 5. Eucl.) the area of the circle of the diameter HF will be equal to the area of the ellipſe ABCD. *Q. E. D.*

SCHOLIUM.

From this and the two preceding propoſitions, a method is derived of finding the area of an ellipſe. There are two ways: 1ſt, Say, as one is to the leſſer diameter, ſo is the greater diameter to a fourth number, (which is found by the rule of three.) Then again ſay, as 14 to 11, ſo is the 4th number found to the area ſought. But the ſecond way is ſhorter. Multiply the leſſer diameter into the greater, and the product by 11; then divide the whole product by 14, and the quotient will be the area ſought of the ellipſe. For example, Let the greater diameter be 10, and the leſſer 7; by multiplying 10 by 7, the product is 70; and multiplying that by 11, it is 770; and dividing 770 by 14, the quotient will be 55, which is the area of the ellipſe ſought.

" The area of the ellipſe will be found more accurate- " ly, by multiplying the product of the two diameters " by 7854."

We ſhall add no more about other plain ſurfaces, whether rectilinear or curvilinear, which ſeldom occur in practice; but ſhall ſubjoin ſome propoſitions about meaſuring the ſurfaces of ſolids.

PROPOSITION XXXVI.

To meaſure the ſurface of any priſm.—By the 14th definition of the 11th Eucl. a priſm is contained by planes, of which two oppoſite ſides (commonly called the baſes) are plain rectilineal figures; which are either regular and ordinate, and meaſured by prop. 32. of this; or however irregular, and then they are meaſured by the 38th prop. The other ſides are parallelograms, which are meaſured by prop. 28th; and the whole ſuperficies of the priſm conſiſts of the ſum of thoſe taken altogether.

PROPOSITION XXXVII.

To meaſure the ſuperficies of any pyramid.—Since its baſis is a rectilinear figure, and the reſt of the planes terminating in the top of the pyramid are triangles; theſe meaſured ſeparately, and added together, give the ſurface of the pyramid required.

PROPOSITION XXXVIII.

To meaſure the ſuperficies of any regular body.—Theſe bodies are called regular, which are bounded by equilateral and equiangular figures. The ſuperficies of the tetraedron conſiſts of four equal and equiangular triangles; the ſuperficies of the hexaedron, or cube, of ſix equal ſquares; an octedron, of eight equal equilateral triangles; a dodecaedron, of twelve equal and ordinate pentagons; and the ſuperficies of an icoſiædron, of twenty equal and equilateral triangles. Therefore it will be eaſy to meaſure theſe ſurfaces from what has been already ſhown.

In the ſame manner we may meaſure the ſuperficies of a ſolid contained by any planes.

PROPOSITION XXXIX.

Fig. 19. *To meaſure the ſuperficies of a cylinder.*—Becauſe a cylinder differs very little from a priſm, whoſe oppoſite planes (or baſes) are ordinate figures of an infinite number of ſides, it appears that the ſuperficies of a cylinder, without the baſes, is equal to an infinite number of parallelograms; the common altitude of all which is the ſame with the height of the cylinder, and the baſes of them all differ very little from the periphery of the circle which is the baſe of the cylinder. Therefore this periphery multiplied into the common height, gives the ſuperficies of the cylinder, excluding the baſes; which are to be meaſured ſeparately by the help of the 33d prop.

This propoſition concerning the meaſure of the ſurface of the cylinder (excluding its baſis) is evident from this, that when it is conceived to be ſpread out, it becomes a parallelogram, whoſe baſe is the periphery of the circle of the baſe of the cylinder ſtretched into a right line, and whoſe height is the ſame with the height of the cylinder.

PROPOSITION XL.

Fig. 20. *To meaſure the ſurface of a right cone.*—The ſurface of a right cone is very little different from the ſurface of a right pyramid, having an ordinate polygon for its baſe of an infinite number of ſides; the ſurface of which (excluding the baſe) is equal to the ſum of the triangles. The ſum of the baſes of theſe triangles is equal to the periphery of the circle of the baſe, and the common height of the triangles is the ſide of the cone AB; wherefore the ſum of theſe triangles is equal to the product of the ſum of the baſes (*i.e.* the periphery of the baſe of the cone) multiplied into the half of the common height, or it is equal to the product of the periphery of the baſe.

If the area of the baſe is likewiſe wanted, it is to be found ſeparately by the 33d prop. If the ſurface of a cone is ſuppoſed to be ſpread out on a plane, it will become a ſector of a circle, whoſe radius is the ſide of the cone; and the arc terminating the ſector is made from the periphery of the baſe. Whence, by corol. 33d prop. of this, its dimenſion may be found.

COROLLARY.

Hence it will be eaſy to meaſure the ſurface of a *fruſtum* of a cone cut by a plane parallel to the baſe.

PROPOSITION XLI.

Fig. 21. *To meaſure the ſurface of a given ſphere.*—Let there be a ſphere, whoſe centre is A, and let the area of its convex ſurface be required. Archimedes demonſtrates (37. prop. 1. book of the ſphere and cylinder) that its ſurface is equal to the area of four great circles of the ſphere; that is, let the area of the great circle be multiplied by 4, and the product will give the area of the ſphere; or, (by the 20th 6. and 2d 12 of Eucl.) the area of the ſphere given is equal to the area of a circle whoſe radius is the right line BC, the diameter of the ſphere. Therefore having meaſured (by 33d prop) the circle deſcribed with the radius BC, this will give the ſurface of the ſphere.

PROPOSITION XLII.

Fig. 22. *To meaſure the ſurface of a ſegment of a ſphere.*—Let there be a ſegment cut off by the plane ED. Archimedes demonſtrates (49, and 50. 1 *De ſphæra*) that the ſurface of this ſegment, excluding the circular baſe, is equal to the area of a circle whoſe radius is the right line BE drawn from the vertex B of the ſegment to the periphery of the circle DE. Therefore, (by the 33d prop.) it is eaſily meaſured.

COROLLARY 1.

Hence that part of the ſurface of a ſphere that lieth between two parallel planes is eaſily meaſured, by ſubtracting the ſurface of the leſſer ſegment from the ſurface of the greater ſegment.

COROLLARY 2.

Hence likewiſe it follows, that the ſurface of a cylinder, deſcribed about a ſphere (excluding the baſis) is equal to the ſurface of the ſphere, and the parts of the one to the parts of the other, intercepted between planes parallel to the baſis of the cylinder.

Of Solid Figures and their Menſuration, comprehending likewiſe the Principles of gauging Veſſels of all Figures.

As in the former part of this treatiſe we took an inch for the ſmalleſt meaſure in length, and an inch ſquare for the ſmalleſt ſuperficial meaſure; ſo now, in treating of the menſuration of ſolids, we take a cubical inch for the ſmalleſt ſolid meaſure. Of theſe 109 make a Scots pint; other liquid meaſures depend on this, as is generally known.

In dry meaſures, the firlot, by ſtatute, contains 19½ pints; and on this depend the other dry meaſures: therefore, if the content of any ſolid be given in cubical inches, it will be eaſy to reduce the ſame to the common liquid or dry meaſures, and converſely to reduce theſe to ſolid inches. The liquid and dry meaſures, in uſe among other nations, are known from their writers.

“ As to the Engliſh liquid meaſures, by act of parliament 1706, any round veſſel, commonly called a cylinder, having an even bottom, being ſeven inches in diameter throughout, and ſix inches deep from the top of the inſide to the bottom, (which veſſel will be found by computation to contain 230 $\frac{907}{1000}$ cubical inches), or any veſſel containing 231 cubical inches, and no more, is deemed to be a lawful wine-gallon. An Engliſh pint therefore contains 28⅞ cubical inches; two pints make a quart; four quarts a gallon; 18 gallons a roundlet; three roundlets and an half, or 63 gallons, make a hogſhead; the half of a hogſhead is a barrel: one hogſhead and a third, or 84 gallons, make a puncheon; one puncheon and a half, or two hogſheads, or 126 gallons, make a pipe or butt; the third part of a pipe, or 42 gallons, make a tierce; two pipes, or three puncheons, or four hogſheads, make a ton of wine. Though the Engliſh wine gallon is now fixed at 231 cubical inches, the ſtandard kept in Guildhall being meaſured, before many perſons of diſtinction, May 25th 1688, it was found to contain only 224 ſuch inches.

“ In the Engliſh beer meaſure, a gallon contains 282 cubical inches; conſequently 35¼ cubical inches make a pint, two pints make a quart, four quarts make a gallon, nine gallons a firkin, four firkins a barrel. In ale, eight gallons make a firkin, and 32 gallons make a barrel. By an act of the firſt of William and Mary, 34 gallons is the barrel, both for beer and ale, in all places, except within the weekly bills of mortality.

“In Scotland it is known that four gills make a mutchkin, two mutchkins make a chopin; a pint is two chopins; a quart is two pints; and a gallon is four quarts, or eight pints. The accounts of the cubical inches contained in the Scots pint vary conſiderably from each other. According to our author, it contains 109 cubical inches. But the ſtandard-jugs kept by the dean of guild of Edinburgh (one of which has the year 1555, with the arms of Scotland, and the town of Edinburgh, marked upon it) having been carefully meaſured ſeveral times, and by different perſons, the Scots pint, according to thoſe ſtandards, was found to contain about $103\frac{4}{10}$ cubic inches. The pewterers jugs (by which the veſſels in common uſe are made) are ſaid to contain ſometimes betwixt 105 and 106 cubic inches. A caſk that was meaſured by the brewers of Edinburgh, before the commiſſioners of Exciſe in 1707, was found to contain $46\frac{7}{8}$ Scots pints; the ſame veſſel contained $18\frac{1}{16}$ Engliſh ale-gallons. Suppoſing this menſurating to be juſt, the Scots pint will be to the Engliſh ale-gallon as 289 to 750; and if the Engliſh ale-gallon be ſuppoſed to contain 282 cubical inches, the Scots pint will contain 108.664 cubical inches. But it is ſuſpected, on ſeveral grounds, that the experiment was not made with ſufficient care and exactneſs.

“The commiſſioners appointed by authority of parliament to ſettle the meaſures and weights, in their act of February 19. 1618, relate, That having cauſed fill the Linlithgow firlot with water, they found that it contained $21\frac{1}{4}$ pints of the juſt Stirling jug and meaſure. They likewiſe ordain that this ſhall be the juſt and only firlot; and add, *That the wideneſs and breadneſs of the which firlot, under and above even over within the buirds, ſhall contain nineteen inches and the ſixth part of an inch, and the deepneſs ſeven inches and a third part of an inch.* According to this act (ſuppoſing their experiment and computation to have been accurate) the pint contained only 99.56 cubical inches; for the content of ſuch a veſſel as is deſcribed in the act, is 2115.85, and this divided by $21\frac{1}{4}$ gives 99.56. But, by the weight of water ſaid to fill this firlot in the ſame act, the meaſure of the pint agrees nearly with the Edinburgh ſtandard above mentioned.

“As for the Engliſh meaſures of corn, the Wincheſter gallon contains $272\frac{1}{4}$ cubical inches; two gallons make a peck; four pecks, or eight gallons (that is 2178, cubical inches) make a buſhel; and a quarter is eight buſhels.

“Our author ſays, that $19\frac{1}{2}$ Scots pints make a firlot. But this does not appear to be agreeable to the ſtatute above mentioned, nor to the ſtandard-jugs. It may be conjectured that the proportion aſſigned by him has been deduced from ſome experiment of how many pints, according to common uſe, were contained in the firlot. For if we ſuppoſe thoſe pints to have been each of 108.664 cubical inches, according to the experiment made in the 1707 before the commiſſioners of exciſe, deſcribed above; then $19\frac{1}{2}$ ſuch pints will amount to 2118.94, cubical inches; which agrees nearly with 2115.85, the meaſure of the firlot by ſtatute above mentioned. But it is probable, that in this he followed the act 1587, where it is ordained, That the wheat-firlot ſhall contain 19 pints and two joucattes. A wheat-firlot marked with the Linlithow ſtamps being meaſured, was found to contain about 2211 cubical inches. By the ſtatute of 1618 the barley-firlot was to contain 31 pints of the juſt Stirling-jug.

“A Paris pint is 48 cubical Paris inches, and is nearly equal to an Engliſh wine-quart. The *Boiſſean* contains 644.68099 Paris cubical inches, or 780.36 Engliſh cubical inches.

“The Roman *amphora* was a cubical Roman foot, the *congius* was the eighth part of the *amphora*, the *ſextarius* was one ſixth of the *congius*. They divided the *ſextarius* like the *as* or *libra*. Of dry meaſures, the *medimnus* was equal to two amphoras, that is, about $1\frac{11}{25}$ Engliſh legal buſhels; and the *modius* was the third part of the *amphora*.”

PROPOSITION XLIII.

To find the ſolid content of a given priſm.—By the 29th prop. let the area of the baſe of the priſm be meaſured, and be multiplied by the height of the priſm, the product will give the ſolid content of the priſm.

PROPOSITION XLIV.

To find the ſolid content of a given pyramid.—The area of the baſe being found, (by the 30th prop.) let it be multiplied by the third part of the height of the pyramid, or the third part of the baſe by the height, the product will give the ſolid content, by 7th 12. Eucl.

COROLLARY.

If the ſolid content of a *fruſtum* of a pyramid is required, firſt let the ſolid content of the entire pyramid be found; from which ſubtract the ſolid content of the part that is wanting, and the ſolid content of the broken pyramid will remain.

PROPOSITION XLV.

To find the content of a given cylinder.—The area of the baſe being found by prop. 33. if it be a circle, and by prop. 35. if it be an ellipſe, (for in both caſes it is a cylinder,) multiply it by the height of the cylinder, and the ſolid content of the cylinder will be produced.

COROLLARY.

FIG. 23. And in this manner may be meaſured the ſolid content of veſſels and caſks not much different from a cylinder, as ABCD. If towards the middle EF it be ſomewhat groſſer, the area of the circle of the baſe being found (by 33d prop.) and added to the area of the middle circle EF, and the half of their ſum (that is, an arithmetical mean between the area of the baſe and the area of the middle circle) taken for the baſe of the veſſel, and multiplied into its height, the ſolid content of the given veſſel will be produced.

Note, That the length of the veſſel, as well as the diameters of the baſe, and of the circle EF, ought to be taken within the ſtaves; for it is the ſolid content within the ſtaves that is ſought.

PROPOSITION XLVI.

To find the ſolid content of a given cone.—Let the area of the baſe (found by prop. 33.) be multiplied into $\frac{1}{3}$ of the height, the product will give the ſolid content of the cone; for by the 10th 12. Eucl. a cone is the third part of a cylinder that has the ſame baſe and height.

PROPOSITION XLVII.

FIG. 24. 25. *To find the ſolid content of a* fruſtum *of a cone cut by a plane parallel to the plane of the baſe.*—Firſt, let the height of the entire cone be found, and thence (by the preceding prop.) its ſolid content; from which ſubtract the ſolid content of the cone cut off at the top, there will remain the ſolid content of the *fruſtum* of the cone.

How the content of the entire cone may be found, appears thus: Let ABCD be the *fruſtum* of the cone (either right or ſcalenous, as in the figures 2. and 3.) let the cone ECD be ſuppoſed to be compleated; let AG be drawn parallel to DE, and let AH and EF be perpendicular on CD; it will be (by 2d 6. Eucl.) as CG:CA::CD:CE; but (by art. 72. of part. 1.) as CA:AH::CE:EF; conſequently (by 22d 5. Eucl.) as CG:AH::CD:FF; that is, as the exceſs of the diameter of the leſſer baſe is to the height of the *fruſtum*, ſo is the diameter of the greater báſe to the height of the entire cone.

COROLLARY.

FIG. 26. Some caſks whoſe ſtaves are remarkably bended about the middle, and ſtrait towards the ends, may be taken for two portions of cones, without any conſiderable error. Thus ABEF is a *fruſtum* of a right cone, to whoſe baſe EF, on the other ſide, there is another ſimilar *fruſtum* of a cone joined, EDCF. The vertices of theſe cones, if they be ſuppoſed to be completed, will be found at G and H. Whence, (by the preceding prop.) the ſolid content of ſuch veſſels may be found.

PROPOSITION XLVIII.

FIG. 27. A cylinder circumſcribed about a ſphere, that is, having its baſe equal to a great circle of the ſphere, and its height equal to the diameter of the ſphere, is to the ſphere as 3 to 2.

Let ABEC be the quadrant of a circle, and ABDC the circumſcribed ſquare; and likewiſe the triangle ADC; by the revolution of the figure about the right line AC, as axis, a hemiſphere will be generated by the quadrant, a cylinder of the ſame baſe and height by the ſquare, and a cone by the triangle. Let theſe three be cut any how by the plane HF, parallel to the baſe AB; the ſection in the cylinder will be a circle whoſe radius is FH, in the hemiſphere a circle of the radius EF, and in the cone a circle of the radius GF.

By (art. 69. of part 1.) EA*q*, or HF*q*=EF*q* and FA*q* taken together, (but AF*q*=FG*q*, becauſe AC=CD); therefore the circle of the radius HF is equal to a circle of the radius EF together with a circle of the radius GF; and ſince this is true every where, all the circles together deſcribed by the reſpective *radii* HF (that is, the cylinder) are equal to all the circles deſcribed by the reſpective *radii* EF and FG (that is, to the hemiſphere and the cone taken together); but, (by the 10th 12. Eucl.) the the cone generated by the triangle DAC is one third part of the cylinder generated by the ſquare BC. Whence it follows, that the hemiſphere generated by the rotation of the quadrant ABEC is equal to the remaining two third parts of the cylinder, and that the whole ſphere is $\frac{2}{3}$ of the double cylinder circumſcribed about it.

This is that celebrated 39th prop. 1. book of Archimedes of the ſphere and cylinder; in which he determines the proportion of the cylinder to the ſphere inſcribed to be that of 3 to 2.

COROLLARY.

Hence it follows, that the ſphere is equal to a cone whoſe height is equal to the ſemidiameter of the ſphere, having for its baſe a circle equal to the ſuperficies of the ſphere, or to four great circles of the ſphere, or to a circle whoſe radius is equal to the diameter of the ſphere, (by prop. 41. of this.) And indeed a ſphere differs very little from the ſum of an infinite number of cones that have their baſes in the ſurface of the ſphere, and their common vertex in the centre of the ſphere; ſo that the ſuperficies of the ſphere, (of whoſe dimenſion ſee prop. 41. of this) multiplied into the third part of the ſemidiameter, gives the ſolid content of the ſphere.

PROPOSITION XLIX.

FIG. 28. *To find the ſolid content of a ſector of the ſphere.*—A ſpherical ſector ABC (as appears by the cor. of the preceding prop.) is very little different from an infinite number of cones, having their baſes in the ſuperficies of the ſphere BEC, and their common vertex in the centre. Wherefore the ſpherical ſuperficies BEC being found (by prop. 42. of this), and multiplied into the third part of AB the radius of the ſphere, the product will give the ſolid content of the ſector ABC.

COROLLARY.

It is evident how to find the ſolidity of a ſpherical ſegment leſs than a hemiſphere, by ſubtracting the cone ABC from the ſector already found. But if the ſpherical ſegment be greater than a hemiſphere, the cone correſponding muſt be added to the ſector, to make the ſegment.

PROPOSITION L.

FIG. 29. *To find the ſolidity of the ſpheroid, and of its ſegments cut by planes perpendicular to the axis.*—

In prop. 44. of this, it is ſhewn, that every where EH : EG :: CF : CD; but circles are as the ſquares deſcribed upon their rays, that is, the circle of the radius EH is to the circle of the radius EG, as CF*q* to CD*q*. And ſince it is ſo every where, all the circles deſcribed with the reſpective rays EH, (that is, the ſpheroid made by the rotation of the ſemi-ellipſes AFB around the axis AB) will be to all the circles deſcribed by the reſpective *radii* EG, (that is, the ſphere deſcribed by the rotation of the ſemicircle ADB on the axis AB) as FC*q* to CD*q*; that is, as the ſpheroid to the ſphere on the ſame axis, ſo is the ſquare of the other axis of the generating ellipſe to the ſquare of the axis of the ſphere.

And this holds, whether the ſpheroid be found by a revolution around the greater or leſſer axis.

COROLLARY 1.

Hence it appears, that the half of the ſpheroid, formed by the rotation of the ſpace AHFC around the axis AC, is double of the cone generated by the triangle AFC about the ſame axis; which is the 32d prop. of Archimedes of conoids and ſpheroids.

COROLLARY 2.

Hence, likewiſe, is evident the meaſure of ſegments of the ſpheroid cut by planes perpendicular to the axis. For the ſegment of the ſpheroid made by the rotation of the ſpace ANHE, round the axis AE, is to the ſegment of the ſphere having the ſame axis AC, and made by the rotation of the ſegment of the circle AMGE, as CF*q* to CD*q*.

But if the meaſure of this ſolid be wanted with leſs labour, by the 34th prop. of Archimedes of conoids and ſpheroids, it will be as BE to AC+EB; ſo is the cone generated by the rotation of the triangle AHE round the axis AE, to the ſegment of the ſphere made by the rotation of the ſpace ANHE round the ſame axis AE; which could eaſily be demonſtrated by the method of indiviſibles.

COROLLARY 3.

Hence it is eaſy to find the ſolid content of the ſegment of a ſphere or ſpheroid intercepted between two parallel planes, perpendicular to the axis. This agrees as well to the oblate as to the oblong ſpheroid; as is obvious.

COROLLARY 4.

FIG. 30. If a caſk is to be valued as the middle piece of an oblong ſpheroid, cut by the two planes DC and FG, at right angles to the axis: firſt, let the ſolid content of the half ſpheroid ABCED be meaſured by the preceding prop. from which let the ſolidity of the ſegment DEC be be ſubtracted, and there will remain the ſegment ABCD; and this doubled will give the capacity of the caſk required.

The following method is generally made uſe of for finding the ſolid content of ſuch veſſels. The double area of the greateſt circle, that is, of that which is deſcribed by the diameter AB at the middle of the caſk, is added to the area of the circle at the end, that is, of the circle DC or FG (for they are uſually equal), and the third part of this ſum is taken for a mean baſe of the caſk; which therefore multiplied into the length of the caſk OP, gives the content of the veſſel required

Sometimes veſſels have other figures, different from thoſe we have mentioned; the eaſy methods of meaſuring which may be learned from thoſe who practiſe this art. What hath already been delivered, is ſufficient for our purpoſe.

PROPOSITION LI

FIG. 31. and 32. *To find how much is contained in a veſſel that is in part empty, whoſe axis is parallel to the horizon.*—Let AGBH be the great circle in the middle of the caſk, whoſe ſegment GBH is filled with liquor, the ſegment GAH being empty; the ſegment GBH is known, if the depth EB be known, and EH a mean proportional between the ſegments of the diameter AB and EB; which are found by a rod or ruler put into the veſſel at the orifice. Let the baſis of the caſk, at a medium, be found, which ſuppoſe to be the circle CKDL; and let the ſegment KCL be ſimilar to the ſegment GAH (which is either found by the rule of three, becauſe as the circle AGBH is to the circle CKDL, ſo is the ſegment GAH to the ſegment KCL; or is found from the tables of ſegments made by authors); and the product of this ſegment multiplied by the length of the caſk will give the liquid content remaining in the caſk.

PROPOSITION LII.

To find the ſolid content of a regular and ordinate body.—A tetraedron being a pyramid, the ſolid content is found by the 44th prop. The hexaedron, or cube, being a kind of priſm, it is meaſured by the 43d prop. An octaedron conſiſts of two pyramids of the ſame ſquare baſe and of equal heights; conſequently its meaſure is found by the 44th prop. A dodecaedron conſiſts of twelve pyramids having equal equilateral and equiangular pentagonal baſes; and ſo one of theſe being meaſured (by the 44th prop. of this) and multiplied by 12, the product will be equal to the ſolid content of the dodecaedron. The icoſiaedron conſiſts of 20 equal pyramids having triangular baſes; the ſolid content of one of which being found (by the 44th prop.) and multiplied by 20, gives the whole ſolid. The baſes and heights of theſe pyramids, if you want to proceed more exactly, may be found by trigonometry. See TRIGONOMETRY.

PROPOSITION LIII.

To find the ſolid content of a body however irregular.—Let the given body be immerſed into a veſſel of water, having the figure of a parallelopipedon or priſm, and let it be noted how much the water is raiſed upon the immerſion of the body. For it is plain, that the ſpace which the water fills, after the immerſion of the body, exceeds the ſpace filled before its immerſion, by a ſpace equal to the ſolid content of the body, however irregular. But when this exceſs is of the figure of a parallelopipedon or priſm, it is eaſily meaſured by the 43d prop. of this, *viz.* by multiplying the area of the baſe, or mouth of the veſſel, into the difference of the elevations of the water before and after immerſion. Whence is found the ſolid content of the body given.

In the ſame way the ſolid content of a part of a body may be found, by immerſing that part only in water.

There is no neceſſity to inſiſt here on diminiſhing or enlarging ſolid bodies in a given proportion. It will be eaſy to deduce theſe things from the 11th and 12th books of Euclid.

" The following rules are ſubjoined for the ready computation of the contents of veſſels, and of any ſolids in the meaſures in uſe in Great Britain

" I. To find the content of a cylindric veſſel in Engliſh wine-gallons, the diameter of the baſe and altitude of the veſſel being given in inches and decimals of an inch.

" Square the number of inches in the diameter of the veſſel; multiply this ſquare by the number of inches in the height: then multiply the product by the decimal fraction ,0034; and this laſt product ſhall give the content in wine-gallons and decimals of ſuch a gallon. To expreſs the rule arithmetically; let D repreſent the number of inches and decimals of an inch in the diameter of the veſſel, and H the inches and decimals of an inch in the height of the veſſel; then the content in wine-gallons ſhall be DDH×$\frac{34}{10000}$, or DDH×.0034. *Ex.* Let the diameter D=51.2 inches, the height H=62.3 inches, then the content ſhall be 51.2 × 51.2 × 62.3 × .0034 = 555.27.342 wine-gallons. This rule follows from prop. 33. and 45. for, by the former, the area of the baſe of the veſſel is in ſquare inches DD×.7854; and by the latter, the content of the veſſel in ſolid inches is DDH×.7854; which divided by 231 (the number of cubical inches in a wine-gallon) gives DDH ×0034, the content in wine-gallons. But though the charges in the exciſe are made (by ſtatute) on the ſuppoſition that the wine-gallon contains 231 cubical inches; yet it is ſaid, that in ſale, 224 cubical inches, the content of the ſtandard meaſured at Guildhall (as was mentioned above) are allowed to be a wine-gallon.

“ II. Suppoſing the Engliſh ale-gallon to contain 282 cubical inches, the content of a cylindric veſſel is computed in ſuch gallons, by multiplying the ſquare of the diameter of a veſſel by its height as formerly, and their product by the decimal fraction .0,027,851: that is, the ſolid content in ale-gallons is DDH× .0,027,851.

“ III. Suppoſing the Scots pint to contain about 103.4 cubical inches, (which is the meaſure given by the ſtandards at Edinburgh, according to experiments mentioned above), the content of a cylindric veſſel is computed in Scots pints, by multiplying the ſquare of the diameter of the veſſel by its height, and the product of theſe by the decimal fraction 0076. Or the content of ſuch a veſſel in Scots pints is DDH×.0076.

“ Suppoſing the Wincheſter buſhel to contain 2187 cubical inches, the content of a cylindric veſſel is computed in thoſe buſhels by multiplying the ſquare of the diameter of the veſſel by the height, and the product by the decimal fraction .0,003,606. But the ſtandard buſhel having been meaſured by Mr Everard and others in 1696, it was found to contain only 2145.6 ſolid inches; and therefore it was enacted in the act for laying a duty upon malt, *That every round buſhel, with a plain and even bottom, being* 18$\frac{1}{2}$ *inches diameter throughout, and* 8 *inches deep, ſhould be eſteemed a legal* Wincheſter *buſhel*. According to this act (ratified in the firſt year of Queen Anne) the legal Wincheſter buſhel contains only 2150.42 ſolid inches. And the content of a cylindric veſſel is computed in ſuch buſhels, by multiplying the ſquare of the diameter by the height, and their product by the decimal fraction .0,003,625. Or the content of the veſſel in thoſe buſhels is DDH × .0,003,625.

“ V. Suppoſing the Scots wheat firlot to contain 21$\frac{1}{2}$ Scots pints, (as is appointed by the ſtatute 1618), and the pint to be conform to the Edinburgh ſtandards above mentioned, the content of a cylindric veſſel in ſuch firlots is computed by multiplying the ſquare of the diameter by the height, and their product by the decimal fraction .00,358. This firlot, in 1426, is appointed to contain 17 pints; in 1457, it was appointed to contain 18 pints; in 1587, it is 19$\frac{1}{4}$ pints; in 1628, it is 21$\frac{1}{4}$ pints: and though this laſt ſtatute appears to have been founded on wrong computations in ſeveral reſpects; yet this part of the act that relates to the number of pints in the firlot ſeems to be the leaſt exceptionable; and therefore we ſuppoſe the firlot to contain 21$\frac{1}{4}$ pints of the Edinburgh ſtandard, or about 2197 cubical inches; which a little exceeds the Wincheſter buſhel, from which it may have been originally copied.

“ VI. Suppoſing the bear-firlot to contain 31 Scots pints, (according to the ſtatute 1618), and the pint conform to the Edinburgh ſtandards, the content of a cylindric veſſel in ſuch firlots is found by multiplying the ſquare of the diameter by the height, and this product by .000,245.

“ When the ſection of the veſſel is not a circle, but an ellipſis, the product of the greateſt diameter by the leaſt, is to be ſubſtituted in thoſe rules for the ſquare of the diameter.

“ VII. To compute the content of a veſſel that may be conſidered as a *fruſtum* of a cone in any of thoſe meaſures.

“ Let A repreſent the number of inches in the diameter of the greater baſe, B the number of inches in the diameter of the leſſer baſe. Compute the ſquare of A, the product of A multiplied by B, and the ſquare of B, and collect theſe into a ſum. Then find the third part of this ſum, and ſubſtitute it in the preceding rules in the place of the ſquare of the diameter; and proceed in all other reſpects as before. Thus, for example, the content in wine-gallons is $\overline{AA \times AB \times BB} \times \frac{1}{3} \times H \times .0034$.

“ Or, to the ſquare of half the ſum of the diameters A and B, add one third part of the ſquare of half their difference, and ſubſtitute this ſum in the preceding rules for the ſquare of the diameter of the veſſel; for the ſquare of $\frac{1}{2}$ A × $\frac{1}{2}$ B added to $\frac{1}{3}$ of the ſquare of $\frac{1}{2}$ A—$\frac{1}{2}$ B, gives $\frac{1}{3}$ AA × $\frac{1}{3}$ AB × $\frac{1}{3}$ BB.

“ VIII. When a veſſel is a *fruſtum* of a parabolic conoid, meaſure the diameter of the ſection at the middle of the height of the *fruſtum*; and the content will be preciſely the ſame as of a cylinder of this diameter, of the ſame height with the veſſel.

“ IX. When a veſſel is a *fruſtum* of a ſphere, if you meaſure the diameter of the ſection at the middle of the height of the *fruſtum*, then compute the content of a cylinder of this diameter of the ſame height with the veſſel, and from this ſubtract $\frac{1}{3}$ of the content of a cylinder of the ſame height, on a baſe whoſe diameter is equal to its height; the remainder will give the content of the veſſel. That is, if D repreſent the diameter of the middle ſection, and H the height of the *fruſtum*, you are to ſubſtitute DD—$\frac{1}{3}$ HH for the ſquare of the diameter of the cylindric veſſel in the firſt ſix rules.

“ X. When the veſſel is a *fruſtum* of a ſpheroid, if the baſes are equal, the content is readily found by the rule in p. 708. In other caſes, let the axis of the ſolid be to the conjugate axis as *n* to 1; let D be the diameter of the middle ſection of the *fruſtum*, H the height or length of the *fruſtum*; and ſubſtitute in the firſt ſix rules DD——$\frac{HH}{3nn}$ for the ſquare of the ſquare of the diameter of the veſſel.

“ XI. When the veſſel is an hyperbolic conoid, let the axis of the ſolid be to the conjugate axis as *n* to 1, D the diameter of the ſection at the middle of the *fruſtum*, H the height or length: compute DD ×$\frac{1}{3nn}$ × HH, and ſubſtitute this ſum for the ſquare of the diameter of the cylindric veſſel in the firſt ſix rules.

“ XII. In general, it is uſual to meaſure any round veſſel, by diſtinguiſhing it into ſeveral *fruſtums*, and

“ taking the diameter of the ſection at the middle of each *fruſtum*; thence to compute the content of each, as if it was a cylinder of that mean diameter; and to give their ſum as the content of the veſſel. From the total content, computed in this manner, they ſubtract ſucceſſively the numbers which expreſs the circular areas that correſpond to thoſe mean diameters, each as often as there are inches in the altitude of the *fruſtum* to which it belongs, beginning with the uppermoſt; and in this manner calculate a table for the veſſel, by which it readily appears how much liquor is at any time contained in it, by taking either the dry or wet inches; having regard to the inclination or drip of the veſſel, when it has any.

“ This method of computing the content of a *fruſtum* from the diameter of the ſection at the middle of its height, is exact in that caſe only when it is a portion of a parabolic conoid; but in ſuch veſſels as are in common uſe, the error is not conſiderable. When the veſſel is a portion of a cone or hyperbolic conoid, the content by this method is found leſs than the truth; but when it is a portion of a ſphere or ſpheroid, the content computed in this manner exceeds the truth. The difference or error is always the ſame, in the different parts of the ſame or of ſimilar veſſels, when the altitude of the *fruſtum* is given. And when the altitudes are different, the error is in the triplicate *ratio* of the altitude. If exactneſs be required, the error in meaſuring the *fruſtum* of a conical veſſel, in this manner, is $\frac{1}{4}$ of the content of a cone ſimilar to the veſſel, of an altitude equal to the height of the *fruſtum*. In a ſphere, it is $\frac{1}{3}$ of a cylinder of a diameter and height equal to the *fruſtum*. In the ſpheroid and hyperbolic conoid, it is the ſame as in a cone generated by the right-angled triangle, contained by the two ſemiaxes of the figure, revolving about that ſide which is the ſemiaxis of the *fruſtum*.

“ In the uſual method of computing a table for a veſſel, by ſubducting from the whole content the number that expreſſes the uppermoſt area, as often as there are inches in the uppermoſt *fruſtum*, and afterwards the numbers for the other areas ſucceſſively; it is obvious that the contents aſſigned by the table, when a few of the uppermoſt inches are dry, are ſtated a little too high, if the veſſel ſtands on its leſſer baſe, but too low when it ſtands on its greater baſe; becauſe, when one inch is dry, for example, it is not the area at the middle of the uppermoſt *fruſtum*, but rather the area at the middle of the uppermoſt inch, that ought to be ſubducted from the total content, in order to find the content in this caſe.

“ XIII. To meaſure round timber: Let the mean circumference be found in feet and decimals of a foot; ſquare it; multiply this ſquare by the decimal .079,577, and the product by the length. Ex. Let the mean circumference of a tree be 10 3 feet, and the length 24 feet. Then 10 3 × 10 3 × 079,577 × 24=202.615, is the number of cubical feet in the tree. The foundation of this rule is, that when the circumference of a circle is 1, the area is .0,795,774,715, and that the areas of circles are as the ſquares of their circumferences.

“ But the common way uſed by artificers for meaſuring round timber, differs much from this rule. They call one fourth part of the circumference the ***girt***, which is by them reckoned the ſide of a ſquare, whoſe area is equal to the area of the ſection of the tree; therefore they ſquare the ***girt***, and then multiply by the length of the tree. According to their method, the tree of the laſt example would be computed at 159.13 cubical feet only.

“ How ſquare timber is meaſured, will be eaſily underſtood from the preceding propoſitions. Fifty ſolid feet of hewn timber, and forty of rough timber, make a load.

“ XIV. To find the burden of a ſhip, or the number of tons it will carry, the following rule is commonly given. Multiply the length of the keel taken within board, by the breadth of the ſhip within board, taken from the midſhip beam from plank to plank, and the product by the depth of the hold, taken from the plank below the keelſon to the under part of the upper-deck plank, and divide the product by 94, the quotient is the content of the tonnage required. This rule however cannot be accurate; nor can one rule be ſuppoſed to ſerve for the meaſuring exactly the burden of ſhips of all ſorts. Of this the reader will find more in the Memoirs of the Royal Academy of Sciences at Paris, for the year 1721.

“ Our author having ſaid nothing of weights, it may be of uſe to add briefly, that the Engliſh Troy-pound contains 12 ounces, the ounce 20 penny-weight, and the penny-weight 24 grains; that the Averdupois pound contains 16 ounces, the ounce 16 drams, and that 112 pounds is uſually called the hundred weight. It is commonly ſuppoſed, that 14 pounds Averdupois are equal to 17 pounds Troy. According to Mr Everard's experiments, 1 pound Averdupois is equal to 14 ounces 12 penny-weight and 16 grains Troy, that is, to 7000 grains; and an Averdupois ounce is $437\frac{1}{2}$ grains. The Scots Troy-pound (which, by the ſtatute 1718, was to be the ſame with the French) is commonly ſuppoſed equal to $15\frac{3}{4}$ ounces Engliſh Troy, or 7560 grains. By a mean of ſtandards kept by the Dean of Guild at Edinburgh, it is $7599\frac{3}{32}$ or 7600 grains. They who have meaſured the weights which were ſent from London, after the union of the kingdoms, to be the ſtandards by which the weights in Scotland ſhould be made, have found the Engliſh Averdupois pound (from a medium of the ſeveral weights) to weigh 7000 grains, the ſame as Mr Everard; according to which, the Scots, Paris, or Amſterdam-pound, will be to the pound Averdupois as 38 to 35. The Scots Troy-ſtone contains 16 pounds, the pound 2 marks or 16 ounces, an ounce 16 drops, a drop 36 grains. Twenty Scots ounces make a Tron pound; but becauſe it is uſual to allow one to the ſcore, the Tron pound is commonly 21 ounces. Sir John Skene, however, makes the Tron ſtone to contain only $19\frac{1}{2}$ pounds.”

GEORGE, or *Knights of St* GEORGE, has been the denomination of ſeveral military orders, whereof that of the garter is one of the moſt illuſtrious. See GARTER.

St GEORGE *del Mina*, the capital of the Dutch ſettlements, on the gold-coaſts of Guinea, ſituated ſeven or eight miles weſt of Cape-coaſt caſtle, the capital of the Britiſh ſettlements there: W. long. 5′, and N. lat. 5°.

Fort St GEORE, a town and fort on the coaſt of Cormandel, in the Hither India: E. long. 80°, and N. lat. 13°.

The town is divided into the White and Black town. The fort, and White-town, which adjoins to it, are inhabited only by Britiſh; the whole circumference, which is not above half a mile, being ſurrounded by a ſtone wall. The outward, or Black-town, called Madraſs, has been lately encompaſſed by a ſtone-wall and baſtions, and is about a mile and a half in circumference; the whole being almoſt environed by a river and the ſea.

St GEORGE'*s*, the largeſt of the Bermuda, or Summer-iſlands.

Croſs of St GEORGE, a red one in a field argent, which makes part of the Britiſh ſtandard.

GEORGIA, in Aſia, a province bounded by Circaſſia and Dageſtan on the north, by the Caſpian ſea on the eaſt, by Armenia or Turcomania on the ſouth, and by Mingrelia on the weſt.

GEORGIA, in America, one of the Britiſh plantations, taken out of South-Carolina, from which it is ſeparated by the river Savannah on the north, and bounded by the Atlantic ocean on the eaſt, by the river of St John, which divides it from Spaniſh Florida, on the ſouth and weſt.

GEORGIC, a poetical compoſition upon the ſubject of huſbandry, containing rules therein, put into a pleaſing dreſs, and ſet off with all the beauties and embelliſhments of poetry.

Heſiod and Virgil are the two greateſt maſters in this kind of poetry.

The moderns have produced nothing in this kind, except Rapin's book of Gardening, and the celebrated poem entitled Cyder by Mr Philips, who, if he had enjoyed the advantage of Virgil's language, would have been ſecond to Virgil in a much nearer degree.

GERANITES, in natural hiſtory, an appellation given to ſuch of the ſemipellucid gems as are marked with a ſpot reſembling a crane's eye.

GERANIUM, CRANE'S BILL, in botany, a genus of the monodelphia decandria claſs. It has but one ſtylus; the ſtigmata are five; and the capſule is ſhaped like the bill of a crane. There are fifty-ſeven ſpecies, ſixteen of which are natives of Britain, *viz.* the cicutarium, or hemlock-leaved crane's bill; the maſchatum, or muſhed crane's bill; the maritimum, or ſea crane's bill; the nodoſum, or knotty crane's bill; the phœum, or ſpotted crane's bill; the ſylvaticum, or mountain crane's bill; the pratenſe, or crowfoot crane's bill; the robertianum, or herb Robert; the lucidum, or ſhining dove's-foot crane's bill; the rotundifolium, or round-leaved crane's bill; the perenne, or perennial dove's-foot crane's bill; the molle, or common dove's-foot crane's bill; the puſillum, or ſmall flowered dove's-foot crane's bill; the columbinum, or long ſtalked dove's foot crane's bill; the diſſectum, or jagged-leaved dove's-foot crane's bill; and the ſanguineum, or bloody crane's bill. The leaves of the robertianum and pratenſe were formerly uſed as aſtringents, but are now left out both of the London and Edinburgh diſpenſatories.

GERARDIA, in botany, a genus of the didynamia angioſpermia claſs. The calix conſiſts of five ſegments; the corolla is bilabiated, the inferior lip being divided into three parts; the lobes are emarginated, the middle one being divided into two ſegments; and the capſule is bilocular, and opens at the baſe. There are five ſpecies, none of them natives of Britain.

GERFALCON, or GYRFALCON. See FALCO.

GERGENTUM, a town of Sicily, the Agrigentum of the ancients, about fifty five miles ſouth-eaſt of Palermo: E. long. 13° 30′, N. lat. 37° 20′.

GERMAINS, or *St* GERMAINS, a town and royal palace of France, fourteen miles north-weſt of Paris.

St GERMAINS is alſo a borough of Cornwal, eight miles weſt of Plymouth. It ſends two members to parliament.

GERM, among gardeners. See BUD.

GERMAN, in genealogy, denotes entire or whole: thus, a brother-german is one both by the father's and mother's ſide; and couſins german are the children of brothers or ſiſters.

GERMAN, or GERMANIC, alſo denotes any thing belonging to Germany; as the German empire, German flute, *&c.*

GERMANDER, in botany. See TEUCRIUM.

GERMANY, an extenſive empire of Europe, ſituated between 5° and 19° E. long. and between 45° and and 55° N. lat.; bounded by Denmark and the Baltic ſea on the north, by Poland and Hungary on the eaſt, by Switzerland and the Alps on the ſouth, and by France, Holland, *&c.* on the weſt.

It is divided into ten circles, three of which lie on the north, *viz.* Upper and Lower Saxony, and Weſtphalia; three on the ſouth, *viz.* Auſtria, Bavaria, and Swabia; three about the middle, *viz* Franconia, and the Upper and Lower Rhine; the tenth, which conſiſted of the duchy of Burgundy and the ſeventeen provinces of the Netherlands, have long been detached from the empire.

There are in Germany upwards of three hundred ſovereign princes and ſtates, moſt of them arbitrary in their reſpective territories.

GERMEN, or GERM. See BUD.

GERMERSHEIM, a town of Germany, ſubject to France, about ten miles eaſt of Landau: E. long. 8° 15′, and N. lat. 49° 12′.

GERMINATION, the firſt ſprouting of the ſeeds of plants. See AGRICULTURE, Part I.

GERONTES, in Grecian antiquity, a ſort of magiſtrates of ancient Sparta, anſwering to the areopagites at Athens.

GERTRUDENBURG, a fortified town of the united Netherlands, in the province of Holland, nine miles north of Breda; ſubject to the prince of Orange.

GERUND, in grammar, a verbal noun of the neuter gender, partaking of the nature of a participle, declinable only in the ſingular number, through all the caſes except the vocative; as, nom. *amandum*, gen. *amandi*, dat. *amando*, accuſ. *amandum*, abl. *amando*.

GESNERIA, in botany, a genus of plants, of the didynamia claſs. The calix reſts upon the germen, and conſiſts of five ſegments; the corolla is bent inwards and backwards; the capſule is below the flower, and bilocular. There are three ſpecies, none of them natives of Britain.

GESTATION, among phyſicians. See PREGNANCY.

GESTRICIA, a province of Sweden, bounded by Helſingia on the north, by the Bothnic gulph on the eaſt, by Upland on the ſouth, and by Dalecarlia on the weſt.

GESTURE, in rhetoric, conſiſts chiefly in the proper action of the hands and face.

CETHYLLIS, in botany, a genus of the decandria-monogynia claſs. The calix is a ſpatha; the corolla conſiſts of ſix ſegments; and the capſule has three cells. There is but one ſpecies, a native of Africa.

GEVAUDAN, a territory of Languedoc, adjoining to the Cevennes.

GEUM, in botany, a genus of the icoſandria-pentagynia claſs. The calix has eight ſegments; the petals are eight; and the ſeeds are hairy and caudated. There are five ſpecies, two of which are natives of Britain, *viz.* the urbanum, or common avens; and the the rivale, or water avens. The root of the avens is ſometimes uſed as a ſtomachic.

GHENT, or GAUNT, a city and capital of Flanders, thirty miles north weſt of Bruſſels: E. long. 3° 36′, N. lat. 51°.

It is a large fortified town, twelve miles in circumference, and defended by a citadel; and yet is a place of no great ſtrength, by reaſon of the vaſt extent of ground it takes in.

GIAGH, in chronology, a cycle of twelve years; in uſe among the Turks and Cathayans.

Each year of the giagh bears a name of ſome animal: the firſt, that of a mouſe; the ſecond, that of a bullock; the third, of a lynx or leopard; the fourth, of a horſe; the fifth, of a crocodile; the ſixth, of a ſerpent; the ſeventh, of a horſe; the eighth, of a ſheep; the ninth, of a monkey; the tenth, of a hen; the eleventh, of a dog; and the twelfth, of a hog.

They alſo divide the day into twelve parts, which they call giaghs, and diſtinguiſh them by the name of ſome animals. Each giagh contains two of our hours, and is divided into eight kehs, as many as there are quarters in our hours.

GIALLOLINO, in natural hiſtory, a heavy, friable, fine, yellow ochre, called Naples yellow, and much uſed among painters, who eſteem it a very fine colour.

GIANT'S CAUSEWAY, a vaſt collection of a black kind of marble, called baſaltes, in the county of Antrim, in Ireland. See BASALTES.

GIBBOUS, a term in medicine, denoting any protuberance or convexity of the body, as a perſon haunched, or hump backed.

GIBBOUS, in aſtronomy, a term uſed in reference to the enlightened parts of the moon, whilſt ſhe is moving from the firſt quarter to the full, and from the full to the laſt quarter: for all that time the dark part appears horned, or falcated; and the light one hunched out, convex, or gibbous.

GIBELINS, GIBELLINS, a famous faction in Italy, oppoſite to another called the Guelphs.

Theſe two factions ravaged and laid waſte Italy for a long ſeries of years, ſo that the hiſtory of that country, for the ſpace of two centuries, is no more than a detail of their mutual violences and ſlaughters. The Gibelins ſtood for the emperor againſt the pope: but concerning their origin and the reaſon of their names, we have but a very obſcure account. According to the generality of authors, they roſe about the year 1240, upon the emperor Frederick II.'s being excommunicated by the pope Gregory IX. Other writers maintain, that the two factions aroſe ten years before, though ſtill under the ſame pope and emperor. But the moſt probable opinion is that of Maimbourg, who ſays, that the two factions of Guelphs and Gibellins aroſe from a quarrel between two ancient and illuſtrious houſes on the confines of Germany, that of the Henries of Gibeling, and that of the Guelphs of Adorf.

GIBRALTAR, a port-town of Andaluſia, in Spain, ſubject to Great Britain: W. long. 6°, and N. lat. 36°.

It ſtands at the foot of mount Calpe, one of Hercules's pillars, about ſixteen miles north of Ceuta, in Africa, from which it is divided by the Streights, to which it gives name. It is built on a rock, in a peninſula, and can only be approached on the land-ſide by a very narrow paſſage between the mountain and the ſea: croſs this paſſage the Spaniards have drawn a line, and fortified it, to prevent the garriſon's having any communication with the country.

The Straits of Gibraltar are about twenty-four miles long, and fifteen broad.

GIFT, in Scots law. See DONATION.

GIGG, or JIGG, in muſic, denotes a briſk and lively air; or an airy kind of dance to a ſprightly meaſure.

GILAN, a province of Perſia, bounded by the Caſpian Sea on the north. Its capital is a city of the ſame name: E long. 48°, and N. lat. 37°.

GILBERTINES, a religious order founded in England by St Gilbert, in the reign of Henry I. The nuns followed the rule of St Benedict, and the monks that of Auguſtin. There were many monaſtries of this order in different parts of England.

GILDING, the art of ſpreading or covering a thing with gold, either in leaf or liquid.

We have this advantage over the ancients, in the manner of uſing and applying the gold, that the ſecret of painting in oil, lately diſcovered, furniſhes us with means of gilding works, capable of enduring all the violence of time and weather, which theirs could not.

There are ſeveral methods of gilding in uſe among us, as gilding in water, gilding in oil, gilding by fire, &c.

The method of water-GILDING. Water-gilding requires more preparation than oil gilding, and is chiefly on wooden works, and thoſe made of ſtucco; and theſe too muſt be ſheltered from the weather. A ſize is uſed for this way of gilding made of ſhreds, &c. of parchment or gloves boiled in water to the conſiſtence of a jelly. If the thing to be gilt be of wood, it is firſt waſhed with this ſize, boiling hot, and then ſet to dry; and afterwards with white paint mixed up with the ſame ſize. Some uſe Spaniſh white for this purpoſe, and others plaſter of Paris, well beaten and ſifted. This ſized paint muſt be laid on with a ſtiff bruſh; which is to be repeated ſeldomer or oftener according to the nature of the work, as ten or twelve times in flat or ſmooth works; but ſeven or eight times will be ſufficient in pieces of ſculpture. In the former caſe they are applied by drawing the bruſh over the work, in the latter by daubing it. When the whole is dry, they moiſten it with fair water, and rub it over with ſeveral pieces of coarſe linen, if it be on the flat; if not, they beat or ſwitch it with ſeveral ſlips of the ſame linen, tied to a little ſtick, to make it follow and enter all the cavities and depreſſures thereof.

Having thus finiſhed the white, the next thing to be done, is to colour it with yellow ochre: but if it be a piece of ſculpture in relievo, they firſt touch it up, and prepare the ſeveral parts, which may have happened to have been diſfigured, by the ſmall iron inſtruments, as gouges, chiſſels, &c. The ochre uſed for this purpoſe muſt be well ground and ſifted, and mixed up with the ſize before-mentioned. This colour is to be laid on hot; and in works of ſculpture, ſupplies the place of gold, which ſometimes cannot be carried into all the depreſſures and cavities of the foliages and ornaments. A lay is alſo applied over this yellow, which ſerves for the ground on which the gold is to be laid: this lay is uſually compoſed of Armenian bole, bloodſtone, black-lead, and a little fat; to which ſome add ſoap, and oil of olives; others, burnt bread, biſtre, antimony, glaſs of tin, butter, and ſugar-candy. Theſe ingredients being all ground down together with hot ſize, three lays of this compoſition is applied upon the yellow, the one after the other has been dried; being cautious not to put any into the cavity of the work to hide the yellow.

The bruſh uſed for this purpoſe, muſt be a ſoft one; and when the matter is become very dry, they go over it again with a ſtronger bruſh, to rub it down, and take off the ſmall grains that ſtick out, in order to facilitate the burniſhing of the gold.

To be prepared for gilding, you muſt have three ſorts of pencils; one to wet, another to touch up and amend, and a third to flatten; alſo a gilding cuſhion, for ſpreading the leaves of gold on when taken out of the book; a knife to cut them, and a ſquirrel's tail fitted with a handle; or elſe a piece of fine ſoft ſtuff on a ſtick, to take them up directly and apply them. You are firſt to begin with wetting your pencils; by which the laſt lay laid on with water is moiſtened, that it may the better receive and retain the gold. Then you are to lay the leaves of gold on the cuſhion; and if whole, you muſt take up with the ſquirrel's tail, but, if in pieces, with the other inſtrument, or the knife wherewith they are cut, and lay and ſpread them gently on the parts of the work you had moiſtened before. If the leaves, as they frequently do, happen to crack or break in laying on, theſe breaches muſt be made up with ſmall bits of leaf, taken up upon the repairing pencil, and the whole work is to be ſmoothed either with the ſame pencil, or another ſomething larger; the gold being preſſed into the dents, into which it could not be ſo eaſily carried by the ſquirrel's tail.

The work having been thus far gilded, muſt be ſet to dry, in order to be burniſhed and flatted. See BURNISHING.

The laſt operation is the applying the vermeil in all the little lines and cavities; and to ſtop and amend any little faults with ſhell-gold. The compoſition called of vermeil is made of gum guttæ, vermilion, and a little of ſome ruddy-brown, ground together with venetian varniſh and oil of turpentine. Some gilders, inſtead of this, make ſhift with fine lacca, or dragon's blood, with gum-water.

Sometimes, inſtead of burniſhing the gold, they burniſh the ground or compoſition laid on the laſt before it, and only afterwards waſh the part over with the ſize. This method is chiefly practiſed for the hands, face, and other nudities in relievo: which, by this means, do not appear ſo very brilliant as the parts burniſhed, though much more ſo than the parts perfectly flat.

To gild a piece of work, and yet preſerve white grounds, they apply a lay of Spaniſh white, mixed with a weak fiſh-glue, on all the parts of the ground, whereon the yellow or the laſt lay might run.

The method of GILDING *in oil.* This operation requires much leſs apparatus than that before-mentioned. The baſis or matter whereon the gold is laid, in this method, is the remains of colours found ſettled to the bottom of the pots in which painters waſh their pencils. This matter, which is very viſcid or ſticky, is firſt ground, and then paſſed through a linen-cloth, and thus laid on the matter to be gilt, after it is waſhed once or twice over with ſize; and if it be wood, with ſome white paint.

When this is almoſt dry, but yet is ſtill unctuous enough to catch and retain the gold, the leaf-gold is laid on, either whole, if the work be large, or cut to pieces, if ſmaller: the leaves of gold are taken up and laid on with a piece of fine, ſoft, well carded cotton; or ſometimes by a pallet for the purpoſe, or ſometimes with the knife with which the leaves were cut, according to the parts of the work that are to be gilded, or the breadth of the gold that is to be laid on. As the gold is laid on, they paſs over it a coarſe ſtiff pencil bruſh, to make it ſtick and as it were incorporate with the ground; and after this they mend any cracks that may have happened in it, either with the ſame pencil or one that is ſmaller, as has been ſhewn before in water-gilding.

This kind of gilding is chiefly uſed for domes and roofs of churches, courts, banquetting-houſes, &c. and for figures of plaſter of Paris, lead, &c.

The method of Gilding *with liquid gold.* This is performed by gold reduced to a calx and amalgamated with mercury, in the proportion of about an ounce of mercury to a dram of gold. To perform this, they heat a crucible red hot, and then put the gold and mercury into it, ſtirring them gently about till the gold be found melted, and incorporated into a maſs with the mercury. When this is done, they caſt them into water, to waſh and purify them; and out of that into other waters, where the amalgama, which is almoſt as liquid as if there were nothing but quickſilver in it, may be preſerved a long time for uſe.

Before they proceed to lay this amalgamated gold on the metal, they firſt render the metal rough, by waſhing it over with aqua fortis, or aqua ſecunda; and afterwards rinſe the metal in fair water, and ſcour it a little with fine ſand, and then it is ready for the gold.

They next cover over the metal with the mixture of gold and mercury, taking it up with a ſlip of copper, or a bruſh made of braſs-wire, ſpreading it as even as poſſible, to do which they wet the bruſh from time to time in fair water. Then they ſet the metal to the fire, upon a grate, or in a ſort of cage, under which ſtands a pan of coals; and in proportion as the mercury, evaporating and flying off, diſcovers the places where gold is wanting, they take care to ſupply them by adding new parcels of amalgama.

Then the work is rubbed over with the wire-bruſh, dipt in beer or vinegar, which leaves it in a condition to be brought to a colour which is the laſt part of the proceſs, and which the gilders keep to themſelves as a mighty ſecret.

The method of Gilding *by fire on metal.* To prepare the metal, they ſcratch it well, or rake it; then poliſh it with a poliſher; and afterwards ſet it to the fire to blue, *i. e.* to heat, till it appear of a blue colour. When this has been done, they clap on the firſt lay of leaf-gold, rubbing it lightly down with a poliſher; and expoſe it thus to a gentle fire. They uſually give it but three ſuch lays, or four at the moſt, each lay conſiſting of a ſingle leaf for common works, and of two for extraordinary ones: after each lay, it is ſet a-freſh to the fire; and after the laſt lay, the gold is in condition to be burniſhed.

To gild paper. Grind bole-armoniac (with rain-water, and give one laying of it; when it is dry, take glair of eggs, and add to it a little ſugar-candy and gum-water, which lay over the former; and upon this, when it is dry enough, lay leaf-ſilver, or leaf-gold.

To gild the leaves of books. Take bole-armoniac, eight penny-weight; ſugar-candy, two penny-weight: mix and grind them with glair of eggs: then on a bound book (while it is in the preſs, after it hath been ſmeared with glair of eggs, and is dried) ſmear the ſaid compoſition; let it dry, then rub it well and poliſh it; then with fair water wet the edges of the book, and ſuddenly lay on the gold, preſs it down gently with cotton, let it dry, and then poliſh it with a tooth.

GILL, a meaſure of capacity, containing a quarter of an Engliſh pint.

GILLS, in ichthyology. See Branchiæ.

GILOLO, a large iſland of the pacific ocean, lying between 1° S. lat. and 2° N. lat. and between 125° and 128° E. long.

Gilolo is alſo the name of the capital of the above iſland, ſituated in 40′ N. lat.

GIN, in mechanics, a machine for driving piles, fitted with a windlaſs and winches at each end, where eight or nine men heave, and round which a rope is reeved that goes over the wheel at the top: one end of this rope is ſeized to an iron-monkey, that hooks to a beetle of different weights, acccording to the piles they are to drive, being from eight to thirteen hundred weight; and when hove up to a croſs-piece, near the wheel, it unhooks the monkey, and lets the beetle fall on the upper end of the pile, and forces the ſame into ground: then the monkey's own weight over-hauls the windlaſs, in order for its being hooked again to the beetle.

GINGEN, an imperial city of Germany, twenty miles E. of Ulm: E. long. 10°, and north lat. 48° 36′.

GINGER, the root of a ſpecies of amomum, too well known to need any deſcription: It is a very uſeful ſpice in cold flatulent colics, and in laxity and debility of the inteſtines.

GINGLYMUS, in anatomy. See Anatomy, p. 149.

GINSENG, a ſmall root brought from North America, and ſometimes from China. It has a ſweet taſte, accompanied with a ſlight bitteriſhneſs and warmth. The Chineſe look upon it as an univerſal reſtorative in all decays.

GIRONNE, a large city and biſhop's ſee of Spain, in the province of Catalonia, forty-five miles north-eaſt of Barcelona: E. long. 2° 35′, and N. lat. 32°.

Gironné, or **Gironny**, in heraldry, a coat of arms divided into girons, or triangular figures, meeting in the centre of the ſhield, and alternately colour and metal. See Plate XCVII. fig. 5.

GISBORN, a market-town of Yorkſhire, fifty miles weſt of York.

GISBOROUGH, another market-town of Yorkſhire, thirty-ſeven miles north of York.

GISORS, a city of Normandy in France, twenty-eight miles ſouth-eaſt of Rouen: E. long. 1° 25′, N. lat. 50° 10′.

GLACIS, in building, an eaſy inſenſible ſlope or declivity.

The deſcent of the glacis is leſs ſteep than that of the talus. In gardening, a deſcent ſometimes begins in talus, and ends in glacis.

The glacis of the corniche, is an eaſy imperceptible ſlope in the cymatium, to promote the deſcent and draining off the rain-water.

Glacis, in fortification, that maſs of earth which ſerves as a parapet to the covered way, ſloping eaſily towards the champain or field.

GLADDON. See IRIS.

GLADE, in gardening and agriculture, an opening and light paſſage made through a wood, by lopping off the branches of trees along that way.

GLADIATORS, in antiquity, perſons who fought generally in the arena at Rome, for the entertainment of the people.

The gladiators were uſually ſlaves, and fought out of neceſſity; though ſometimes freemen made profeſſion thereof, like our prize fighters, for a livelihood. The Romans borrowed this cruel diverſion from the Aſiatics; and we find that the very high-prieſts had their ludi pontificales, and ludi ſacerdotales. As from the earlieſt ages of antiquity we read that it was cuſtomary to ſacrifice priſoners of war to the manes of the great men that fell in the engagement; in proceſs of time they came to ſacrifice ſlaves at the funerals of all perſons of condition; but as it would have appeared barbarous to cut their throats like beaſts, they were appointed to fight with each other, and do their beſt to ſave their own lives by killing their adverſary.

Hence aroſe the maſters of arms called laniſtæ, and and men learned to fight. Theſe laniſtæ bought ſlaves to train up to this cruel trade, whom they afterwards ſold to ſuch as had occaſion to exhibit ſhews. Junius Brutus, who expelled the kings, was the firſt that honoured the funeral of his father with theſe inhuman diverſions at the ſepulchre of the deceaſed; but afterwards they were removed to the circus and amphitheatres; and other perſons, beſides ſlaves, would hire themſelves to this infamous office.

They were all firſt ſworn that they would fight till death; and if they failed, they were put to death, either by fire, ſwords, clubs, whips, *&c.* It was uſual with the people, or emperor, to grant them life when they ſhewed no ſigns of fear. Auguſtus decreed that it ſhould always be granted them.

From ſlaves and freed men, the wanton ſport ſpread to perſons of rank, as we find in Nero's time. And Domitian exhibited combats of women in the night-time: we alſo read, that dwarfs encountered with one another. Conſtantine the Great firſt prohibited theſe combats in the Eaſt; but the practice was not entirely aboliſhed in the Weſt before Theodoric king of the Oſtrogoths, in the year 500.

When any perſon deſigned to entertain the people with a ſhow of gladiators, he ſet up bills in the public places, giving an account of the time, the number and names of the combatants, and the circumſtances whereby they were to be diſtinguiſhed; each having his ſeveral badge, which generally was a peacock's feather: they alſo gave notice what time the ſhow would laſt; and ſometimes gave repreſentations of theſe things in painting, as is practiſed among us, by thoſe who have any thing to ſhow at fairs, *&c.*

Upon the day appointed for the ſhow, in the firſt place the gladiators were brought out all together, and obliged to take a circuit round the arena in a very ſolemn and pompous manner. After this they proceeded, *paria componere*, to match them by pairs, in which great care was taken to make the matches equal. The firſt ſort of weapons they made uſe of were ſtaves, or wooden files, called rudes; and the ſecond were effective weapons, as ſwords, poinards, *&c.*

The firſt were called *arma luſoria*, or *exercitoria*; the ſecond, *decretoria*, as being given by decree or ſentence of the prætor, or of him at whoſe expence the ſpectacle was exhibited.

They began to fence or ſkirmiſh with the firſt, which was to be the prelude to the battle; and from theſe, when well warmed, they advanced to the ſecond, with which they fought naked. The firſt part of the engagement was called *ventilare, præludere*; and the ſecond *dimicare ad certum*, or *verſis armis pugnare*.

When any received a remarkable wound, either his adverſary or the people uſed to cry out, *Habet*, or, *Hoc habet*. If the vanquiſhed ſurrendered his arms, it was not in the victor's power to grant him life: it was the people during the time of the republic, and the prince or people during the time of the empire, that were alone empowered to grant this boon. The two ſigns of favour and diſlike given by the people were, *premere pollicem*, and *vertere pollicem*; the former of which M. Dacier takes to be a clenching of the fingers of both hands between one another, and ſo holding the two thumbs upright cloſe together, was a ſign of the peoples admiration of the courage ſhewn by both combatants; and at the ſame time for the conqueror to ſpare his antagoniſt's life: but the contrary motion, or bending back of the thumbs, ſignified the diſſatiſfaction of the ſpectators, and authoriſed the victor to kill the other combatant downright for a coward. The emperor ſaved whom he liked, if he was preſent at the ſolemnity, in the ſame manner.

After the engagement, ſeveral marks of favour were conferred on the victor, particularly a branch of palmtree; and oftentimes a ſum of money, perhaps gathered up among the ſpectators: but the moſt common rewards were the pileus and the rudis; the former being given only to ſuch gladiators as were ſlaves, for a token of obtaining their freedom; but the rudis ſeems to have been beſtowed both on ſlaves and freemen, with this difference, that it procured the former no more than a diſcharge from any further performance in public, upon which they commonly turned laniſta: but the rudis, when given to ſuch perſons as, being free, had hired themſelves out for theſe ſhows, reſtored them to a full enjoyment of their liberty. See PILEUS, RUDIS, and LANISTA.

GLADIOLUS, in botany, a genus of the triandria monogynia claſs. The corolla is ringent, and divided into ſix parts. There are ten ſpecies, none of them natives of Britain.

GLAMA. See CAMELUS.

GLAMORGANSHIRE, a county of South Wales, bounded by Brecknockſhire on the north, and by the Briſtol channel on the ſouth. Its capital is Landaff.

GLAND, in anatomy. See ANATOMY, p. 307.

GLANDERS. See FARRIERY, p. 557.

Glans, in anatomy. See ANATOMY, p. 270.

GLARIS, the capital of one of the cantons of Switzerland, of the ſame name, the inhabitants of which are both proteſtant and popiſh: it is ſituated thirty-five miles ſouth-eaſt of Zurich, in E. long. 9°, and N. lat. 47°.

GLASGOW, a large city of Scotland, in the ſhire of Lanerkſhire, or Clydeſdale, ſituated on the river Clyde, twenty miles north-weſt of Lanerk, and forty miles weſt of Edinburgh, in 4° 8′, W. long. and 55° 5′, N. lat.

This is one of the moſt elegant towns in Scotland. It has an univerſity, and a good foreign trade.

GLASS, a tranſparent, brittle, factitious body, produced by the action of fire upon a fixt ſalt and ſand, or ſtone, that readily melts.

The chemiſts hold, that there is no body but may be vitrified, or converted into glaſs; being the laſt effect of fire, as all its force is not able to carry the change of any natural body beyond its vitrification.

When or by whom the art of making glaſs was firſt found out is uncertain: ſome will have it invented before the flood; but without any proof. Neri traces the antiquity of this art as far back as the time of Job: but Dr Merret will have it as ancient as either pottery, or the making of bricks: becauſe that a kiln of bricks can ſcarce be burnt, or a batch of pottery be made, but ſome of the bricks and the ware will be at leaſt ſuperficially turned to glaſs; ſo that it muſt have been known at the building of Babel, and as long before as the making of bricks was uſed. It muſt have been known, conſequently, among the Egyptians, when the Iſraelites were employed by them in making bricks. Of this kind, no doubt, was that foſſil glaſs mentioned by Ferrant. Imperat. to be found under-ground in places where great fires had been. The Egyptians indeed boaſt, that this art was taught them by the great Hermes. Ariſtophanes, Ariſtotle, Alexander Aphrodiſæus, Lucretius, and John the divine, put us out of all doubt that glaſs was in uſe in their days.

Pliny relates, that it was firſt diſcovered accidentally in Syria, at the mouth of the river Belus, by certain merchants driven thither by a ſtorm at ſea, who, being obliged to continue there, and dreſs their vicals, by making a fire on the ground, where there was great plenty of the herb kali; that plant burning to aſhes, its ſalts mixed and incorporated with ſand, or ſtones fit to vitrify, and produced glaſs: that this accident being known, the people of Sidon, in that neighbourhood, aſſayed the work, improved the hint, and brought it into uſe; and that this art has been improving ever ſince.

Venice, for many years, excelled all Europe in the fineneſs of its glaſſes; but of late the French and Engliſh have excelled in the Venetians, ſo that we are no longer ſupplied with this commodity from abroad.

Nature and characters of GLASS. Naturaliſts are divided in what claſs of bodies to rank glaſs: ſome making it a concrete juice; others a ſtone; others again rank it among ſemi-metals; but Dr Merret obſerves, that theſe are all natural productions, whereas glaſs is a factitious compound, produced by fire, and never found in the earth, but only the ſand and ſtone that form it: that metals are formed by nature into certain ſpecies; and that fire only produces them, by its faculty of ſeparating heterogeneous, and uniting homogeneous bodies: whereas it produces glaſs, by uniting heterogeneous matter, *viz.* ſalt and ſand, of both which it evidently conſiſts; 100 ℔ weight of ſand yielding above 150 ℔ of glaſs.

The ſame learned doctor gives us a preciſe and accurate enumeration of the ſeveral characters, or properties of glaſs, whereby it is diſtinguiſhed from all other bodies, *viz.* 1. That it is an artificial concrete of ſalt and ſand, or ſtones. 2. Fuſible by ſtrong fire. 3. When fuſed, tenacious and coherent. 4. It does not waſte nor conſume in the fire. 5. When melted, it cleaves to iron. 6. When it is red hot, it is ductile, and may be faſhioned into any form; but not malleable; and capable of being blown into a hollowneſs, which no mineral is. 7. Frangible when thin, without annealing. 8. Friable, when cold. 9. Diaphanous, whether hot or cold. 10. Flexible and elaſtic. 11. Diſſoluble by cold and moiſture. 12. Only capable of being graven or cut with a diamond, or other hard ſtone and emery. 13. Receives any dye or colour both externally and internally. 14. Not diſſoluble by aqua fortis, aqua regia, or mercury. 15. Neither acid juices nor any other matter extract either colour, taſte, or any other quality from it. 16. Admits of poliſhing. 17. Neither loſes weight nor ſubſtance by the longeſt and moſt frequent uſe. 18. Gives fuſion to other metals, and ſoftens them. 19. The moſt pliable thing in the world, and that which beſt retains the faſhion given it. 20. Not capable of being calcined. 21. An open glaſs being filled with water in the ſummer-time, will gather drops of water on the outſide, juſt ſo far as the water on the inſide reaches; and a perſon's breath blown on it will manifeſtly moiſten it. 22. Little glaſs balls filled with water, mercury, and other liquor, and thrown into the fire, as alſo drops of green glaſs being broken, will fly aſunder with a great noiſe. 23. Neither wine, beer, nor any other liquor, will make it muſty, or change its colour, or ruſt it. 24. It may be cemented, as ſtones and metals. 25. A drinking glaſs, partly filled with water, and rubbed on the brim with a wet finger, yields muſical notes, higher or lower as the glaſs is more or leſs full, and will make the liquor friſk and leap.

Materials for making of GLASS. The materials whereof glaſs is made, we have already mentioned to be ſalt and ſand, or ſtones. The ſalt here uſed, is procured from a ſort of aſhes, brought from the Levant, called polverine, or rochetta; which aſhes are thoſe of a ſort of water-plant, called kali, cut down in ſummer, dried in the ſun, and burnt in heaps, either on the ground, or on iron grates; the aſhes falling into a pit, grow into a hard maſs, or ſtone, fit for uſe.

To extract the ſalt, theſe aſhes, or polverine, are powdered and ſifted, then put into boiling water, and there kept till one third of the water be conſumed; the

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Fig. 1. **GLASS MAKERS** at Work

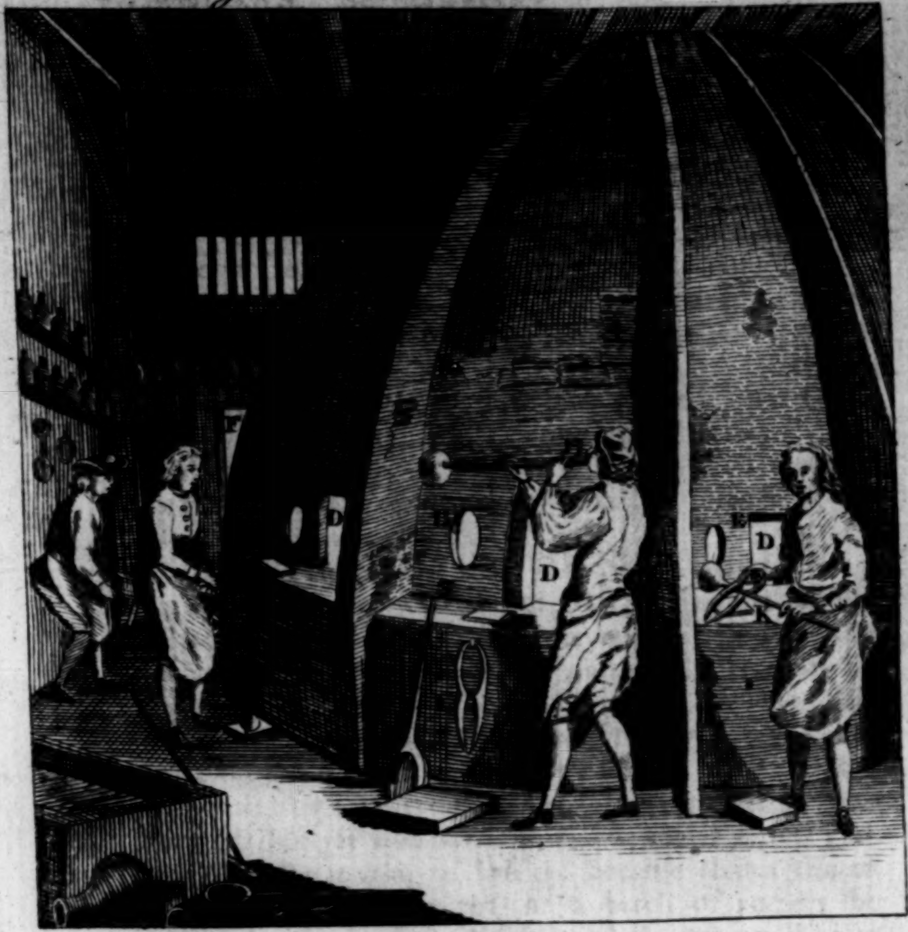


Fig. 2. Casting and Running of **PLATE GLASS**

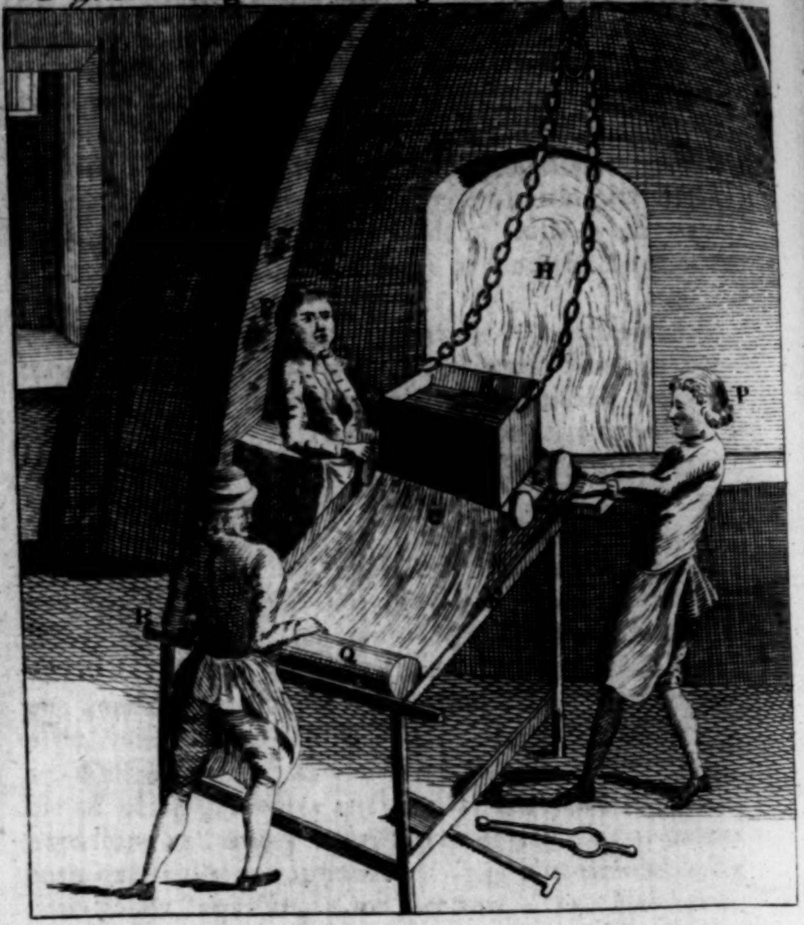


Fig. 3.
Grinding and Polishing of **PLATE GLASS**.

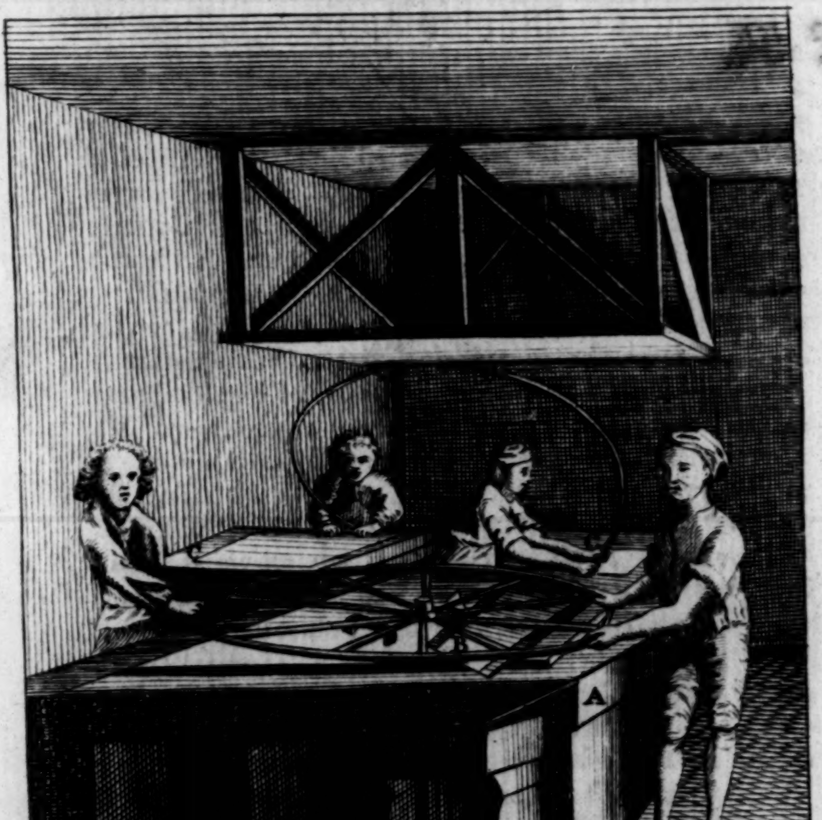


Fig. 4.
GIRONNE.

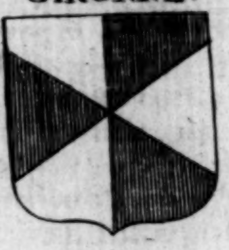


Fig. 5.
GORE.

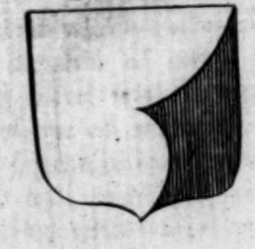


Fig. 6.
GARDANT

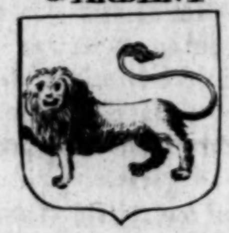


Fig. 7.
GULES

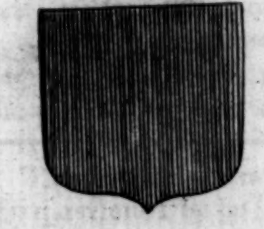
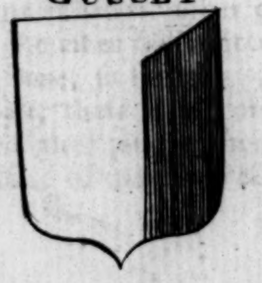


Fig. 8.
GUSSET



A Bell Sculp.

whole being ſtirred up, from time to time, that the aſhes may incorporate with the fluid, and all its ſalts be extracted: then the veſſel is filled up with new water, and boiled over again, till one half be conſumed; what remains is a ſort of lee, ſtrongly impregnated with ſalt. This lee, boiled over again in freſh coppers, thickens in about twenty-four hours, and ſhoots its ſalt; which is to be ladled out, as its ſhoots, into earthern pans, and thence into wooden fats to drain and dry. This done, it is groſly pounded, and thus put in a ſort of oven, called calcar, to dry. It may be added, that there are other plants, beſides kali, which yield a ſalt fit for glaſs: ſuch are the alga, or ſea weed, the common way-thiſtle, bramble, hops, wormwood, woad, tobacco, fern, and the whole leguminous tribe, as peaſe, beans, *&c.*

The ſand or ſtone, called by the artiſts Tarſo, is the ſecond ingredient in glaſs, and that which gives it the body and firmneſs. Theſe ſtones, Agricola obſerves, muſt be ſuch as will fuſe; and of theſe ſuch as are white and tranſparent are beſt; ſo that cryſtal challenges the precedency of all others.

At Venice they chiefly uſe a ſort of pebble, found in the river Teſino, reſembling white marble, and called cuogolo. Indeed Ant. Neri aſſures us, that all ſtones which will ſtrike fire with ſteel, are fit to vitrify: but Dr Merret ſhews, that there are ſome exceptions from this rule. Flints are admirable; and when calcined, powdered, and ſearched, make a pure white cryſtalline metal: but the expence of preparing them makes the maſters of our glaſs-houſes ſparing of their uſe. Where proper ſtones cannot be ſo conveniently had, ſand is uſed; which ſhould be white, and ſmall, and well waſhed, before it be applied: ſuch is uſually found in the mouths and ſides of rivers. Our glaſs-houſes are furniſhed with a fine ſand for cryſtal, from Maidſtone; the ſame with that uſed for ſand boxes, and in ſcouring; and with a coarſer for green glaſs from Woolwich. For cryſtal glaſs, to 200 ℔ of tarſo, pounded fine, they put 130 ℔ of ſalt of polverine; mix them together, and put them into the calcar, a ſort of reverberatory furnace, being firſt well heated. Here they remain baking, frying, and calcining, for five hours, during which the workman keeps mixing them with a rake, to make them incorporate: when taken out, the mixture is called frit, or bollito.

It may be further obſerved, that glaſs might be made by immediately melting the materials without thus calcining, and making them frit: but the operation would be much more tedious.

A glaſs much harder than any prepared in the common way may be made by means of borax, in the following manner. Take four ounces of borax, and an ounce of fine white ſand, reduced to powder, and melt them together in a large cloſe crucible ſet in a wind furnace, keeping a ſtrong fire for half an hour: then take out the crucible, and, when cold, break it; and there will be found at the bottom a hard, pure glaſs, capable of cutting common glaſs almoſt like a diamond. This experiment duly varied, ſays Dr Shaw, may lead to ſome conſiderable improvements in the art of glaſs, enamels, and artificial gems. It ſhews us an expeditious method of making glaſs without the uſe of fixed ſalts, which has generally been thought an eſſential ingredient in glaſs, and which is the ingredient that gives common glaſs its ſoftneſs; and it is not yet known, whether calcined cryſtal, or other ſubſtances being added to this ſalt, inſtead of ſand, it might not make a glaſs approaching to the nature of a diamond.

Kinds of GLASS. Of theſe materials we have many ſorts of glaſs made, which may principally be diſtinguiſhed according to their beauty: as the cryſtal flint glaſs, the cryſtal white glaſs, the green glaſs, and the bottle glaſs. Again theſe ſeveral ſorts are diſtinguiſhed by their ſeveral uſes: as plate or coach glaſſes, looking-glaſſes, optic glaſſes, *&c.* which are made of the firſt ſort. The ſecond ſort includes crown-glaſs, toys, phials, drinking-glaſſes, *&c.* The third ſort is well known by its colour, and the ſecond by its form.

Balas-coloured GLASS is made thus: Put into a pot cryſtal frit, thrice waſhed in water; tinge this with manganeſe prepared into a clear purple: to this add alumen cativum ſifted fine in ſmall quantities, and at ſeveral times; this will make the glaſs grow yellowiſh, and a little reddiſh, but not blackiſh, and always diſſipates the manganeſe. The laſt time you add manganeſe, give no more of the alumen cativum, unleſs the colour be too full. Thus will the glaſs be exactly of the colour of the balas-ruby.

Red GLASS. A blood-red glaſs may be made in the following manner: Put ſix pounds of glaſs of lead, and ten pounds of common glaſs, into a pot glazed with white glaſs: when the whole is boiled and refined, add, by ſmall quantities, and at ſmall diſtances of time, copper calcined to a redneſs, as much as, on repeated proofs, is found ſufficient: then add tartar in powder by ſmall quantities at a time, till the glaſs is become as red as blood; and continue adding one or other of the ingredients till the colour is quite perfect.

Yellow GLASS. It is a neceſſary remark in glaſs-making, that the cryſtal glaſs made with ſalt that has an admixture of tartar will never receive the true gold yellow, though it will all other colours: for yellow glaſs, therefore, a ſalt muſt be prepared from polverine, or pot aſhes alone, to make the glaſs.

Furnaces for the making GLASS. In this manufacture, there are three ſorts of furnaces; one, called calcar, is for the frit; the ſecond is for working the glaſs; the third ſerves to anneal the glaſs, and is called the leer. See FURNACE.

The calcar A (Plate XCVII. fig. 1.) reſembles an oven ten feet long, ſeven broad, and two deep: the fuel, which in England is ſea coal, is put into a trench on one ſide of the furnace; and the flame reverberating from the roof upon the frit, calcines it. The glaſs-furnace, or working furnace B, is round, of three yards diameter, and two high; or thus proportioned. It is divided into three parts, each of which is vaulted. The lower part C is properly called the crown, and is made in that form. Its uſe is to keep a briſk fire of coal and wood, which is never put out. The mouth of it is called the bocca. There are ſeveral holes in the arch of this crown, through which the flame paſſes into the ſecond vault, or partition, and reverberates into the pots filled with the ingredients above mentioned. Round the inſides are eight or more pots placed, and piling pots on them. The number of pots is always double that of the boccas D, or mouths, or of the number of workmen, that each may have one pot refined to work out of, and another for metal to refine in while he works out of the other. Through the working holes the metal is taken out of the pots, and the pots are put into the furnace; and theſe holes are ſtopped with moveable covers made of lute and brick, to ſcreen the workmens eyes from the ſcorching flames. On each ſide of the bocca, or mouth, is a bocarella, or little hole, out of which coloured glaſs, or finer metal, is taken from the piling pot. Above this oven, there is the third oven or leer, about five or ſix yards long, where the veſſels, or glaſs, is annealed, or cooled: this part conſiſts of a tower, beſides the leer F, into which the flame aſcends from the furnace. The tower has two mouths, through which the glaſſes are put in with a fork, and ſet on the floor or bottom: but they are drawn out on iron pans, called ſraches, through the leer, to cool by degrees; ſo that they are quite cold by the time they reach the mouth of the leer, which enters the ſaroſel, or room where the glaſſes are to be ſtowed.

But the green glaſs furnace is ſquare; and at each angle it has an arch for annealling, or cooling glaſſes. The metal is wrought on two oppoſite ſides, and on the other two they have their colours, into which are made linnet holes, for the fire to come from the furnace to bake the frit, and to diſcharge the ſmoke. Fires are made in the arches to anneal the work, ſo that the whole proceſs is done in one furnace.

Theſe furnaces muſt not be of brick, but of hard ſandy ſtones. In France, they build the outſide of brick, and the inner part to bear the fire is made of a ſort of fuller's earth, or tobacco-pipe clay, of which earth they alſo make their melting-pots.

Mr Blancourt obſerves, that the worſt and roughest work in this art, is the changing the pots, when they are worn out, or cracked. In this caſe the great working hole muſt be uncovered; the faulty pot muſt be taken out with iron hooks and forks, and a new one muſt be ſpeedily put in its place, through the flames, by the hands only. For this work, the man guards himſelf with a garment made of ſkins, in the ſhape of a pantaloon, that covers him all but his eyes, and is made as wet as poſſible: the eyes are defended with a proper ſort of glaſs.

Inſtruments for making of GLASS. The inſtruments made uſe of in this work, may be reduced to theſe that follow. A blowing pipe, made of iron, about two feet and a half long, with a wooden handle. An iron rod to take up the glaſs, after it is blown, and to cut off the former. Sciſſars to cut the glaſs when it comes off from the firſt hollow iron. Shears to cut and ſhape great glaſſes, *&c.* an iron ladle, with the end of the handle caſed with wood, to take the metal out of the refining pot, to put it into the workmens pots. A ſmall iron ladle, caſed in the ſame manner, to ſkim the alkalic ſalt that ſwims at top. Shovels, one like a peel, to take up the great glaſſes; another, like a fire-ſhovel, to feed the furnace with coals. A hooked iron fork, to ſtir the matter in the pots. An iron rake for the ſame purpoſe, and to ſtir the frit. An iron fork, to change or pull the pots out of the furnace, *&c.*

Working or blowing round GLASS. The tools thus provided, the workman dips his blowing pipe into the melting-pot; and by turning it about, the metal ſticks to the iron more firmly than turpentine. This he repeats four times, at each time rolling the end of his inſtrument, with the hot metal thereon, on a piece of iron G, over which is a veſſel of water which helps to cool, and ſo to conſolidate, and to diſpoſe that matter to bind more firmly with what is to be taken next out of the melting pot. But after he has dipt a fourth time, and the workman perceives there is metal enough on the pipe, he claps his mouth immediately to the other end of it H, and blows gently through the iron tube, till the metal lengthens like a bladder about a foot. Then he rolls it on a marble ſtone I, a little while, to poliſh it, and blows a ſecond time, by which he brings it to the ſhape of a globe of about eighteen or twenty inches diameter. Every time he blows into the pipe, he removes it quickly to his cheek, otherwiſe he would be in danger, by often blowing, of drawing the flame into his mouth; and this globe may be flattened by returning it to the fire, and brought into any form by ſtamp-irons, which are always ready. When the glaſs is thus blown, it is cut off at the collet, or neck, which is the narrow part that ſtuck to the iron. The method of performing this is as follows: the pipe is reſted on an iron bar, cloſe by the collet; then a drop of cold water being laid on the collet, it will crack about a quarter of an inch, which, with a ſlight blow, or cut of the ſhears K, will immediately ſeparate the collet.

After this is done, the operator dips the iron rod into the melting-pot, by which he extracts as much metal as ſerves to attract the glaſs he has made, to which he now fixes this rod at the bottom of his work, oppoſite to the opening made by the breaking of the collet. In this poſition the glaſs is carried to the great bocca, or mouth of the oven, to be heated and ſcalded, by which means it is again put into ſuch a ſoft ſtate, that, by the help of an iron inſtrument, it can be pierced, opened, and widened without breaking. But the veſſel is not finiſhed till it is returned to the great bocca; where it being again heated thoroughly, and turned quickly about with a circular motion, it will open to any ſize, by the means of the heat and motion. And by this means we come to learn the cauſe why the edge of all bowls and glaſſes, *&c.* are thicker than the other parts of the ſame glaſſes; becauſe in the turning it about in the heat, the edge thickens; and the glaſs being as it were doubled in that part, the circumference appears like a ſelvage.

If there remains any ſuperfluities, they are cut off with the ſhears L; for till the glaſs is cool, it remains in a ſoft, flexible ſtate. It is therefore taken from the bocca, and carried to an earthen bench, covered with brands, which are coals extinguiſhed, keeping it turning; becauſe that motion prevents any ſettling, and preſerves an evenneſs in the face of the glaſs, where, as it cools, it comes to its conſiſtency; being firſt cleared from the iron rod by a ſlight ſtroke by the hand of the workman.

If the veſſel conceived in the workman's mind, and whoſe body is already made, requires a foot, or a handle, or any other member or decoration, he makes them ſeparate; and now aſſays to join them with the help of hot metal, which he takes out of the pots with his iron rod: but the glaſs is not brought to its true hardneſs, till it has paſſed the leer, or annealing oven, deſcribed before.

Working, or blowing, of window or table GLASS. The method of working round glaſs, or veſſels of any ſort, is in every particular applicable to the working of window or table-glaſs, till the blowing iron has been dipt the fourth time. But then, inſtead of rounding it, the workman blows, and ſo manages the metal upon the iron plate, that it extends two or three feet in the form of a cylinder. This cylinder is put again to the fire, and blown a ſecond time, and is thus repeated till it is extended to the dimenſions required, the ſide to which the pipe is fixed diminiſhing gradually till it ends in a pyramidical form; ſo that, to bring both ends nearly to the ſame diameter, while the glaſs is thus flexible, he adds a little hot metal to the end oppoſite the pipe, and draws it out with a pair of iron pinchers, and immediately cuts off the ſame end with the help of a little cold water, as before.

The cylinder being now open at one end, is carried back to the bocca, and there, by the help of cold water, it is cut about eight or ten inches from the iron pipe or rod; and the whole length at another place, by which alſo it is cut off from the iron rod. Then it is heated gradually on an earthen table, by which it opens in length, while the workman, with an iron tool, alternately lowers and raiſes the two halves of the cylinder, which at laſt will open like a ſheet of paper, and fall into the ſame flat form in which it ſerves for uſe; in which it is preſerved by heating it over again, cooling it on a table of copper, and hardening it twenty-four hours in the annealing furnace, to which it is carried upon forks. In this furnace an hundred tables of glaſs may lie at a time, without injury to each other, by ſeparating them into tens, with an iron ſhiver between, which diminiſhes the weight by dividing it, and keeps the tables flat and even.

This was the method formerly made uſe of for blowing plate-glaſs, looking-glaſſes, *&c.*; but the workmen, by this method, could never exceed fifty inches in length, and a proportional breadth, becauſe what were larger were always found to warp, which prevented them from reflecting the objects regularly, and wanted ſubſtance to bear the neceſſary grinding. Theſe imperfections have been remedied by an invention of the Sieur Abraham Thevart, in France, about the year 1688, of caſting or running large plates of glaſs in the following manner.

*Caſting, or running of large looking-*GLASS *plates.* The furnace G, fig. 2. is of a very large dimenſion, environed with ſeveral ovens, or annealing furnaces, called carquaſſes, beſides others for making of frit, and calcining old pieces of glaſs. This furnace, before it is fit to run glaſs, coſts 3500l. It ſeldom laſts above three years, and even in that time it muſt be refitted every ſix months. It takes ſix months to rebuild it; and three months to refit it. The melting-pots are as big as large hogſheads, and contain about 2000 weight of metal. If one of them burſts in the furnace, the loſs of the matter and time amounts to 250l. The heat of this furnace is ſo intenſe, that a bar of iron laid at the mouth thereof becomes red hot in leſs than half a minute. The materials in theſe pots are the ſame as deſcribed before; and A is the man breaking the frit for that purpoſe. When the furnace is red-hot, theſe materials are put in at three different times, becauſe that helps the fuſion; and in twenty-four hours they are vitrified, refined, ſettled, and fit for caſting. H is the bocca, or mouth of the furnace; K is the ciſtern that conveys the liquid glaſs it receives out of the melting-pots in the furnace to the caſting table. Theſe ciſterns are filled in the furnace, and remain therein ſix hours after they are filled; and then are hooked out by the means of a large iron chain, guided by a pulley marked I, and placed upon a carriage with four wheels marked L, by two men P P. This carriage has no middle piece; ſo that when it has brought the ciſtern to the caſting-table M, they ſlip off the bottom of the ciſtern, and out ruſhes a torrent of flaming matter O, upon the table: this matter is confined to certain dimenſions by the iron rulers N, N, N, which are moveable, retain the fluid matter, and determine the width of the glaſs; while a man R, with the roller Q reſting on the edge of the iron rulers, reduceth it as it cools to an equal thickneſs, which is done in the ſpace of a minute. This table is ſupported on a wooden frame, with truſtles for the convenience of moving to the annealing furnace; into which, ſtrewed with ſand, the new plate is ſhoved, where it will harden in about ten days. After this, the glaſs needs only be ground, poliſhed, and foliated for uſe.

*Grinding and poliſhing of plate-*GLASS. Glaſs is made tranſparent by fire, but it receives its luſtre by the ſkill and labour of the grinder and poliſher, the former of whom takes it rough out of the hands of the maker.

In order to grind plate glaſs, they lay it horizontally upon a flat ſtone-table, (fig. 3.) made of a very fine-grained free-ſtone; and for its greater ſecurity they plaſter it down with lime, or ſtucco: for otherwiſe the force of the workmen, or the motion of the wheel with which they grind it, would move it about.

This ſtone-table is ſupported by a ſtrong frame A, made of wood, with a ledge quite round its edges, riſing about two inches higher than the glaſs. Upon this glaſs to be ground, is laid another rough glaſs not above half ſo big, and ſo looſe as to ſlide upon it; but cemented to a wooden plank, to guard it from the injury it muſt otherwiſe receive from the ſcraping of the wheel, to which this plank is faſtened; and from the weights laid upon it, to promote the grinding, or friture, of the glaſſes. The whole is covered with a wheel, B, made of hard light wood, about ſix inches in diameter; by pulling of which backwards and forwards alternately, and ſometimes turning it round, the workmen who always ſtand oppoſite to each other, produce a conſtant attrition between the two glaſſes, and bring them to what degree of ſmoothneſs they pleaſe, by firſt pouring in water and coarſe ſand; after that, a finer ſort of ſand, as the work advanceth, till at laſt they muſt pour in the powder of ſmalt. As the upper or incumbent glaſs poliſhes, and grows ſmoother, it muſt be taken away, and another from time to time put in its place.

This engine is called a mill by the artiſts, and is uſed only in the largeſt ſize glaſſes; for in the grinding of the leſſer glaſſes, they are content to work without a wheel, and to have only four wooden handles faſtened to the four corners of the ſtone which loads the upper plank, by which they work it about.

When the grinder has done his part, who finds it very difficult to bring the glaſs to an exact plainneſs, it is turned over to the care of the poliſher, who with the fine powder of tripoli-ſtone, or emery, brings it to a perfect evenneſs and luſtre. The inſtrument made uſe of in this branch, is a board, *c*, *c*, furniſhed with a felt, and a ſmall roller, which the workman moves by means of a double handle at both ends. The artiſt in working this roller, is aſſiſted with a wooden hoop or ſpring, to the end of which it is fixed: for the ſpring, by conſtantly bringing the roller back to the ſame points, facilitates the action of the workman's arm.

Painting in Glass. The ancient manner of painting in glaſs was very ſimple; it conſiſted in the mere arrangement of pieces of glaſs of different colours in ſome ſort of ſymmetry, and conſtituted what is now called Mowork. See Mosaic.

In proceſs of time they came to attempt more regular deſigns, and alſo to repreſent figures heightened with all their ſhades: yet they proceeded no farther than the contours of the figures in black with water-colours, and hatching the draperies after the ſame manner on glaſſes of the colour of the object they deſigned to paint. For the carnation, they uſed glaſs of a bright red colour; and upon this they drew the principal lineaments of the face, *&c.* with black.

But in time, the taſte for this ſort of painting improving conſiderably, and the art being found applicable to the adorning of churches, baſilics, *&c.* they found out means of incorporating the colours in the glaſs itſelf, by heating them in the fire to a proper degree; having firſt laid on the colours. The colours uſed in painting or ſtaining of glaſs are very different from thoſe uſed in painting either in water or oil colours.

For black, Take ſcales of iron, one ounce; ſcales of copper, one ounce; jet, half an ounce; reduce them to powder, and mix them. For blue, Take powder of blue, one pound; ſal nitre, half a pound; mix them and grind them well together. For carnation, Take red chalk, eight ounces; iron ſcales and litharge of ſilver, of each two ounces; gum arabic, half an ounce; diſſolve in water; grind altogether for half an hour as ſtiff as you can; then put it in a glaſs and ſtir it well, and let it ſtand to ſettle fourteen days. For green, Take red lead, one pound; ſcales of copper, one pound; and flint, five pounds; divide them into three parts; and add to them as much ſal nitre; put them into a crucible, and melt them with a ſtrong fire; and when it is cold, powder it, and grind it on a porphyry. For gold colour, Take ſilver an ounce; antimony, half an ounce; melt them in a crucible; then pound the maſs to powder; and grind it on a copper plate; add to it yellow oker, or brick-duſt calcined again, fifteen ounces; and grind them well together with water. For purple, Take minium, one pound; brown ſtone, one pound; white flint, five pounds; divide them into three parts, and add to them as much ſal nitre as one of the parts; calcine, melt, and grind it as you did the green. For red, Take jet, four ounces; litharge of ſilver, two ounces; red chalk, one ounce; powder them fine, and mix them. For white, Take jet, two parts; white flint, ground on a glaſs very fine, one part; mix them. For yellow, take Spaniſh brown, ten parts; leaf ſilver, one part; antimony, half a part; put all into a crucible, and calcine them well.

In the windows of ancient churches, *&c.* there are to be ſeen the moſt beautiful and vivid colours imaginable, which far exceed any of thoſe uſed by the moderns, not ſo much becauſe the ſecret of making thoſe colours is entirely loſt, as that the moderns will not go to the charge of them, nor be at the neceſſary pains, by reaſon that this ſort of painting is not now ſo much in eſteem as formerly. Thoſe beautiful works which were made in the glaſs-houſes were of two kinds.

In ſome, the colour was diffuſed through the whole ſubſtance of the glaſs. In others, which were the more common, the colour was only on one ſide, ſcarce penetrating within the ſubſtance above one third of a line; though this was more or leſs according to the nature of the colour; the yellow being always found to enter the deepeſt. Theſe laſt, though not ſo ſtrong and beautiful as the former, were of more advantage to the workmen, by reaſon that on the ſame glaſs, though already coloured, they could ſhew other kind of colours where there was occaſion to embroider draperies, enrich them with foliages, or repreſent other ornaments of gold, ſilver, *&c.*

In order to this, they made uſe of emery, grinding or wearing down the ſurface of the glaſs, till ſuch time as they were got through the colour to the clear glaſs. This done, they applied the proper colours on the other ſide of the glaſs. By theſe means, the new colours were hindered from running and mixing with the former, when they expoſed the glaſſes to the fire, as will appear hereafter.

When indeed the ornaments were to appear white, the glaſs was only bared of its colour with emery, without tinging the place with any colour at all; and this was the manner by which they wrought their lights, and heightnings, on all kinds of colour.

The firſt thing to be done, in order to paint or ſtain glaſs, in the modern way, is to deſign, and even colour the whole ſubject on paper. Then they chuſe ſuch pieces of glaſs as are clear, even, and ſmooth, and proper to receive the ſeveral parts, and proceed to diſtribute the deſign itſelf, or papers it is drawn on, into pieces ſuitable to thoſe of the glaſs; always taking care that the glaſſes may join in the contours of the figures, and the folds of the draperies; that the carnations, and other finer parts, may not be impaired by the lead with which the pieces are to be joined together. The diſtribution being made, they mark all the glaſſes as well as papers, that they may be known again: which done, applying every part of the deſign upon the glaſs intended for it, they copy, or transfer, the deſign upon this glaſs with the black colour diluted in gum-water, by tracing and following all the lines and ſtrokes as they appear through the glaſs with the point of a pencil.

When theſe ſtrokes are well dried, which will happen in about two days, the work being only in black and white, they give a ſlight waſh over with urine, gum arabic, and a little black; and repeat it ſeveral times, according as the ſhades are deſired to be heightened, with this precaution, never to apply a new waſh till the former is ſufficiently dried.

This done, the lights and riſings are given by rubbing off the colour in the reſpective places with a wooden point, or the handle of the pencil.

As to the other colours above-mentioned, they are uſed with gum water, much as in painting in miniature; taking care to apply them lightly, for fear of effacing, the out-lines of the deſign; or even, for the greater ſecurity, to apply them on the other ſide; eſpecially yellow, which is very pernicious to the other colours, by blending therewith. And here too, as in pieces of black and white, particular regard muſt always be had not to lay colour on colour, or lay on a new lay, till ſuch time as the former are well dried.

It may be added, that the yellow is the only colour that penetrates through the glaſs, and incorporates therewith by the fire; the reſt, and particularly the blue, which is very difficult to uſe, remaining on the ſurface, or at leaſt entering very little. When the painting of all the pieces is finiſhed, they are carried to the furnace, or oven, to anneal, or bake the colours.

The furnace here uſed is ſmall, built of brick, from eighteen to thirty inches ſquare. At ſix inches from the bottom is an aperture to put in the fuel, and maintain the fire. Over this aperture is a grate, made of three ſquare bars of iron, which traverſe the furnace, and divide it into two parts. Two inches above this partition, is another little aperture, through which they take out pieces to examine how the coction goes forward. On the grate is placed a ſquare earthen pan, ſix or ſeven inches deep; and five or ſix inches leſs every way than the perimeter of the furnace. On the one ſide hereof is a little aperture, through which to make trials, placed directly oppoſite that of the furnaces deſtined for the ſame end. In this pan are the pieces of glaſs to be placed, in the following manner. Firſt, the bottom of the pan is covered with three ſtrata, or layers, of quick lime pulveriſed; thoſe ſtrata being ſeparated by two others of old broken glaſs, the deſign whereof is to ſecure the painted glaſs from the too intenſe heat of the fire. This done, the glaſſes are laid horizontally on the laſt or uppermoſt layer of lime.

The firſt row of glaſs they cover over with a layer of the ſame powder, an inch deep; and over this they lay another range of glaſſes, and thus alternately till the pan is quite full; taking care that the whole heap always end with a layer of the lime-powder.

The pan being thus prepared, they cover up the furnace with tiles, on a ſquare table of earthen ware, cloſely luted all round; only leaving five little apertures, one at each corner, and another in the middle, to ſerve as chimneys. Things thus diſpoſed, there remains nothing but to give the fire to the work. The fire for the firſt two hours muſt be very moderate, and muſt be increaſed in proportion as the coction advances, for the ſpace of ten or twelve hours; in which time it is uſually compleated. At laſt the fire, which at firſt was charcoal, is to be of dry wood, ſo that the flame covers the whole pan, and even iſſues out at the chimneys.

During the laſt hours, they make eſſays, from time to time, by taking out pieces laid for the purpoſe through the little aperture of the furnace, and pan, to ſee whether the yellow be perfect, and the other colours in good order. When the annealing is thought ſufficient, they proceed with great haſte to extinguiſh the fire, which otherwiſe would ſoon burn the colours, and break the glaſſes.

Glass *of lead*. See **Chemistry**, p. 136.

Glass *porcelain*, the name given by many to a modern invention of imitating the china-ware with glaſs.

The method of making it, as given by Mr Reamur, who was the firſt that carried the attempt to any degree of perfection, is as follows.

The glaſs veſſels to be converted into porcelain, are to be put into large veſſels, ſuch as the common fine earthen diſhes are baked in; or into ſufficiently large crucibles: the veſſels are to be filled with a mixture of fine white ſand, and of fine gypſum; or plaſter ſtone, burnt into what is called plaſter of Paris; and all the interſtices are to be filled up with the ſame powder, ſo that the glaſs veſſels may no where touch either one another, or the ſides of the veſſels they are baked in.

The veſſel is to be then covered down, and luted, and the fire does the reſt of the work: for this is only to be put into a common potter's furnace, and when it has ſtood there the uſual time of baking the other veſſels, it is to be taken out, and the whole contents will be found no longer glaſs, but converted into a white opake ſubſtance, which is a very elegant porcelain, and has almoſt the properties of that of china.

GLASS *of antimony*. See CHEMISTRY, p 87.

GLASTONBURY, a market town of Somerſetſhire, five miles ſouth of Wells.

GLATZ, the capital of a county of the ſame name in Bohemia, 100 miles eaſt of Prague: E. long. 16° 8′, N. lat. 50° 25′.

GLAUBER's SALT. See CHEMISTRY, p. 127.

GLAUCION, in ornithology. See ANAS.

GLAUCIUM, in botany. See CHELIDONIUM.

GLAUCOMA, in medicine, the change of the cryſtalline humour of the eye into an azure-colour. See MEDICINE.

GLAUCUS, in ichthyology. See SQUALUS.

GLAUX, in botany, a genus of the pentandria-monogynia claſs. The calix conſiſts of one leaf; it has no corolla; the capſule has one cell, 5 valves, and 5 ſeeds. There is but one ſpecies, *viz.* the maritima, ſea-milkwort, or glaſs-wort, a native of Britain.

GLAZIER, an artificer who works in glaſs. See GLASS.

The principal part of a glazier's buſineſs conſiſts in fitting panes and plates of glaſs to the ſaſhes and window-frames of houſes, pictures, *&c.* and in cleaning the ſame.

GLAZING, the poliſhing or cruſting over earthen ware, by running melted lead or litharge over it.

The common ware is glazed with a compoſition of 50 lb. clean ſand, 70 lb. lead aſhes, 30 lb. wood aſhes, and 12 lb. ſalt, all melted into a cake. With this mixture they glaze it over, and then ſet it in an earthen glazing pan; taking care that the veſſels do not touch one another. As ſeveral colours are uſed for this purpoſe, we ſhall give the following receipts, from Smith's laboratory. 1. For a black, take lead-aſhes, 18 parts; iron-filings, 3; copper-aſhes, 3; and zaffer, 2: this, when melted, will make a brown black; and if you would have it blacker, put ſome more zaffer to it. 2. For blue, take lead-aſhes, 1 lb. clear ſand or pebble, 2 lb. ſalt, 2 lb. white calcined tartar, 1lb. Venice or other glaſs, 16 lb. and zaffer, half a pound: mix them well together; and after melting, quench them in water, and then melt them again; which operation is to be repeated ſeveral times; and if you would have it fine and good, it will be proper to put the mixture into a glaſs furnace for a day or two. 3. A brown glazing may be given with a mixture of lead-glaſs, 12 parts, and common glaſs and manganeſe, of each one part. 4. A citron-yellow may be made of 6 parts of red-lead, 7 parts of fine red brick-duſt, and 2 parts of antimony, all melted together. 5. A fleſh-colour, with 12 parts of lead-aſhes, and one of white glaſs. 6 For a green-colour, take 8 parts of litharge, 8 parts of Venice-glaſs, 4 parts of braſs-duſt, and melt them together for uſe; or melt together two parts yellow glaſs, with as much copper-duſt. 7. For a gold-yellow, take of antimony, red lead, and ſand, an equal quantity, and melt them into a cake. 8. For a fine purple brown, take lead-aſhes, 15 parts; clear ſand, 18; manganeſe, 1; white glaſs, 15 meaſures; and 1 of zaffer. 9. For a fine red, take antimony, 2 lb. litharge, 3 lb. ruſt of iron calcined, 1 lb. and grind them to a fine powder. 10. For a fine white glazing, take 2 lb. of lead, 1 lb. of tin, and calcine them to aſhes; of which take 2 parts; of calcined flint or pebble, 1 part; of ſalt, 1 part; and mixing them well together, melt them into a cake. At Rotterdam, they make a fine ſhining white glazing, by melting together 2 lb. clean tin-aſhes, 10 lb. lead-aſhes, 2 lb. fine Venice-glaſs, and ½ lb. tartar. 11 A yellow glazing is made of 4 ounces of red lead, and 2 ounces of antimony, melted together. 12. For a fine yellow, take red lead, 3 pints; antimony and tin, of each 2 lb. then melting them into a cake, grind it fine; and repeating this ſeveral times, you will have a good yellow.

GLEBE, among miners, ſignifies a piece of earth, wherein is contained ſome mineral ore.

GLEBE, in law, the land belonging to a pariſh-church, beſides the tithes.

GLECHOMA, in botany, a genus belonging to the didynamia gymnoſpermia claſs. The calix conſiſts of five ſegments; and each pair of antheræ are diſpoſed in the form of a croſs. There are three ſpecies, two of which are natives of Britain, *viz.* the hederacea, or ground-ivy; and the arvenſis, or upright ground-ivy. The leaves of the hederacea are corroborant, aperient, and detergent.

GLEDITSIA, in botany, a genus of the polygamia diœcia claſs. The calix of the hermaphrodite has four ſegments; the corolla four petals; there are ſix ſtamina, and one piſtillum. The calix of the male conſiſts of three leaves, and the corolla of three petals; and it has ſix ſtamina. The calix of the female conſiſts of five leaves, and the corolla of five petals; it has but one piſtillum; and the capſule is a legumen. There are two ſpecies, none of them natives of Britain.

GLEET, in medicine, the flux of a thin limpid humour from the urethra. See MEDICINE.

GLIRES, the name of Linnæus's fourth order of mammalia. See NATURAL HISTORY.

GLENOIDES, the name of two cavities, or ſmall depreſſions, in the inferior part of the firſt vertebra of the neck.

GLIS, in zoology. See SCIURUS.

GLISCHROMICTHES, in natural hiſtory, the name by which Dr Hill calls the tougher and more viſcid loams.

GLISTER, in ſurgery. CLYSTER.

GLOBE, in practical mathematics, an artificial ſpherical body, on the convex ſurface of which are repreſented the countries, ſeas, *&c.* of our earth; or the face of the heavens, the circles of the ſphere, *&c.* See GEOGRAPHY.

GLOBULARIA, in botany, a genus of the tetrandria monogynia claſs. The common calix is imbricated; and the proper calix is tubular and below the fruit; the upper labium of the corollulæ is divided into two parts, and the under one into three; and the receptacle is paleaceous. There are ſeven ſpecies, none of them natives of Britain.

GLOBULE, a diminutive of globe, frequently uſed by phyſicians in ſpeaking of the red ſpherical particles of the blood.

GLOCESTER, the capital of Gloceſter-ſhire, ninety miles weſt of London: W. long. 2° 16′, and N. lat. 51° 50′.

It is a biſhop's ſee, and ſends two members to parliament.

GLOGAW, a city of Sileſia, ſituated on the river Oder, forty five miles north weſt of Breſlaw: E long 16° 8′, and N. lat 51° 40′.

Leſſer **GLOGAW**, a town of Sileſia, fifty miles ſouth of Breſlaw.

GLORIOSA, SUPERB LILY, in botany, a genus of the hexandria monogynia claſs. The corolla conſiſts of ſix undulated and reflected petals; and the ſtylus is oblique. There is but one ſpecies, a native of Malabar.

GLOSSARY, a ſort of dictionary, explaining the obſcure and antiquated terms in ſome old author.

GLOSSOPETRA, in natural hiſtory, a genus of extraneous foſſils, ſo called from their having been ſuppoſed the tongues of ſerpents turned into ſtone, though they are really the teeth of ſharks, and are daily found in the mouths of thoſe fiſhes, where ever taken.

GLOTTIS, in anatomy. See ANATOMY, p. 300.

GLOW WORM. See CICINDELA.

GLUCKSTAT, a fortified town of Germany, ſituated on the eaſt ſide of the river Elbe, thirty miles north weſt of Hamburgh: E. long. 9°, and N. lat. 54° 20′.

GLUE, among artificers, a tenacious viſcid matter, which ſerves as a cement to bind or connect things together.

Glues are of different kinds, according to the various uſes they are deſigned for, as the common glue, glove-glue, and parchment-glue; whereof the two laſt are more properly called ſize.

The common or ſtrong glue is chiefly uſed by carpenters, joiners, cabinet-makers, &c. and the beſt kind is that made in England, in ſquare pieces of a ruddy brown colour; and, next to this, the Flanders glue. It is made of the ſkins of animals, as oxen, cows, calves, ſheep, &c. and the older the creature is, the better is the glue made of its hide. Indeed, whole ſkins are but rarely uſed for this purpoſe, but only the ſhavings, parings, or ſcraps of them; or the feet-ſinews, &c. That made of whole ſkins, however, is undoubtedly the beſt; as that made of ſinews is the very worſt.

The method of making GLUE. In making glue of parings, they firſt ſteep them two or three days in water; then waſhing them well out, they boil them to the conſiſtence of a thick jelly; which they paſs, while hot, through ozier-baſkets, to ſeparate the impurities from it, and then let it ſtand ſome time, to purify it further: when all the filth and ordures are ſettled to the bottom of the veſſel, they melt and boil it a ſecond time. They next pour it into flat frames or moulds, whence it is taken out pretty hard and ſolid, and cut into ſquares pieces or cakes. They afterwards dry it in the wind, in a ſort of coarſe net; and at laſt ſtring it, to finiſh its drying.

The glue made of ſinews, feet, &c. is managed after the ſame manner; only with this difference, that they bone and ſcour the feet, and do not lay them to ſteep.

The beſt glue is that which is oldeſt; and the ſureſt way to try its goodneſs, is to lay a piece to ſteep three or four days, and if it ſwell conſiderably without melting, and when taken out reſumes its former drineſs, it is excellent.

A glue that will hold againſt fire or water, may be made thus: mix a handful of quicklime with four ounces of linſeed oil; boil them to a good thickneſs, then ſpread it on tin-plates in the ſhade, and it will become exceeding hard, but may be eaſily diſſolved over a fire, as glue, and will effect the buſineſs to admiration.

Method of preparing and uſing GLUE. Set a quart of water on the fire, then put in about half a pound of good glue, and boil them gently together till the glue be entirely diſſolved and of a due conſiſtence. When glue is to be uſed, it muſt be made thoroughly hot; after which, with a bruſh dipped in it, beſmear the faces of the joints as quick as poſſible; then clapping them together, ſlide or rub them lengthwiſe one upon another, two or three times, to ſettle them cloſe; and ſo let them ſtand till they are dry and firm.

GLUME, among botaniſts. See BOTANY, p. 637.

GLUTÆUS, in anatomy. See ANATOMY, p 204.

GLYCINE, in botany, a genus of the diadelphia decandria claſs. The calix is bilabiated: and the pod conſiſts of two cells. There are nine ſpecies, none of them natives of Britain.

GLYCYRRHIZA, LIQUORICE, in botany, a genus of the diadelphia decandria claſs. The calix is bilabiated; and the pod is oval and compreſſed. There are three ſpecies, none of them natives of Britain.

The common liquorice is cultivated in moſt countries of Europe for the ſake of its root. That which is cultivated in Britain is preferable to ſuch as comes from abroad; this laſt being generally mouldy, which this root is very apt to become, unleſs kept in a dry place. The powder of liquorice uſually ſold is often mingled with flour, and probably too often with ſubſtances not quite ſo wholeſome: the beſt ſort is of a browniſh yellow colour (the fine pale yellow being generally ſophiſticated) and of a very rich ſweet taſte, much more agreeable than that of the freſh root. Liquorice is almoſt the only ſweet that quenches thirſt; whence it was called by the Greeks *adipſon*. Galen takes notice, that it was employed in this intention in hydropic caſes, to prevent the neceſſity of drinking. Mr Fuller, in his *Medicina gymnaſtica*, recommends this root as a very uſeful pectoral, and ſays it excellently ſoftens acrimonious humours, at the ſame time that it proves gently detergent: and this account is warranted by experience.

GLYPH, in ſculpture and architecture, denotes any canal or cavity uſed as an ornament.

GMELINA, in botany, a genus of the didynamia angioſpermia claſs. The calix has four teeth; the corolla is bell-ſhaped, and divided into four ſegments; the antheræ are divided into two parts; and the fruit is a bilocular drupa. There is but one ſpecies, a native of the Indies.

GNAPHALIUM, CUDWEED, in botany, a genus of the ſyngeneſia polygamia ſuperflua claſs. The receptacle is naked; the pappus is plumoſe; and the calix is imbricated. There are 41 ſpecies, five of them natives of Britain, *viz.* the dioicum, mountain cudweed, or cat's foot; the margaritaceum, or American cudweed; the luteo-album, or Jerſey cudweed; the ſylvaticum, or upright cudweed; and the uliginoſum, or black-headed cudweed.

GNAT, in zoology. See Musca.

GNESNA, the capital city of great Poland, ſituated one hundred and ten miles weſt of Warſaw: E. long. 18°, and N. lat. 53°.

It is the ſee of an archbiſhop, who is always primate of Poland. See Poland.

GNIDIA, in botany, a genus of the octandria monogynia claſs. The calix is funnel ſhaped, and conſiſts of four ſegments; the petals are four, and inſerted into the calix; and the berry contains but one ſeed. There are three ſpecies, none of them natives of Britain.

GNOMON, in dialling, the ſtyle, pin, or cock of a dial; which, by its ſhadow, ſhews the hour of the day. See Dialling.

Gnomon, in aſtronomy, a ſtyle erected perpendicular to the horizon, in order to find the altitude of the ſun.

Gnomon *of a globe*, the index of the hour-circle. See Geography.

GNOMONICS, the art of dialling. See Dialling.

GNOSTICS, in church-hiſtory, Chriſtian heretics ſo called, it being a name which almoſt all the ancient heretics affected to take, to expreſs that new knowledge and extraordinary light to which they made pretenſions; the word gnoſtic ſignifying a learned or enlightened perſon.

GOA, a city and ſea-port of the hither India, ſituated in an iſland of the river Mandoua, and ſubject to the Portugueſe: E. lon. 73° 20′, and N. lat. 15° 20′.

GOAT, in zoology. See Capra.

Goat's beard, in botany. See Tragopogon.

Goat's rue, in botany. See Galega.

Goat sucker, in ornithology. See Caprimulgus.

GOBIUS, in ichthyology, a genus of fiſhes belonging to the order of thoracici. They have two holes between the eyes, four rays in the membrane of the gills; and the belly-fins are united in an oval form. There are eight ſpecies, principally diſtinguiſhed by the number of rays in their fins.

GOD, one of the many names of the Supreme Being. See Religion.

GODDESS, a heathen deity of the female ſex.

The ancients had almoſt as many goddeſſes as gods; ſuch were Juno, the goddeſs of air; Diana, the goddeſs of woods, *&c.* And under this character were repreſented the virtues, graces, and principal advantages of life; Truth, Juſtice, Piety, Liberty, Fortune, Victory, *&c.*

It was the peculiar privilege of the goddeſſes to be repreſented naked on medals; for it was ſuppoſed that the imagination muſt be awed and reſtrained by the conſideration of the divine character.

GOLCONDA, the capital of a province of the ſame name in the hither India: E. long. 77°, and N. lat. 16°.

GOLD. See Chemistry, p. 78, and 129.

Gold-wire, a cylindrical ingot of ſilver, ſuperficially gilt, or covered with gold at the fire, and afterwards drawn ſucceſſively through a great number of little, round holes, of a wire-drawing iron, each leſs than the other, till it be ſometimes no bigger than a hair of the head.

It may be obſerved, that before the wire be reduced to this exceſſive fineneſs, it is drawn through above an hundred and forty different holes; and that each time they draw it, it is rubbed afreſh over with new wax, both to facilitate its paſſage, and to prevent the ſilver's appearing through it.

Gold-wire *flatted*, is the former wire flatted between two rollers of poliſhed ſteel, to fit it to be ſpun on a ſtick, or to be uſed flat, as it is, without ſpinning, in certain ſtuffs, laces, embroideries, *&c.* See Stuff, *&c.*

Gold-thread, or Spun-gold, is a flatted gold, wrapped or laid over a thread of ſilk, by twiſting it with a wheel and iron bobbins.

Manner of forming Gold-wire, *and* Gold-thread, *both round and flat.* Firſt, an ingot of ſilver, of twenty-four pounds, is forged into a cylinder, of about an inch in diameter: then it is drawn through eight or ten holes, of a large, coarſe, wire-drawing iron, both to finiſh the roundneſs, and to reduce it to about three fourths of its former diameter. This done, they file it very carefully all over, to take off any filth remaining on the forge; then they cut it in the middle; and thus make two equal ingots thereof, each about twenty ſix inches long, which they draw through ſeveral new holes, to take off any inequalities the file may have left, and to render it as ſmooth and equable as poſſible.

The ingot thus far prepared, they heat it in a charcoal fire; then taking ſome gold leaves, each about four inches ſquare, and weighing twelve grains, they join four, eight, twelve, or ſixteen of theſe, as the wire is intended to be more or leſs gilt; and when they are ſo joined, as only to form a ſingle leaf, they rub the ingots reeking hot with a burniſher. Theſe leaves being thus prepared, they apply over the whole ſurface of the ingot, to the number of ſix, over each other, burniſhing or rubbing them well down with the blood-ſtone, to cloſe and ſmoothe them. When gilt, the ingots are laid anew in a coal fire; and when raiſed to a certain degree of heat, they go over them a ſecond time with the blood-ſtone, both to ſolder the gold more perfectly, and to finiſh the poliſhing. The gilding finiſhed, it remains to draw the ingot into wire.

In order to this, they paſs it through twenty holes of a moderate drawing iron, by which it is brought to the thickneſs of the tag of a lace: from this time the ingot loſes its name, and commences gold-wire. Twenty holes more of a leſſer iron leaves it ſmall enough for the leaſt iron; the fineſt holes, of which laſt ſcarce exceeding the hair of the head, finiſh the work.

To diſpoſe the wire to be ſpun on ſilk, they paſs it between two rollers of a little mill: theſe rollers are of nicely poliſhed ſteel, and about three inches in diameter. They are ſet very cloſe to each other, and turned by means of a handle faſtened to one of them, which gives motion to the other. The gold wire in paſſing between the two, is rendered quite flat, but without loſing any thing of its gilding, and is rendered ſo exceedingly thin and flexible, that it is eaſily ſpun on ſilk thread, by means of a hand wheel, and ſo wound on a ſpool or bobin.

Gold-leaf, or **Beaten Gold**, is gold beaten with a hammer into exceeding thin leaves, ſo that it is computed, that an ounce may be beaten into ſixteen hundred leaves, each three inches ſquare, in which ſtate it takes up more than 159052 times its former ſurface.

This gold they beat on a block of black marble, about a foot ſquare, and uſually raiſed three feet high: they make uſe of three ſorts of hammers, formed like mallets, of poliſhed iron: the firſt, which weighs three or four pounds, ſerves to chaſe, or drive; the ſecond, of eleven or twelve pounds, to cloſe; and the third, which weighs fourteen or fifteen pounds, to ſtretch and finiſh. They alſo make uſe of four moulds of different ſizes, *viz.* two of vellum, the ſmalleſt whereof conſiſts of forty or fifty leaves, and the larger of two hundred; the other two, conſiſting each of five hundred leaves, are made of bullocks guts well ſcoured, and prepared. See Mould.

Method of preparing and beating **Gold**. They firſt melt a quantity of pure gold, and form it into an ingot: this they reduce, by forging, into a plate about the thickneſs of a ſheet of paper; which done, they cut the plate into little pieces about an inch ſquare, and lay them in the firſt or ſmalleſt mould to begin to ſtretch them: after they have been hammered here a while with the ſmalleſt hammer, they cut each of them into four, and put them into the ſecond mould, to be extended further.

Upon taking them hence, they cut them again into four, and put them into the third mould; out of which they are taken, divided into four, as before, and laid in the laſt, or finiſhing mould, where they are beaten to the degree of thinneſs required.

The leaves thus finiſhed, they take them out of the mould, and diſpoſe them into little paper-books, prepared with a little red bole, for the gold to ſtick to; each book ordinarily contains twenty-five gold leaves. There are two ſizes of theſe books; twenty-five leaves of the ſmalleſt only weigh five or ſix grains, and the ſame number of the largeſt nine or ten grains.

It muſt be obſerved, that gold is beaten more or leſs, according to the kind or quality of the work it is intended for; that for the gold-wire drawers to gild their ingots withal, is left much thicker than that for gilding the frames of pictures, *&c.* withal. See Gilding.

Gold-finch, in ornithology. See Fringilla.

Goldsmith, or, as ſome chuſe to expreſs it, *ſilverſmith*, an artiſt who makes veſſels, utenſils, and ornaments, in gold and ſilver.

The goldſmith's work is either performed in the mould, or beat out with the hammer or other engine. All works that have raiſed figures, are caſt in a mould, and afterwards poliſhed and finiſhed: plates, or diſhes, of ſilver or gold, are beat out from thin flat plates; and tankards, and other veſſels of that kind, are formed of plates ſoldered together, and their mouldings are beat, not caſt. The buſineſs of the goldſmiths formerly required much more labour than it does at preſent; for they were obliged to hammer the metal from the ingot to the thinneſs they wanted: but there are now invented flatting-mills, which reduce metals to the thinneſs that is required, at a very ſmall expence. The goldſmith is to make his own moulds, and for that reaſon ought to be a good deſigner, and have a taſte in ſculpture: he alſo ought to know enough of metallurgy, to be able to aſſay mixed metals, and to mix the alloy.

GOLDEN, ſomething that has a relation to gold, or conſiſts of gold.

Golden *number*. See Astronomy, p. 492.

Golden *rule*. See Arithmetick, p. 381.

GOLDINGEN, a city of Poland, in the duchy of Courland, ſixty miles weſt of Mittau: E. long. 22°, N. lat 57°.

GOMBRON, the greateſt ſea-port town in Perſia, ſituated on the ſtrait at the entrance of the gulph of Perſia, oppoſite to the iſland of Ormus: E. long. 55° 30′, N. lat. 27° 30′.

GOMERA, one of the Canary iſlands, ſubject to Spain, and ſituated weſt of Teneriff: W. long. 18°, N. lat. 28°.

Gomorro *iſlands*, ſituated between 10° and 13° S. lat. on the eaſtern coaſt of Africa.

GOMPHOSIS, in anatomy. See Anatomy, p. 148.

GOMPHRENA, the *purple everlaſting flower*, in botany, a genus of the pentandria digynia claſs. The calix conſiſts of three coloured leaves; the nectarium is cylindrical, with ten teeth; and the capſule contains one ſeed. There are ſeven ſpecies, none of them natives of Britain.

GONDOLA, in naval architecture, a flat kind of boat, very long and narrow, chiefly uſed on the canals at Venice.

GONORRHOEA, in medicine, an involuntary efflux of the ſeminal juices, and ſome other recrementitious matter. See Medicine.

GOOD, in general, whatever is apt to cauſe or increaſe pleaſure, or diminiſh pain in us; or, which amounts to the ſame, whatever is able to procure or preſerve to us the poſſeſſion of agreeable ſenſations, and remove thoſe of an oppoſite nature.

Moral **Good**, denotes the right conduct of the ſeveral ſenſes and paſſions, or their juſt proportion and accommodation to their reſpective objects and relations. See Morals.

GOOD-HOPE, or *Cape of* **Good-hope**, the moſt ſouthern promontory of Africa, where the Dutch have built a good town and fort: E. long. 16° and N. lat. 34° 15′.

GOOSE, in ornithology. See Anas.

Gooseberry, in botany. See Pibes.

Gooſe-neck, in a ſhip, a piece of iron fixed on the one end of the tiller, to which the laniard of the whip-ſtaff or the wheel-rope comes, for ſteering the ſhip.

Gooſe-wing, in the ſea-language. When a ſhip ſails before, or with a quarter wind on a freſh gale, to make the more haſte, they launch out a boom, and ſail on the lee ſide; and a ſail ſo fitted, is called a gooſe-wing.

GOR, the capital of a province of the ſame name, in the Eaſt-Indies, ſubject to the Mogul: E. long. 85°, N. lat. 31° 15′.

GORCUM, a city of the United Provinces, ſituated in that of Holland, on the river Waal, twenty two miles eaſt of Rotterdam: E. long. 4° 50′, N. lat. 51° 50′.

GORDIAN knot, in antiquity, a knot made in the leathers or harneſs of the chariot of Gordius, king of Phrygia, ſo very intricate, that there was no finding where it began or ended.

The inhabitants had a tradition, that the oracle had declared, that he who united this knot, ſhould be maſter of Aſia. Alexander having undertaken it, was unable to accompliſh it; when fearing leſt his not untying it ſhould be deemed an ill augury, and prove a check in the way of his conqueſts, he cut it aſunder with his ſword, and thus either accompliſhed or eluded the oracle.

GORE, in heraldry, one of the abatements, which, according to Guillim, denotes a coward. It is a figure conſiſting of two arch lines drawn one from the ſiniſter chief, and the other from the ſiniſter baſe, both meeting in an acute angle in the middle of the feſs point. See Plate XCVII. fig. 4.

GORGE, in architecture, the narroweſt part of the Tuſcan and Doric capitals, lying between the aſtragal, above the ſhaft of the pillar, and the annulets.

Gorge, in fortification, the entrance of the platform of any work. See Fortification.

GORGED, in heraldry, the bearing of a crown, coronet, or the like, about the neck of a lion, a ſwan, *&c.* and in that caſe it is ſaid, the lion or cygnet is gorged with a ducal coronet, *&c.*

Gorged is alſo uſed when the gorge or neck of a peacock, ſwan, or the like bird, is of a different colour or metal from the reſt.

GORGONA, the name of two iſlands; one in the Pacific Ocean on the coaſt of Peru, W. long. 79°, N. lat. 3°; the other in the Mediterranean, twenty-five miles weſt of Leghorn.

GORGONS, in antiquity, a warlike female nation of Lybia, in Africa, who had frequent quarrels with another nation of the ſame ſex, called Amazons.

GORLITZ, a city of Upper Saxony, in Germany, fifty miles eaſt of Dreſden: E. long. 15° 6′, N. lat. 51° 12′.

GOSHAWK. See Falco.

GOSLAR, an imperial city of Lower Saxony, in Germany, thirty miles ſouth of Brunſwick: E. long. 10° 30′, N. lat 52°.

GOSPEL, the hiſtory of the life, actions, death, reſurrection, aſcenſion and doctrine of Jeſus Chriſt.

The word is ſaxon, and of the ſame import with the Latin term *evangelium*, which ſignifies glad tidings, or good news.

This hiſtory is contained in the writings of St Matthew, St Mark, St Luke, and St John; who from thence are called evangeliſts. The Chriſtian church never acknowledged any more than theſe four goſpels as canonical; notwithſtanding which, ſeveral apocryphal goſpels are handed down to us, and others are entirely loſt.

GOSSYPIUM, in botany, a genus of the monodelphia polyandria claſs. The calix is double, the exterior one conſiſting of three leaves; the capſule has four cells; and the ſeeds are covered with down. There are four ſpecies, none of them natives of Britain.

GOTHA the capital of the duchy of Saxe Gotha, in Upper Saxony; E. long. 10° 36′, N. lat. 51°.

It is ſubject to the duke of Saxe Gotha, brother of her royal highneſs the princeſs dowager of Wales.

GOTHIC, in general, whatever has any relation to the Goths: thus, we ſay, Gothic cuſtoms, Gothic architecture, *&c.*

GOTHLAND, the moſt ſouthern province of Sweden, being a peninſula ſurrounded on three ſides by the Baltic Sea. It is ſubdivided into Eaſt and Weſt Gothland, Smaland, Halland, Bleken, and Schonen.

Gothland, is alſo an iſland of the Baltic, ſituated without the province of Gothland and Livonia.

GOTTENBURG, a port-town of Sweden, ſituated between the Sound, on the coaſt of the Schaggerack Sea, near the entrance of the Baltic.

GOTTINGEN, a city of Germany, in the circle of Lower Saxony and dukedom of Brunſwick: E. long. 9° 45′, N. Lat. 51° 32′.

GOTTORP, a city of the dukedom of Sleſwic, in Denmark, and capital of the territories of the duke of Holſtein Gottorp: E. long. 10°, N. lat. 54° 40′.

GOUDE, a city of the United Netherlands, in the province of Holland, ten miles north-eaſt of Rotterdam.

GOVERNMENT, in general, is the polity of a ſtate, or an orderly power conſtituted for the public good.

Civil government was inſtituted for the preſervation and advancement of mens civil intereſts, and for the better ſecurity of their lives, liberties, and properties. The uſe and neceſſity of government is ſuch, that there never was an age or country without ſome ſort of civil authority: but as men are ſeldom unanimous in the means of attaining their ends, ſo their difference in opinion in relation to government, has produced a variety of forms of it. To enumerate them, would be to recapitulate the hiſtory of the whole earth. But they may, in general, be reduced to one of theſe heads: either the civil authority is delegated to one or more, or elſe it is ſtill reſerved to the whole body of the people; whence ariſes the known diſtinction of government into monarchy, ariſtocracy, and democracy.

Mr Hooker thinks, that the firſt government was arbitrary, and adminiſtered by a ſingle perſon; till it was found by experience, that to live by one man's will, was the cauſe of all mens miſery: and this, he concludes, was the original of inventing laws. The Roman and moſt of the Grecian ſtates were built upon the republican plan; but when the Goths, and other northern nations, deſtroyed the Roman empire, and extended their conqueſts into far diſtant countries, they eſtabliſhed, where-ever they came, a mixed form of government. The preſervation of this conſtitution depending upon the balance between the king, nobility, and people, the legiſlative power was lodged in theſe three ſtates, called by different names in different countries; in the north, diets; in Spain, cortes; in France, eſtates; and in Britain, parliaments. The excellency of this mixed government, conſiſts in that due poiſe or balance between rule and ſubjection, ſo juſtly obſerved in it, that by the neceſſary concurrence of the nobility and commons, in making and repealing all laws, it has the main advantage of an ariſtocracy, and a democracy, and yet is free from the diſadvantages and evils of either of them. This mixed form of government is, however, now driven almoſt out of Europe, in ſome parts of which we can hardly find the ſhadow of liberty left, and in many there is no more than the name of it remaining. France, Spain, Portugal, Denmark, and part of Germany, were all, an age or two ago, limited monarchies, governed by princes, well adviſed by parliaments or courts, and not by the abſolute will of one man. But now all their valuable rights and liberties are ſwallowed up by the arbitrary power of their princes: whilſt we in great Britain have ſtill happily preſerved this noble and ancient Gothic conſtitution, which all our neighbours once enjoyed. There is ſuch a due balance of property, power, and dominion in our conſtitution, that, like the ancient government of Sparta, it may be called an empire of laws, and not of men; being the moſt excellent plan of limited monarchy in the world.

Governments are commonly divided into two claſſes, arbitrary and free governments; but there are many differed ſorts of each. Thus the governments of France and Spain are generaly called arbitrary; tho' they differ as much from the governments of Turky and other eaſtern empires, where abſolute diſpoticiſm prevails, as they do from the government of England, and other European nations, where liberty is ſaid to flouriſh in its fulleſt perfection.

GOVERNMENT is alſo a poſt or office which gives a perſon the power or right to govern or rule over a place, a city, or province, either ſupremely or by deputation.

GOVERNMENT is alſo uſed for the city, country, or place to which the power of governing is extended.

GOURD, in botany. See CUCURBITA.

GOUT, in medicine. See MEDICINE.

GRABOW, or GRUBOW, a town of Lower Saxony and duchy of Mecklenburg: E. long. 11° 36′, N. lat. 53° 32′.

GRACE, among divines, is taken, 1ſt, For the free love and favour of God, which is the ſpring and ſource of all the benefits which we receive from him. 2dly, For the work of the ſpirit, renewing the ſoul after the image of God, and continually guiding and ſtrengthening the believer to obey his will, to reſiſt and mortify ſin, and to overcome it.

GRACE, in geography, a city of Provence, in France, fifteen miles ſouth-weſt of Nice: E. long. 6° 50′, N. lat. 43° 40′.

Act of GRACE, the appellation given to the act of parliament 1696, *c.* 32. which allows priſoners for civil debts to be ſet at liberty, upon making oath, that they have not wherewithal to ſupport themſelves in priſon, unleſs they are alimented by the creditors upon whoſe diligences they were impriſoned, within ten days after intimation made for that purpoſe. See SCOTS LAW, tit. 32.

Days of GRACE, three days immediately following the term of payment of a bill, within which the creditor muſt proteſt it, if payment is not obtained, in order to intitle him to recourſe againſt the drawer. See SCOTS LAW, tit. 21.

GRACE is alſo a title of dignity given to dukes, archbiſhops, and in Germany to barons and other inferior princes.

GRACES, in heathen mythology, three goddeſſes, whoſe names were Aglia, Thalia, and Euphroſyne; that is, ſhining, flouriſhing, and gay; or, according to ſome authors, Paſithae, Euphroſyne, and Ægiale. Some make them the daughters of Jupiter, and Eurynome, or Eunomia, the daughter of Oceanus; but the moſt common opinion is, that they were the daughters of Bacchus and Venus.

They are ſometimes repreſented dreſſed, but more frequently naked; to ſhew, perhaps, that whatever is truly graceful, is ſo in itſelf, without the aid of exterior ornaments. They preſided over mutual kindneſs and acknowledgment; beſtowed liberality, eloquence, and wiſdom, together with a good grace, gaiety of diſpoſition, and eaſineſs of manners.

GRACULA, in ornithology, a genus belonging to the order of picæ. The bill is convex, cultrated, and bare at the point; the tongue is not cloven, but is fleſhy and ſharpiſh; it has three toes before, and one behind. There are eight ſpecies, principally diſtinguiſhed by their colour.

GRACULUS, in ornithology. See CORVUS.

GRADATION, in general, the aſcending ſtep by ſtep, or in a regular and uniform manner.

GRADISKA, a city of Sclavonia, ſituated on the river Save, twenty-five miles weſt of Poſega: E. long. 18°, N. lat. 45° 33′.

GRADUATE, a perſon who has taken a degree in the univerſity. See DEGREE.

GRAFT, or GRAFF, in gardening, a cion or ſhoot of a tree inſerted into another, ſo as to make it yield fruit of the ſame nature with that of the tree from whence the graft was taken. See GARDENING.

GRAIES, a market-town of Eſſex, ſituated on the river Thames, ſeventeen miles eaſt of London.

GRAIN, all ſorts of corn, as wheat, barley, oats, rye, *&c.* See CORN, WHEAT, *&c.*

GRAMMAR.

GRAMMAR is *the art of ſpeaking or of writing any language with propriety.*

Grammar conſidered as an *Art*, neceſſarily ſuppoſes the previous exiſtence of language; and as its deſign is to teach any language to thoſe who are ignorant of it, it muſt be adapted to the genius of that particular language of which it treats.—A juſt method of grammar, therefore, ſuppoſing a language introduced by cuſtom, without attempting any alterations in it, furniſhes certain obſervations called rules, to which the methods of ſpeaking uſed in this language may be reduced; this collection of rules is what is called a grammar of any particular language. For the greater diſtinctneſs with regard to theſe rules, grammarians have uſually divided this ſubject into four diſtinct heads, *viz.* ORTHOGRAPHY, or *the art of combining letters into ſyllables, and ſyllables into words;* ETYMOLOGY, or *the art of deducing one word from another, and the various modifications by which the ſenſe of any one word can be diverſified;* SYNTAX, or what relates *to the conſtruction or due diſpoſition of the words of a language into ſentences or phraſes;* and PROSODY, or that which treats of *the quantities and accents of ſyllables, and the art of making verſes.*

But grammar conſidered as a *Science*, views language in itſelf: neglecting particular modifications, or the analogy which *words* may bear to *each other*, it examines the analogy and relation between *words* and *things*; diſtinguiſhes between thoſe particulars which are *eſſential* to language, and thoſe which are only *accidental*; and thus furniſhes a certain ſtandard by which different languages may be compared, and their ſeveral excellencies or defects pointed out. This is what is called PHILOSOPHIC or UNIVERSAL GRAMMAR.

OF UNIVERSAL GRAMMAR.

IT is not neceſſary here to inquire how language was originally invented, to trace the various changes it may have undergone, or to examine whether any one language may be conſidered as the original from which all others have been derived: it is ſufficient for our purpoſe to obſerve, that all mankind, however diverſified in other reſpects, agree in the common uſe of language; from which it appears, that language is not merely accidental and arbitrary, but founded in the nature of things, and within the reach of all mankind. It is therefore an object worthy of a philoſophic inquiry to diſcover the foundations upon which this univerſal fabric has been raiſed.

The deſign of ſpeech is to publiſh to others the thoughts and perceptions of our mind. The moſt acute feelings of man, as well as of every other animal, are expreſſed by ſimple inarticulate ſounds, which, as they tend to the preſervation of the individual, are univerſally underſtood. Theſe inarticulate but ſignificant ſounds, therefore, conſtitute a natural and univerſal language, which man, as a mere ſenſitive being, partakes in common with the other animals. But as man is not only endowed with ſenſation, but with the faculty of reaſoning, ſimple inarticulate ſounds are inſufficient for expreſſing all the various modifications of thought, or for communicating to others a chain of argumentation: it was therefore neceſſary to call in the aid of *articulation*; which by modifying theſe ſimple ſounds, and by fixing a particular meaning to theſe modifications, forms the language peculiar to man, and which diſtinguiſhes him from all other animals, and enables him to communicate with facility all that diverſity of ideas with which his mind is ſtored. Theſe ſounds, thus modified and having a determinate meaning, are called WORDS; and as all language is compoſed of ſignificant words variouſly combined, a knowledge of them is neceſſary previous to our acquiring an adequate idea of language.

But, as it is by words that we expreſs the various ideas which occur to the mind, it is neceſſary to examine how ideas themſelves are ſuggeſted, before we can aſcertain the various claſſes into which words may be diſtributed. With this view, therefore, let us ſuppoſe a reaſonable being, devoid of every prepoſſeſſion whatever, placed upon this globe. His attention would, in the firſt place, be directed to the various objects which he ſaw exiſting around him: theſe he would naturally endeavour to diſtinguiſh from one another, and give them names, by means of which the idea of them might be recalled when the objects themſelves were abſent. This is one copious ſource of words, and forms a natural claſs which muſt be common to every language; and which is diſtinguiſhed by the name of NOUNS. And as theſe nouns are the names of the ſeveral ſubſtances which exiſt, they have likewiſe been called SUBSTANTIVES.

It would likewiſe be early diſcovered, that every one of theſe ſubſtances were endowed with certain qualities or attributes, to expreſs which another claſs of words would be requiſite. Thus, *to be weighty*, is a quality of matter; *to think*, is an attribute of man. Therefore, in every language, words have been invented to expreſs the various qualities of the ſeveral objects which exiſt. Theſe may all be comprehended under the general denomination of ATTRIBUTIVES.

Theſe two claſſes of words muſt comprehend all things that exiſt; for whatever exiſts, muſt of neceſſity be either a ſubſtance, or the attribute of ſome ſubſtance; and hence theſe two claſſes muſt comprehend all thoſe words which are ſignificant of themſelves, and may be called WORDS SIGNIFICANT OF THEMSELVES. If any other words occur, they can only be ſignificant in ſo far as they tend to explain or connect the words of the two former claſſes.

But, although theſe words form the baſis or matter of a language, in the ſame manner as ſtones form the matter of a building; yet, as ſtones cannot be arranged into a regular ſtructure without a cement to bind and connect them, ſo theſe original words ſtand in need of others to connect them, before they can be made to expreſs all the variety of our ideas. Another order of words, therefore, were neceſſary, which, although not of themſelves ſignificant, yet, when joined with others, might acquire a meaning. Theſe form a ſecond general claſs of words that may be called WORDS NOT OF THEMSELVES SIGNIFICANT, and which cannot acquire any meaning but ſo far as they ſerve either to EXPLAIN or CONNECT the others.

Hence, therefore, all words which can poſſibly be invented, may be divided into two general claſſes; thoſe that are SIGNIFICANT OF THEMSELVES, and thoſe that are NOT. Words which are ſignificant of themſelves, are either expreſſive of the names of ſubſtances, and therefore called SUBSTANTIVES; or, of qualities, which we call ATTRIBUTIVES. Words which are not ſignificant of themſelves, muſt acquire a meaning either as defining or connecting others, which we ſhall arrange under the two claſſes of DEFINITIVES and CONNECTIVES, each of which ſhall be examined in their order.

CHAPTER I.

Of SUBSTANTIVES.

SUBSTANTIVES may be divided into two claſſes, *viz.* thoſe which are primary, commonly called NOUNS; and thoſe of a ſecondary order, which are often ſubſtituted for nouns, and are hence called PRONOUNS: each of which we ſhall conſider ſeparately.

Section I. *Of* Subſtantives *of the Firſt Order, called* NOUNS.

NOUNS are *all thoſe words by which objects or ſubſtances are denominated, and which diſtinguiſh them from one another, by names applicable to each, without marking either quantity, quality, action, or relation.* And as all the objects which exiſt muſt be either in the ſame ſtate that they were produced by *nature*, or changed from their original ſtate by *art*, or *abſtracted* from ſubſtances by the powers of imagination, this naturally ſuggeſts a diviſion of nouns into NATURAL, as *man, vegetable, tree,* &c.; ARTIFICIAL, as *houſe, ſhip, watch,* &c.; or ABSTRACT, as *whiteneſs, temperance,* &c.

But the diverſity of objects being ſo great as to render it impoſſible for any perſon to know the diſtinct names of every individual, therefore it has been found expedient to arrange them under certain general claſſes, the names of which may be more eaſily acquired, ſo that by referring any unknown object to the claſs to which it belongs, we in ſome meaſure ſupply the want of proper names. Hence, therefore, each of the above ſpecies of nouns are divided into thoſe which denote genera, ſpecies, and individuals. Thus, in natural ſubſtances, *animal, vegetable,* and *foſſile*, denote genera; *man, dog, tree, metal,* are ſpecies; and *Alexander, Cæſar, oak, gold,* are individuals. In artificial ſubſtances, *edifice* is a genus; *houſe, tower, church,* are ſpecies; and the *Vatican, Tron-church,* and *Herriot's hoſpital,* are individuals. In *abſtract* ſubſtances, *motion* is a genus; *flight* and *courſe*, are ſpecies; the *flight of Mahomet*, the *courſe of a greyhound*, are individuals. Each of theſe general claſſes might be ſubdivided into many ſmaller; but as theſe leſſer diviſions can only relate to the particular genius of different languages, it does not fall within our plan to conſider them. We therefore proceed to take notice of the accidents which accompany nouns. Of which kind may be reckoned *number* and *gender*.

As nouns are the names of ſubſtances, and as there may be many ſubſtances of the ſame kind, therefore nouns muſt be adapted to expreſs whether there is one or more of thoſe objects of which we ſpeak. Nouns, therefore, in every language, admit of a certain variation to denote this circumſtance, which is called *number*. Thus, in the Engliſh language, when we ſpeak of a ſingle place of habitation, we call it *a houſe*; but if of more, we call them *houſes*. In the firſt of theſe caſes the noun is ſaid to be in the *ſingular*, and in the laſt caſe, the *plural* number: nor does the Engliſh, or any other language except the Greek, admit of any other variation but theſe two: and although the Greek language admits of a particular variation of the noun called the *dual* number, which is a plural limited to two objects; yet this cannot be conſidered as to language; and it is perhaps doubtful whether this variation ought to be conſidered as an elegance or a defect in that language.

But although number be a natural accident of nouns, it can only be conſidered as eſſential to thoſe which denote genera or ſpecies, as it does not deſcend to individuals. Thus we ſay, *animal*, or *animals, vegetables,* and *foſſils*; as alſo, *man*, or *men, dogs, trees,* &c. But we only ſay, *Xenophon, Ceſar, Bucephalus,* &c. in the ſingular. Nor do theſe admit of a plural, excepting when we conſider any proper name, as a general appellative under which many others are arranged, when it is no longer the name of an individual, but that of a ſpecies, and as ſuch admits of a plural; as the *Alexanders*, the *Ptolemies*, the *Howards*, the *Pelhams*, the *Montagues*, &c. The reaſon of all which will be obvious, if we conſider, that every genus may be found whole and entire in each of its *ſpecies*; for *man, horſe,* and *dog*, are each of them an entire and complete *animal*: and every ſpecies may be found whole and entire in each of its individuals; for *Socrates, Plato,* and *Xenophon*, are each of them compleatly and entirely a *man*. Hence it is, that every *genus*, though ONE, is multiplied into MANY; and every *ſpecies*, though ONE, is alſo multiplied into MANY, *by reference to thoſe beings which are their ſubordinates*. But as *no individual has any ſuch ſubordinates*, it can never in ſtrictneſs be conſidered as MANY, and ſo is truly an INDIVIDUAL as well in *nature* as in *name*, and therefore cannot admit of number.

Beſides number, another accident of nouns is *gender*, the nature of which may be thus explained: As nouns are the names of the various objects in nature; and as the diſtinctions of ſex is perceptible among all thoſe objects which are animated; and as thoſe which are inanimate cannot admit of any ſex at all; therefore all the beings which can become the objects of our ſpeculation, may be conſidered as either *males*, or *females*, or ſuch as admit of *no* ſex, and therefore may be ſaid to be neuter, or of *neither* ſex. Hence, therefore, grammarians have made a threefold diſtinction of nouns, into *maſculine genders*, or thoſe which denote *males*; *feminine*, or thoſe which denote *females*; and *neuters*, which denote thoſe ſubſtances that admit of no ſex. But, although the origin of genders is thus ſo clear and obvious; yet every language that we know of, except the Engliſh, deviates from the order of nature, and often attributes ſex to thoſe ſubſtances which are totally incapable of any; nay, ſome languages are ſo particularly defective in this reſpect, as to claſs every object inanimate as well as animate under either the *maſculine* or *feminine genders*, as they admit of no gender for thoſe that are of neither ſex. This is the caſe with the French, Italian, and Spaniſh. But the Engliſh, ſtrictly following the order of nature, puts every noun which denotes a male animal, and no others, in the *maſculine* gender; every name of a female animal, in the *feminine*; and every animal whoſe ſex is not obvious, or known, as well as every inanimate object whatever, in the *neuter* gender. Nor does this rule admit of any exceptions; although poets take the liberty of perſonifying any objects they think proper, and endow them with whatever ſex ſuits their purpoſe beſt; which ſerves admirably to diſtinguiſh between the cool language of philoſophy, and the enthuſiaſm of poetry.

Although *Caſes* are not neceſſary accidents of nouns; yet as they have been often conſidered as ſuch, it will perhaps be deemed proper to take ſome notice of them. —As natural objects remain the ſame, although viewed from many different points of view, they are not in their own nature altered, although they may be connected with others in many different ways: their names therefore ought to remain unchanged, although their relations to other words may be varied. However, there are certain circumſtances in which nouns may be conſidered with reſpect to their relation *to*, and connection *with* other words, which occur more frequently than others. Some languages, (particularly the Greek and Latin) expreſs *ſome* of theſe circumſtances, by a variation of the original noun, which variations are called CASES. But the Engliſh, and almoſt all the modern languages of Europe, have followed the order of nature, and allow the noun to remain the ſame, expreſſing its relation and connection with other words by the help of diſtinct words called prepoſitions.—Which of theſe methods is beſt, it is not our preſent purpoſe to inquire. See LANGUAGE.

It has been ſuppoſed the Engliſh nouns admit of one variation which anſwers to the genitive caſe of the Latins.—Thus the word *Alexander* is an Engliſh noun in its proper form, and in that caſe which in Latin would be called the *Nominative*. The variation which they called the *Genitive* Caſe, is expreſſed in Engliſh by adding the prepoſition OF before the noun; thus, OF *Alexander*. But the ſame meaning may be conveyed by the word *Alexander's*; for the meaning is the ſame if I ſay the houſe *of Alexander*, or *Alexander's* houſe. This, therefore, has been called a true inflection of the original noun. However, although this opinion has been adopted by all grammarians, it appears to have been adopted without ſufficient examination, as will be evident from the following conſiderations.

There are certain circumſtances in which this ſuppoſed genitive cannot be ſuſtituted inſtead of the other: for I may ſay, I ſpeak OF *Alexander*, I write OF *Cæſar*, I think OF *Pompey*; but I cannot ſay, I ſpeak *Alexander's*, I write *Cæſar's*, or I think *Pompey's*. Hence theſe two are not in all caſes ſynonymous terms; and therefore one of them muſt be conſidered as only accidentally coinciding with the other in particular circumſtances.

Again, every one of theſe ſuppoſed genitives can with propriety aſſume all the various ſigns of the different *caſes* in the Engliſh language: for we may ſay ſimply, as in the nominative caſe, *Alexander's* houſe; but we can alſo ſay, OF *Alexander's houſe*, TO, WITH, FROM, IN, BY, or FOR *Alexander's houſe*, &c. If this then be a real genitive, it requires the ſign of the genitive, as well as of the other caſes, to explain it; which would be an abſurdity too great to be admitted.—But it may be aſked, if theſe are not genitives, to what claſs of words can they be referred?

In anſwer to this, it has been already obſerved, that the variety of ſubſtances is ſo great, that it is impoſſible for any perſon to know the names of every one of them; and therefore they have been arranged under the ſeveral orders of genera and ſpecies. We now further obſerve, that as the individuals are ſo exceedingly numerous, it would be impoſſible even to invent proper names for each, and far leſs would it be poſſible to make theſe names be known to every perſon who might accidentally ſee them: therefore when we want to aſcertain any individual object, and diſtinguiſh it from all the other individuals of the ſame ſpecies, we are obliged to have recourſe to particular epithets, or definitives, to aſcertain that individual.—Thus, I ſee a particular houſe which I want to diſtinguiſh from other houſes; this has no particular name of its own; I muſt therefore aſcertain it in the beſt manner I can; and as the ſhorteſt is always the beſt, we moſt naturally denominate it from its owner or poſſeſſor if we know him, and therefore call it *Alexander's*, *James's*, or *John's* houſe.—Here then we ſee, that the words *Alexander's*, *James's*, and *John's*, do not ſtand as nouns, but as *articles* or *definitives* ſerving to aſcertain and point out the individuality of the noun with which they are joined, and are much nearer allied to adjectives than to ſubſtantives. Theſe, therefore, like other articles, do not alter the caſe of the noun; ſo that the term *Alexander's houſe*, is as much the proper name of a particular houſe, as *Alexander* or *James* are the proper names of particular men, and of conſequence may be varied thro' the different caſes as well as the other.—It is ſurpriſing, that this idea never occurred to grammarians; for *St Peter's* at Rome, and *St Paul's* at London, are as truly the proper names of theſe two noble edifices, as the *Rotundo* or the *Circus* are the proper names of two other ſtructures.—We may therefore ſafely conclude, that the Engliſh language admits of no caſes at all, and that the only eſſential accidents of nouns are gender and number.

Section II. *Of* Subſtantives *of the Second Order, called* PRONOUNS.

All converſation paſſes between individuals. When theſe individuals are unknown to each other, how ſhall the one ſpeaker addreſs the other, when he knows not his name; or how explain himſelf by his own name, of which the other is wholly ignorant? This might perhaps have been at firſt effected by pointing; but as this method behoved to be extremely inconvenient and defective, it was neceſſary that a particular claſs of words ſhould be invented for this purpoſe; and as theſe words always ſupply the place of a noun, they have been called PRONOUNS;—the nature of which may be explained as follows.

Suppoſe the parties converſing to be wholly unacquainted, and the ſubject of the converſation to be the ſpeaker himſelf: here, to ſupply the place of pointing, the inventors of language have furniſhed the ſpeaker with the pronoun *I*; *I write*, *I deſire*; and as the ſpeaker is always principal with reſpect to his own diſcourſe, they have therefore called this the *pronoun* of the FIRST perſon.

Again, ſuppoſe the ſubject of the converſation to be the party addreſſed: here, for ſimilar reaſons, they invented the pronoun THOU, THOU *writeſt*, THOU *walkeſt*; and as the party addreſſed is next in dignity to the ſpeaker, or at leaſt comes next with reference to the diſcourſe, they therefore called this the *pronoun* of the SECOND perſon.

But as the ſubject of the converſation may be ſome third object different from either the ſpeaker or the party addreſſed, another pronoun was neceſſary; and as this object might be either a *male* or a *female*, or a *neuter*, it was neceſſary to have one pronoun for each of the genders, HE for the *maſculine*, SHE for the *feminine*, and IT for the neuter: and this, in diſtinction to the former, was called the *pronoun* of the THIRD perſon.—Hence the diſtribution of pronouns into *perſons*.

We have already ſeen that nouns admit of number; pronouns, which are their ſubſtitutes, likewiſe admit of number. There may be many ſpeakers of the ſame ſentiment, as well as one who including himſelf ſpeaks the ſame ſentiment with MANY; ſpeech may likewiſe be addreſſed to MANY at a time as well as to ONE; and the ſubject of the diſcourſe may likewiſe be MANY; therefore the pronoun of every one of the *perſons* muſt admit of number, to expreſs this ſingularity or plurality. Hence, therefore, the pronoun of the firſt perſon *I*, has the plural WE; that of the ſecond perſon THOU, has the plural YOU; and that of the third perſon HE, SHE, or IT, has the plural THEY, which is equally applied to all the three genders.

With regard to gender, we do not find in any language that the pronouns of the *Firſt* or *Second* perſons admit of any diſtinction in this reſpect: nor was it neceſſary that they ſhould; as the ſpeaker and party addreſſed are uſually preſent with one another, this diſtinction is generally obvious from dreſs and external appearance. But this is not the caſe with regard to the pronoun of the *Third* perſon; of whoſe character and diſtinctions we often know no more than what we learn from the diſcourſe itſelf; and hence it is, that in almoſt all languages the pronoun of the third perſon admits of genders, as we have already ſeen the Engliſh admits of the triple diſtinction of maſculine, feminine, and neuter.—The utility of which threefold diſtinction will be beſt ſhewn by an example. Suppoſing there was no ſuch diſtinction, and that we ſhould read in any hiſtory HE cauſed HIM to deſtroy HIM, and were told that the pronoun which is here thrice repeated ſtood each time for ſomething different; that is to ſay, for a man, for a woman, and for a city, whoſe names were Alexander, Thais, and Perſepolis. Taking the pronoun thus diveſted of its genders, it does not appear which of the three was deſtroyed, which the deſtroyer, or which the cauſe that moved to the deſtruction. But there is no ambiguity when we hear the genders diſtinguiſhed; and when, inſtead of the ambiguous ſentence, *he* cauſed *him* to deſtroy *him*, we are told with the proper diſtinctions that SHE cauſed HIM to deſtroy IT. Then we know with certainty, that the promoter was the *woman*, that her inſtrument was the *hero*, and that the ſubject of her cruelty was the unfortunate *city*.—From this example we would be ſurpriſed how the *Italian*, *French* and *Spaniſh* could expreſs themſelves with preciſion or elegance, with no more than two variations of this perſon.

From the ſame cauſes as a diſtinction of gender is unneceſſary in the pronouns of the firſt and ſecond perſons, we ſee the reaſon why a ſingle pronoun to each perſon, an *I* for the firſt, and a THOU for the ſecond, are ſufficient for all the purpoſes of language, as theſe are always ſuppoſed preſent and obvious. But it is not ſo with reſpect to the third perſon, as the various relations of different objects made it neceſſary to have not *one*, but *many*; ſuch as, HE, SHE, IT, THIS, THAT, OTHER, SOME, ALL, ANY, *&c.*

Although we have ſaid that there is only one pronoun for each of the firſt and ſecond perſons, yet the Engliſh reader may perhaps be puzzled with finding two diſtinct words applied to each; I and ME, for the firſt perſon; THOU and THEE, for the ſecond. The learned reader will at once ſee that theſe two words ME and THEE are equivalent to the *accuſative* caſe of the Latin pronoun: but, in order to make the meaning of this as plain as poſſible without embarraſſing ourſelves about unneceſſary terms, we ſhall only obſerve, no effect can be produced without a cauſe, and no action can be performed without producing ſome effect. The ſame perſon may in different circumſtances be either the active and efficient cauſe *of*, or the paſſive ſubject who ſuffers *by* an action: ſome languages have therefore formed different words to expreſs the ſame object in theſe different circumſtances. Thus in the Latin ſentences, *Brutus amavit Caſſium*, Brutus loved Caſſius; and *Caſſius amavit Brutum*, Caſſius loved Brutus; the word *Brutus* in the firſt, and *Caſſius* in the ſecond, is the form which the noun aſſumes when it is uſed as the efficient cauſe; and *Brutum* and *Caſſium* the forms which the ſame nouns aſſume when they are repreſented as the paſſive ſubjects. This laſt then was what was called the *accuſative* caſe of the noun, and the firſt was called the *nominative*. We have already ſeen that the Engliſh noun admits of no caſes, the active ſubject always preceding the verb, and the paſſive following it, as is plain from the above ſentences, where *Brutus* and *Caſſius* remain changed in both ſituations; and the ſame might be obſerved of all other modern languages:

yet the Engliſh and all modern languages admit of a different word to expreſs the different ſtate of the pronouns. Thus, we ſay, I *eſteem* THEE, I *admire* HIM, I *love* HER: in all of which ſentences *I*, the pronoun of the firſt perſon, is the *active*, and THEE of the ſecond perſon, and HE and HER of the third, are the *paſſive* ſubjects, and are therefore expreſſed by the words THEE, HIM, and HER. But if the caſe be reverſed, and the pronoun of the firſt perſon becomes the paſſive ſubject, and the others the active, they aſſume a different form; thus, THOU *eſteemeſt*, HE *admires*, SHE *loves*—ME. Hence, therefore, it appears that we have two diſtinct words for each of theſe pronouns to expreſs the different ſtates in which they may be repreſented, exactly analogous to the nominative and accuſative caſes of the Romans—Whether theſe are to be admitted as caſes of our pronouns, or whether they may not rather be conſidered as diſtinct words formed for that particular purpoſe, is of little conſequence for us to enquire; as, in whatever light they may be conſidered, this variation cannot be looked upon as an eſſential part of language, but only as a particular refinement, invented to prevent the diſagreeable repetition of the pronoun, which behoved frequently to have happened without this contrivance. This ſeems to be the only reaſon why pronouns have been endowed with this variety, and not nouns. For as nouns are in themſelves greatly diverſified, the ſameneſs of ſounds does not here ſo often occur as it would have done in the pronouns, where the ſame I, THOU, HE, SHE, or IT, anſwers for the name of every object which occurs in nature; but, by this diverſity in the form of the words, this circumſtance is in ſome meaſure obviated. And it is probably for the ſame reaſon, that the plural of each of theſe pronouns is ſo very different from the ſingular. Thus, from I of the firſt perſon is formed WE in the plural, and from ME the plural US; from THOU and THEE the plurals YE and YOU; from HE, SHE,—HIM, HER, and IT, the plurals THEY, and THEM. In all of which there is not the leaſt reſemblance between the ſingular and plural of any one word; and, except in HE and HIM, THEY and THEM, there is not any ſimilarity between what may by ſome be thought to be the different *caſes* of the ſame word.

We have ſeen that the ſame object may ſometimes be the cauſe of an action, and ſometimes the object which ſuffers by it. We now obſerve, that the ſame object may ſometimes be, with regard to the ſame action, both the active cauſe and paſſive ſubject; as when we ſay, *Brutus killed himſelf.* In which caſe it is evident, that Brutus was both the cauſe that produced, and the object that ſuffered by the action; the pronoun himſelf being put for his name; for, were it not for the ſameneſs of the ſound, and the ambiguity which would be occaſioned by it, we might ſurely ſay, *Brutus killed Brutus.* It was therefore neceſſary to have a particular pronoun for the paſſive ſubject, in all thoſe caſes where the ſame object was the agent; and on this account the word SELF has been invented, having the plural SELVES. This pronoun therefore, which ſerves on all occaſions to repreſent the action as returning upon the agent that produced it, may be called the reciprocal pronoun; which has this peculiarity, that it can never ſtand by itſelf, but muſt alway have the aſſiſtance of the pronoun in whoſe place it is ſubſtituted; as, MYSELF, THYSELF, HIMSELF, HERSELF, ITSELF, with their plurals. But although this ſeems to have been the original uſe of this pronoun; yet, in the Engliſh language, its uſe has been extended further; and, from its always having a reference to the agent of any action, it has been employed to denote that agent by way of emphaſis, as performing the action without the aid or aſſiſtance of any other; as, *he himſelf went.* And from this circumſtance it has been further extended to denote any object as performing or ſuffering any thing which we would not naturally have expected from its known character or nature; as in this ſentence: "The moſt daring of mankind are ſometimes ſtartled before they venture upon the commiſſion of any extraordinary crime; even Cæſar HIMSELF felt the utmoſt perturbation of mind before he dared to paſs the Rubicon."

Theſe are all that can be properly called *perſonal pronouns*; but there are others which are derived from them, called *poſſeſſive pronouns*, as, MY, THY, MINE, HIS, HERS, ITS, *&c.* the nature of which it will be neceſſary here to explain. We have already ſhewn how nouns, when they came to denote poſſeſſion, were no longer to be conſidered as nouns, but rather as definitives or articles; ſo the pronouns which we here conſider, being the real ſubſtitutes of *nominal* articles, ought alſo to be conſidered as a diſtinct claſs of pronomial articles; for as theſe never, in any caſe, can be ſubſtituted for a noun, they cannot be conſidered as pronouns. Grammarians have been led into the miſtake of placing them under this head, becauſe they are the ſubſtitutes of theſe words, which, altho' they aſſume the appearance of nouns, only perform the part of definitives. Thus we have ſeen, that when we ſay, *Alexander's houſe*; the word *Alexander's* can only be conſidered as a definitive: and, in the ſame manner, if Alexander was the ſpeaker, he might ſay, MY *houſe*; if the party addreſſed, it would be THY *houſe*; or if any third perſon, HIS, and in the ſame manner HERS or ITS *houſe*. In all which caſes this poſſeſſive pronoun is ſubſtituted for that word which only ſerves to define and aſcertain the identity of the noun, and not for the noun itſelf, which muſt always be either expreſſed or underſtood. Hence the reaſon why one pronoun becomes the ſubſtitute of this noun and its proper definitive, whether that definitive appears in the form of a noun or pronoun: for I can ſay, "*Alexander's houſe* is more elegant than *Mary's*, or *his houſe* is more elegant than *hers*, although IT neither is ſo commodious nor agreeable to live in." In which example it is plain, that the words *his* and *hers* are ſtrictly the ſubſtitutes only of *Alexander's* and *Mary's*, and nothing more; whereas the pronoun IT is the ſubſtitute of the whole noun with its definitive *Alexander's houſe*. The other claſs of pronouns poſſeſſive, MINE, THINE, *&c.* as they do not ſo much ſerve to diſtinguiſh individuals, as to aſcertain the property of the thing ſpoken of, which may, in a certain ſenſe, be conſidered as an attribute thereof, are more nearly allied to attributives, and have therefore by ſome been called adjectives. And it muſt be acknowledged, that theſe two claſſes of words are ſo nearly allied to one another, that it is difficult to aſcertain, in all caſes, the preciſe boundary between them.

Beſides theſe, there are other words which ſometimes aſſume the province of pronouns, and are generally conſidered as belonging to this claſs, although in many caſes improperly; ſuch as, THIS, THAT, ANY, SOME, THESE, THOSE, ALL, and ſome others; which may be called *improper* pronouns. To diſtinguiſh when they may be conſidered as pronouns, we may obſerve, that when they ſtand by themſelves, and ſupply the place of a noun, as when we ſay, THIS *is virtue, give me* THAT, then are they pronouns. But when they are aſſociated to ſome noun, as when we ſay, THIS HABIT *is virtue*, or THAT MAN *defrauded me*; then, as they do not ſupply *the place* of a noun, but only ſerve to *aſcertain* one, they fall rather under the ſpecies of *definitives*, or *articles*. And indeed it muſt be confeſſed, that theſe, as well as the poſſeſſive pronouns, are more properly adapted to define and aſcertain individuals among nouns, than to ſupply their place; and therefore are oftener to be conſidered as articles than as pronouns. The beſt rule to diſtinguiſh when they are to be conſidered as the one or the other, is this. The genuine PRONOUN *always ſtands* by *itſelf*, aſſuming the power of a NOUN, and ſupplying its *place*. The genuine ARTICLE *never ſtands* by *itſelf*, but appears at all times *aſſociated to ſomething elſe*, requiring a noun for its ſupport, as much as *attributives* or *adjectives*.

The three orders of pronouns already mentioned, may be called *prepoſitive*; becauſe they are capable of introducing or leading a ſentence, without having reference to any thing previous. But there is another order of pronouns which can never be employed but to *connect* ſentences, and muſt therefore always have a reference to ſome ſentence that precedes them; as, WHO, WHICH, WHAT. The nature of which may be explained as follows.

Suppoſe I ſay, LIGHT *is a body*; LIGHT *moves with great celerity*; theſe would apparently be two diſtinct ſentences. But if, inſtead of the ſecond LIGHT, I were to place the prepoſitive pronoun IT, and ſay, LIGHT *is a body*, IT *moves with great celerity*; the ſentences would ſtill be diſtinct, and two. But if I add a *connective* (as for example AND) ſaying, LIGHT *is a body*, AND IT *moves with great celerity*; I then, by connection, make the two into *one*. Now it is *in the united powers of a connective and another pronoun*, that we may ſee the force and character of the pronoun here treated of. For if, inſtead of the words AND IT, we ſubſtitute THAT or WHICH; ſaying, LIGHT *is a body* WHICH *moves with great celerity*; the ſentence ſtill retains its *unity*, and becomes, if poſſible, more compact than before. We may therefore call this pronoun the SUBJUNCTIVE; becauſe it cannot introduce an original ſentence, but only ſerves to *ſubjoin one to ſome other which is previous*.

The application of this *ſubjunctive*, like the other pronouns, is univerſal. It may be the ſubſtitute of all kinds of ſubſtantives, natural, artificial, or abſtract; general, ſpecial, or particular: for we may ſay, The *man who*, the *ſhip which; Alexander who, virtue which*, &c. Nay, it may even be the ſubſtitute of all the other pronouns and is therefore of courſe expreſſive of all the three perſons. Thus we ſay, I WHO *now write*; THOU WHO *now readeſt*; HE WHO *now heareth*, &c. And thus the SUBJUNCTIVE is truly a *pronoun* from its *ſubſtitution*; there being no ſubſtantive exiſting in whoſe place it may not ſtand. At the ſame time it is eſſentially diſtinguiſhed from the other pronouns by this particular, that it is not only a *ſubſtitute*, but likewiſe a *connective*.

As to the accidents of this pronoun: From its performing the part of a connective, it of courſe follows, that neither *gender* nor *number* can be conſidered as eſſential to it; becauſe theſe are always expreſſed in the preceding parts of the ſentence to which it refers; nor do we in fact find, that this pronoun, at leaſt in modern languages, admits of any diſtinction to denote *number*, although the Engliſh language admits of one variation for the *gender*; as we employ WHO for the *maſculine* and *feminine*, and WHICH for the *neuter* gender, thus: *The man*, or *the woman* WHO *went to Rome*; *the* TREE *which ſtands on yonder plain, &c.* It likewiſe admits of a variation ſimilar to that of the accuſative caſe; at leaſt when applied to males or females. For when the object which it repreſents is the efficient cauſe of action, it is WHO; as, *the man* WHO *fell, &c.*; but when it is the paſſive ſubject, it then, in certain circumſtances, takes the form of WHOM; as, *the man of* WHOM *I ſpeak*; although this is not univerſal; as we likewiſe ſay, *the man* WHO *was beaten*. But the neuter admits of no ſuch diſtinctions, as we equally ſay, *the tree* WHICH *fell*, or *the tree of* WHICH *I ſpoke*. But both of theſe admit of a variation to denote poſſeſſion or qualities, which is the word WHOSE for all genders. Thus, we ſay, *Socrates* WHOSE *only ſtudy was virtue*; *Elizabeth* WHOSE *reign was glorious*.

To conclude: We have ſeen that ſubſtantives are either *primary* or *ſecondary*; or, in other words, NOUNS or PRONOUNS. The NOUNS denote ſubſtances, either *natural*, *artificial*, or *abſtract*; and theſe either *general*, *ſpecial*, or *particular*. The PRONUNS, their ſubſtitutes, are either *prepoſitive* or *ſubjunctive*: the PREPOSITIVE is diſtinguiſhed into three orders, called the *firſt*, the *ſecond*, and the *third* perſons: the SUBJUNCTIVE includes the powers of all the three, having *ſuperadded*, as of its own, the peculiar force of a connective.

CHAPTER II.

Of ATTRIBUTIVES.

As all attributives muſt either be expreſſive of the attributes of SUBSTANCES, or of other ATTRIBUTES, we divide this claſs into two kinds; calling thoſe of the firſt kind, ATTRIBUTIVES of the FIRST ORDER; and thoſe of the ſecond kind, ATTRIBUTIVES of the SECOND ORDER.

Section I. Attributives *of the Firſt Order*.

Attributives are all thoſe *principal* words that denote *attributes* conſidered as attributes. Such, for example, are the words, *black*, *white*, *great*, *little*, *wiſe*, *eloquent*, *to write*, *to walk*, *to ſpeak*, &c. all of which are the *attributes of ſubſtances*. Thus *black* is an attribute of *jett*, *white* of *ſnow*;—*wiſe* and *eloquent*, as alſo, *to write* and *ſpeak*, are attributes of *men*.

In examining the different attributes of ſubſtances, we readily perceive that ſome of them have their eſſence in *motion*; ſuch are, *to walk*, *to fly*, *to ſtrike*, *to live*, *&c*. Others have it in the *privation* of *motion*; as, *to ſtop*, *to reſt*, *to ceaſe*, *to die*, *&c*. And others have it in ſubjects that have *nothing to do* with either *motion* or its *privation*; ſuch are the attributes of *great* and *little*, *wiſe* and *fooliſh*, *white* and *black*, and, in a word, the ſeveral *quantities* and *qualities* of all things. This therefore furniſhes a natural diviſion of attributives of this order; and grammarians have called all thoſe, whoſe eſſence conſiſts in *motion* or its *privation*, VERBS; and all the others have been called ADJECTIVES; each of which we ſhall conſider ſeparately.

I. Of Verbs.

VERBS are all thoſe principal words which denote *attributes*, whoſe eſſence conſiſts in *motion*, or *energies*, (for we chuſe to make uſe of this laſt term, as it implies the exertions of the mind as well as thoſe of the body), or their *privation*. This order of attributives differs from the other called *adjectives*; not only in the particular abovementioned, but alſo becauſe adjectives denote only qualities or quantities, which do not admit of any change of ſtate; whereas the verbal attributives may be conſidered as in ſeveral different ſtates, and therefore admit of ſeveral variations in the term employed to expreſs theſe. It may, in the firſt place, be conſidered as a ſimple attribute or energy, without particularizing any circumſtance relating to the ſtate it may be in; as in the word TO WRITE. Or, in the ſecond place, as theſe are all attributes which denote motions or energies, they may be repreſented as in the ſtate of actual motion or exertion; as in the word WRITING. Or, laſtly, the motion or energy may be finiſhed, and its effect completed; as in the word WRITTEN. Hence, therefore, every verb admits of a threefold variation in every language, in each of which languages they are diſtinguiſhed by ſome particular names. Our grammarians have given the name of the INFINITIVE MODE to the original verb itſelf, and the other two variations of it are both diſtinguiſhed by the name of PARTICIPLES; that variation which exhibits the verb in its ſtate of energy being called the PARTICIPLE PRESENT or ACTIVE, and the other variation is called the PARTICIPLE PERFECT or PAST.

Theſe variations of the verb are founded in the nature of things, and therefore muſt be found in every language under ſome form or other. As to the other ſuppoſed variations of verbs relating to perſon, number, time, *&c*. the ſlighteſt reflection on this ſubject will ſhew, that a verb, conſidered as a ſimple attributive, can admit of none of theſe affections, but muſt for ever remain the ſame at all times and in all ſituations whatever; for who does not ſee, that the attribute *to write* is the ſame whether it is poſſeſſed by *you*, by *me*, or by any number of different perſons? Nor does this attribute ſuffer any change, whether it is repreſented as having been exerted a *thouſand years ago*, or at *this preſent moment*, or at *any other* aſſignable period of duration; but, like every other attribute, it muſt remain for ever the ſame. For however *ſubſtances* may vary with time, and be inceſſantly changing; yet *attributes* of every ſort are altogether beyond its power. And we muſt eaſily perceive, that the attribute which is expreſſed by the word GOOD, is the ſame now as it was at the creation, or will be while the world exiſts. And in the ſame manner, *to walk*, *to write*, *to fly*, denote attributes, which muſt each of them preſerve their own particular nature during all the ſucceſſive ages of time. Hence therefore we ſee, that the verbal attribute muſt for ever remain in that ſtate, or modification, in which it is at firſt repreſented. Nor can it ſuffer any change, however different the circumſtances may be in which it can be applied in language. All, therefore, that can be ſaid of theſe ſeveral variations with which grammarians have uſually endowed verbs, is this, That, as an attributive, it hath ſuch an intimate connection with a ſubſtantive, as neceſſarily to be united with one, before it can make a principal figure in language: And as that union may be repreſented as taking place at different times, and under different circumſtances, the inventors of ſome languages have contrived to expreſs theſe different connections by a ſingle word, inſtead of doing it by different words, as the thing in itſelf would naturally require; in the ſame manner as thoſe who uſe the ſhort-hand method of writing, make a ſingle character expreſs a whole word, or ſentence: And as it was moſt natural for the contrivers of theſe words to derive them from the verb itſelf of which they are compounded, they have each of them become a *real* variation of the original *word* which expreſſes the verbal attribute; and, from thus being a variation of the verbal *word*, they have at laſt come to be conſidered as an *eſſential* variation of the *verb itſelf*, which has occaſioned thoſe contradictory definitions, and that confuſion of ideas which we meet with among all writers on this ſubject. But as we here conſider language as in itſelf, without regarding the particular forms under which it may appear, we muſt reject all theſe variations of *perſons*, *numbers*, *modes*, and *tenſes*, which the verb itſelf has uſually been ſuppoſed to undergo; and conſider them, not as eſſential variations of the verb itſelf, but as variations produced in language by the combination of the verb with other parts of ſpeech; and therefore relating to *ſyntax*, and of courſe belonging to thoſe grammatical diſquiſitions alone which treat of the peculiarities of any particular language. But as theſe variations have been ſo univerſally conſidered as eſſential parts of the verb itſelf, and as the terms which this diviſion of the verb have introduced into grammar are ſo frequently to be met with, it will be neceſſary to explain in ſome meaſure the meaning of theſe ſeveral terms.

In the natural world, no attribute can poſſibly exiſt without a ſubſtance to which it belongs, nor any ſubſtance without poſſeſſing certain attributes. So neceſſary and intimate is the connection between theſe, that it is as impoſſible to ſeparate them, as to create or annihilate the ſeveral ſubſtances that poſſeſs theſe attributes. But although we are thus circumſcribed as to our bodily powers, the mind admits not of ſuch limitation; but can with the utmoſt facility ſeparate every quality from every object whatever, and conſider them apart; as, *colour* without *ſuperficies*, *ſuperficies* without *ſolidity*, or *weight* without *matter*, &c. and, when thus ſeparated, apply them to what objects, and in what manner, it pleaſes. In this manner the mind abſtracts thoſe attributes which denote *motions* or *energies* from their *agents* or *energizers*, in the ſame way as it abſtracts *qualities* from their *ſubſtances*. And it is theſe energies thus abſtracted, which form that ſpecies of words called *verbs*; in the ſame manner as thoſe attributes which denote *quantities* and *qualities* abſtracted from their neceſſary ſubſtances, form *adjectives*. Thus, the term *to walk*, denotes a particular *energy* as conſidered perfectly apart from every *energizer*, in the ſame manner as the word *good* denotes a certain *quality* without regard to any particular *ſubſtance*.

Here then we diſcover a moſt eſſential difference between the order of nature, and that repreſentation of it which man makes by means of words. For in *nature*, every quality muſt at all times be united with ſome ſubſtance, nor can ever be exhibited ſeparate from it; but in *language*, every attributive, if it be conſidered at all, muſt be ſeparated from the object to which it naturally belongs. Hence we ſee the reaſon why, in language, every *energy* and energizer, not only *may* be conſidered ſeparately, but *muſt* for ever remain ſeparate, unleſs they be united by ſome other power than what is neceſſarily their own. For the attribute *to write*, can no more be united to *man* its proper energizer, than a motion could commence without a cauſe; and till this attribute is united to its proper energizer, it muſt remain in a great meaſure dead and inefficacious in language.—To communicate life and energy, therefore, to this inert attribute, it muſt be united to its proper energizer; which can only be effected by the help of an aſſertion of the ſpeaker himſelf; which may be conſidered as the ſame with regard to language, as life is in the natural world.

It is evident that, by the aſſiſtance of an aſſertion, the ſpeaker is enabled to write any energy to any particular energizer, and thus, without making any change upon the attribute itſelf, repreſent a variety of changes produced upon other bodies by its means.—Thus, if I ſay, *I write*, what do I more than aſſert that I myſelf am poſſeſſed of that particular attribute denoted by the verb *to write*? If I ſay, *You write*, or *He writes*, what do I more than aſſert that another perſon is poſſeſſed of that particular attribute or energy?—If I ſay, *He* DID *write*, I only aſſert that the ſame attribute was poſſeſſed at another time, by the ſame perſon, as before. Hence therefore, by the help of this aſſertion of the ſpeaker, we are enabled to join this particular attribute to many different energizers, as well as to repreſent theſe different combinations as occurring at many different times; ſo that the ſame atribute may thus be made to appear under a great many different circumſtances, and exhibit a great variety of changes upon other objects, although itſelf remains unchanged; the ſeveral variations which we perceive, only relating to the objects with which it is combined, or the means by which that union is effected.—In the ſame manner it often happens, that any object in nature, a houſe for example, may appear extremely different when viewed from different ſituations.

From the intimate connection that takes place between the energy, the energizer, the aſſertion, and time, theſe ſeveral acceſſories have been conſidered as eſſential parts of the verb; and therefore ſome grammarians have defined a verb to be *A word denoting an energy, with time, and an aſſertion*. But if we were thus to confound things with thoſe which may neceſſarily accompany them, we could never arrive at a clear perception of any ſubject whatever. But not to enter into the arguments that might be produced to ſhew the impropriety of this definition, we ſhall only obſerve, that by the univerſal acknowledgment of all grammarians this cannot be juſt. For they unanimouſly agree, that the *infinitive mode* is not only *a part* of every verb, but the *moſt eſſential part*; as it forms the root from which all the other parts are derived. But as this mode neither denotes either time or an aſſertion, it is evident that theſe, even by their own acknowledgment, can be at beſt but acceſſories, and not eſſential parts of the verb.

From theſe arguments, therefore, we muſt conclude, that the verb itſelf admits of no other variations but thoſe already taken notice of;—that before it can produce any active effect in language, like every other attribute, it muſt be united to ſome proper energizer;—that this union in language can never be effected but by means of an exertion of the vital powers of the ſpeaker, whereby he either publiſhes his perception thereof, or his will that it ſhould be;—and that this union may be repreſented as taking place at all the different times that can be aſſigned. Theſe, therefore, are each of them neceſſary accompaniments of a verb, but each of them ſeparate and diſtinct in their own nature, not only from this verb, but from one another; and it becomes an eſſential part of the ſyntax of every language, to conſider the various ways in which theſe can be combined and affect one another.—Nay, ſo intimate has this connection been thought to be by ſome, that the contrivers of certain languages have arranged them under particular claſſes, for the ſake of diſtinctneſs and preciſion.—The form which a verb aſſumed, when thus varied in all the ways that their particular language would admit of, was called the CONJUGATION of the verb; the ſeveral parts of which may be underſtood from the following ſketch.

When the verb is conſidered under the compound form of which we now ſpeak, it can admit of variations chiefly in three reſpects. For, firſt, ſuppoſing the *attribute*, the *energizer*, and the *time* when that attribute was exerted by the energizer, to be the ſame; a variation may be occaſioned by a change being produced in the *perception* or *volition* of the ſpeaker, (which, for brevity, we will call the *aſſertion*,) as in theſe examples: *I write*, SCRIBO; *I may write*, SCRIBAM; *do you write*, SCRIBE. The variations produced by this means have been called MODES. Secondly, Suppoſing the *attribute*, the *energizer*, and the *aſſertion*, to be the ſame; a change may be produced in the *time*, as in theſe examples: *I do* *write*, SCRIBO; *I did write*, SCRIPSI; *I ſhall write*, SCRIBAM, *&c.* The variations produced from this cauſe have been called TENSES. And, thirdly, Suppoſing the *attribute*, the *time*, and the *aſſertion*, to remain unchanged, there may be a difference in the *energizer*; and this likewiſe admits of a diviſion: for as the energizer may be only *one* or more perſons, it muſt have a variation into *ſingular* and *plural* on theſe accounts; as in theſe examples: *I write*, SCRIBO; *thou writeſt*, SCRIBAS; *he writes*, SCRIBAT; and in the plural, *we write*, SCRIBAMUS; *ye write*, SCRIBATIS; *they write*, SCRIBANT. The variations produced from this cauſe have been called PERSON and NUMBER.——Theſe are all the variations which have been made in the Latin or Greek languages; and therefore our grammarians, who have adopted every idea they have of grammar from theſe languages, mention no more: but it was not neceſſary that they ſhould have ſtopt here, for an attribute is ſurely as ſuſceptible of the diſtinction of ſex as of perſon, ſo that they might have had a variation for *Gender* alſo; and inſtead of having one word SCRIBAT to anſwer for all the three genders, *he*, *ſhe*, or *it wrote*, they might have had three different words.—The compoſers of the Hebrew language have adopted this plan, and admit of two variations on this account; and the Ruſſian language admits of a like variation in their verb for theſe genders; as in this example: ON ZOHELAL, *he has done*; ONA ZOHELALA, *ſhe has done*, &c But as the two languages above mentioned do not admit of this diſtinction, therefore all the variations that our verbs are ſaid to admit of are MODES, which include within them TENSES, which include under them PERSONS, under which head is included NUMBER; and theſe are all the parts into which a CONJUGATION has been divided.—As to what concerns the nature and leſſer diſtinctions of each of theſe, the following general remarks may be ſufficient.

With regard to MODES; as this relates ſolely to the *perception* or *volition* of the ſpeaker, it neceſſarily follows, that there ought to be a diſtinct and particular MODE for each diverſity that there can can be in his manner of perceiving or willing any thing whatever, the principal of which are the following.

If we ſimply declare that we perceive any object, or that ſuch a thing is or will be, without any limitation or contigency, it forms what has been called the DECLARATIVE or INDICATIVE MODE; as, *I write*.—Again, if we ſimply repreſent it to be within our *power*, or to depend upon our choice, it forms two other modes, which may be called the POTENTIAL, as, *I can write*; or the ELECTIVE, as, *I may write*.—In the ſame manner, if the ſpeaker repreſents himſelf, or any other object, as *determined* to perform any action, or as *compelled* to it, or as it is his *duty* to perform it; theſe form ſo many diſtinct modes, which may be called the DETERMINATIVE, as, *I will write*; the COMPULSIVE, as, *I muſt write*; and OBLIGATIVE, as, *I ſhould write*. But although each of theſe repreſents the ſpeaker as perceiving the agent under a different light with reſpect to the action; yet as all of them, except the indicative, agree in this, that however much they may repreſent it as the *duty* or *inclination*, &c. of the agent to perform any action with which they are aſſociated, yet as they are ſtill of the nature of contingents which may never take effect, they are frequently ſubjoined to any other verb; therefore the Latins have comprehended all of theſe under one mode, which they have called the SUBJUNCTIVE. We only take notice of this circumſtance here, to ſhew, that however naturally *ſentences* may be diſtinguiſhed into modes, according to the different ſituation of the ſpeaker; yet as the whole order of the variation of words in the conjugation of a verb is merely arbitrary, thoſe who invent them may arrange them into what order they pleaſe, and call them by what names they may think moſt proper. But however they may vary the names or external arrangement, this does not affect the things themſelves. For by whatever name the *mode* may be known which comprehends the words expreſſive of theſe ſeveral meanings, the ſentences formed by theſe will be either *potential*. *obligative*, *compulſive*, &c. as above explained.

All theſe modes above mentioned only relate to the different *perceptions* of the ſpeaker. But as man is not only endowed with the powers of *perception*, but thoſe of *volition* alſo, he muſt have words to expreſs theſe; which forms another order of modes. As he is not only dependent himſelf, but has others depending upon him, he may *command*, *intreat*, *beg*, *pray*, *wiſh*, *inquire*.—Hence, therefore, ſo many different orders of modes, the IMPERATIVE, REQUISITIVE, PRECATIVE, OPTATIVE, INTERROGATIVE, *&c.* to which may be added the VOCATIVE. But although each of theſe diſplay a diſtinct affection of the ſpeaker, yet grammarians have allotted only one variation of their verb for all of theſe purpoſes, called the IMPERATIVE MODE; all the other volitions being expreſſed by this, or ſome other modes, by the help of particular contrivances, which are different in different languages.

With regard to that variation of the verb which relates to *time*, called TENSES: As an action or event may be repreſented as happening at any aſſignable period of time, it is neceſſary to divide that duration into certain parts, that we may be able to repreſent the different relations which events bear to one another with reſpect to this particular. The firſt and moſt obvious diviſion of time is into *preſent*, *paſt*, and *future*. But we may go farther ſtill in our diviſions of time. For as time paſt and future may be infinitely extended, we may in *univerſal time paſt* aſſume *many particular times paſt*, and in *univerſal time future many particular times future*, ſome more, ſome leſs remote, and correſponding to each other under different relations. Even *preſent time*, however, in ſtrict phyſical truth, it may be incapable of it, is by the power of the imagination brought to admit of theſe differences, and as neceſſarily implies *ſome degree of extenſion*, as every given line however minute: And hence it is not ſufficient for language to denote INDEFINITELY mere *paſt*, *preſent*, or *future* times; but on many occaſions to DEFINE with more preciſion what *kind* of *paſt*, *preſent*, or *future* is meant.

Tenſes, therefore, or thoſe variations of a verb which denote a difference of *time* only, may be all divided into PRESENT, PAST, and FUTURE; each of which may be ſubdivided into DEFINITE and INDEFINITE. —The

Definite tenſes are thoſe where the particular inſtant of time, whether preſent, paſt, or future, is pointed out. The *indefinite* are thoſe where paſt, preſent, or future time is indicated in general, without confining it to a particular inſtant in either of theſe caſes. Theſe have been diſtinguiſhed among grammarians by the name of AORISTS.— Thus when Milton makes Adam ſay,

Millions of ſpiritual creatures WALK *the earth,*
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the verb WALK means not that they were walking at that inſtant only when Adam ſpoke, but *indefinitely* in any inſtant whatever. So likewiſe, when the ſame author calls hypocriſy,

—— the only evil which WALKS
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the verb WALKS has the like aoriſtical ſignification. *He* WENT, *he* FELL, are *aoriſts* of the paſt, as they do not ſpecify any particular inſtant, but refer to paſt time in general. So likewiſe in the legiſlative ſentences, *thou ſhalt not kill, thou ſhalt not ſteal, &c.* the ſame aoriſtical meaning is perceived, as the prohibition does not relate to any *particular time future*, but is extended indefinitely to *every* time *future*.

But it is not ſufficient for a language to denote time in this indefinite manner: it is neceſſary likewiſe that it ſhould be capable of ſpecifying any particular inſtant of time in an exact and definite manner. Thus, if, inſtead of the word WALK in the firſt ſentence above quoted, we were to put ARE WALKING, it brings down the verb to denote a particular time, and ſpecifies that theſe *ſpiritual creatures* are, at that very *inſtant* in which Adam ſpeaks, walking upon the earth unſeen. In like manner, in the ſecond ſentence, if the word WALKS were changed to IS WALKING, it denotes, that hypocriſy, at that *particular inſtant* in which the ſentence was pronounced, was walking inviſible upon the earth. And in the ſame manner, WAS WALKING, or WILL BE WALKING, each of them denote, that theſe energies *were* or *will be* exerted at a particular ſpecified time. Theſe, therefore, form ſo many diſtinct definite tenſes, under whatever technical name theſe may be known.

Here then we ſee the uſe of that diſtinction of the different ſtates of the verb, into the *verb properly ſo called*, and *participles*. For as the verb itſelf exhibits the word as altogether *indefinite*; when this is joined to its proper energizer, it forms all theſe INDEFINITE TENSES which our language requires. Thus, *I write, I did write, I will write, I may write, I can write, &c.* each of them, although they repreſent the attribute as united to the energizer in ſome *paſt*, *preſent*, or *future* time, do not ſpecify any particular inſtant, and are therefore ſo many aoriſts or indefinite tenſes. Whereas in the *participle* the attribute is repreſented as in a ſtate of exertion, it neceſſarily follows, that if it be ever united to its energizer, it muſt point out the particular inſtant when that union took effect, and of conſequence form as great a variety of DEFINITE TENSES as the verb forms of indefinite. Thus, *I am writing*, neceſſarily implies that I am actually exerting this particular energy at the *very inſtant* that I declare it. So likewiſe if I ſay *I was writing*, it indicates, that at one *particular inſtant* of paſt duration, to which this has a reference, I was actually employed in that particular occupation. This inſtant is generally fixed by ſome collateral circumſtance; as, "upon the twentieth day of Auguſt laſt, at 12 o'clock, *I was writing*;" or, "when the thunder broke upon the tower in my neighbourhood, *I was writing*," *&c.* And the ſame may be ſaid of future time; as, "to morrow at ten o'clock *I ſhall be writing*," *&c.* In all of which caſes it is obvious, that a particular *now* or *inſtant* is pointed out, in which the attribute is repreſented as united to its proper energizer. We might here proceed to ſhew the various times that each of theſe different ſtates of the verb might be made to indicate; the number of *tenſes* that each mode admitted of; the ſeveral changes that might be produced by joining the *participle perfect* with any object; which cannot be here called the *energizer*, but the *ſubject*; for as the energy is by this participle repreſented as compleated, if it has any connection with any perſon, as the attribute cannot be affected by any energizer after it is compleated, it muſt of neceſſity affect the perſon, inſtead of being affected by it; and hence it is that the ſeveral variations produced by this participle perfect have been called the PASSIVE VOICE of the verb. But as all theſe particulars only relate to the conſtruction of one particular language, it would lead us a great deal too far from the particular ſubject of which this article treats. We ſhall therefore only obſerve, that beſides the above variations of the verb, which the Greeks and Romans have thought proper to make, the terms of which we have adopted; there are many others that they might with equal propriety have made, but which they rather choſe to expreſs by the help of other words called *adverbs*. But ſome other languages have gone further in this reſpect, and endowed their verbal word with ſeveral variations to expreſs ſeveral other circumſtances than they do. This is particularly the caſe with the Hebrew language, which, beſides the variation for gender above mentioned, has allotted certain other variations of its verb to expreſs ſeveral other circumſtances. Thus, PAKAD in that language ſignifies *he viſited*; PAKEDA, *ſhe viſited, &c.* PIKKED, *he viſited diligently*; HEPHKED, *he made him viſit*; and HETHPEKED, *he viſited himſelf*. In this manner is every verb in that language varied; and each of theſe different conjugations of their verb admits of a particular variation for the paſſive of each.— Hence, therefore, the conjugation of a verb in that language admits of a great many variations which neither the Greeks nor Romans were acquainted with: for beſides the diſtinctions of *modes*, *tenſes*, *perſons*, and *number*, they have divided their verb into ſo many diſtinct diviſions to anſwer for theſe diſtinctions above mentioned, which they have denominated KAL, PIHEL, HIPHIL, and HITHPAHEL, with their paſſives NIPHAL, PUHAL, and HOPHAL; each of which admits of variations through all the *modes*, *tenſes*, *perſons*, *numbers*, and *genders* which any of their verbs admit of.

The only uſe which we meant to make of theſe obſervations on the Hebrew verbs, is this: That as the authors, who have formed their idea of grammar from the forms which the ſeveral parts of ſpeech admit of in the Greek and Latin languages, have ſuppoſed that every variation which theſe languages admitted of was a natural and neceſſary part of language; and that therefore every language which did not admit of the ſame number of variations, *write*, SCRIBO; *I did write*, SCRIPSI; *I ſhall write*, SCRIBAM, *&c.* The variations produced from this cauſe have been called TENSES. And, thirdly, Suppoſing the *attribute*, the *time*, and the *aſſertion*, to remain unchanged, there may be a difference in the *energizer*; and this likewiſe admits of a diviſion: for as the energizer may be only *one* or more perſons, it muſt have a variation into *ſingular* and *plural* on theſe accounts; as in theſe examples: *I write*, SCRIBO; *thou writeſt*, SCRIBAS; *he writes*, SCRIBAT; and in the plural, *we write*, SCRIBAMUS; *ye write*, SCRIBATIS; *they write*, SCRIBANT. The variations produced from this cauſe have been called PERSON and NUMBER.——Theſe are all the variations which have been made in the Latin or Greek languages; and therefore our grammarians, who have adopted every idea they have of grammar from theſe languages, mention no more: but it was not neceſſary that they ſhould have ſtopt here, for an attribute is ſurely as ſuſceptible of the diſtinction of ſex as of perſon, ſo that they might have had a variation for *Gender* alſo; and inſtead of having one word SCRIBAT to anſwer for all the three genders, *he*, *ſhe*, or *it wrote*, they might have had three different words.—The compoſers of the Hebrew language have adopted this plan, and admit of two variations on this account; and the Ruſſian language admits of a like variation in their verb for theſe genders; as in this example: ON ZOHELAL, *he has done*; ONA ZOHELALA, *ſhe has done*, &c But as the two languages above mentioned do not admit of this diſtinction, therefore all the variations that our verbs are ſaid to admit of are MODES, which include within them TENSES, which include under them PERSONS, under which head is included NUMBER; and theſe are all the parts into which a CONJUGATION has been divided.—As to what concerns the nature and leſſer diſtinctions of each of theſe, the following general remarks may be ſufficient.

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Tenſes, therefore, or thoſe variations of a verb which denote a difference of *time* only, may be all divided into PRESENT, PAST, and FUTURE; each of which may be ſubdivided into DEFINITE and INDEFINITE. The *definite tenſes* are thoſe where the particular inſtant of time, whether preſent, paſt, or future, is pointed out. The *indefinite* are thoſe where paſt, preſent, or future time is indicated in general, without confining it to a particular inſtant in either of theſe caſes. Theſe have been diſtinguiſhed among grammarians by the name of AORISTS.—Thus when Milton makes Adam ſay,

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> —— *the only evil which* WALKS
> *Inviſible except to God alone.*

the verb WALKS has the like aoriſtical ſignification. *He* WENT, *he* FELL, are *aoriſts* of the paſt, as they do not ſpecify any particular inſtant, but refer to paſt time in general. So likewiſe in the legiſlative ſentences, *thou ſhalt not kill, thou ſhalt not ſteal, &c.* the ſame aoriſtical meaning is perceived, as the prohibition does not relate to any *particular time future*, but is extended indefinitely to *every* time *future*.

But it is not ſufficient for a language to denote time in this indefinite manner: it is neceſſary likewiſe that it ſhould be capable of ſpecifying any particular inſtant of time in an exact and definite manner. Thus, if, inſtead of the word WALK in the firſt ſentence above quoted, we were to put ARE WALKING, it brings down the verb to denote a particular time, and ſpecifies that theſe *ſpiritual creatures* are, at that very *inſtant* in which Adam ſpeaks, walking upon the earth unſeen. In like manner, in the ſecond ſentence, if the word WALKS were changed to IS WALKING, it denotes, that hypocriſy, at that *particular inſtant* in which the ſentence was pronounced, was walking inviſible upon the earth. And in the ſame manner, WAS WALKING, or WILL BE WALKING, each of them denote, that theſe energies *were* or *will be* exerted at a particular ſpecified time. Theſe, therefore, form ſo many diſtinct definite tenſes, under whatever technical name theſe may be known.

Here then we ſee the uſe of that diſtinction of the different ſtates of the verb, into the *verb properly ſo called*, and *participles*. For as the verb itſelf exhibits the word as altogether *indefinite*; when this is joined to its proper energizer, it forms all theſe INDEFINITE TENSES which our language requires. Thus, *I write, I did write, I will write, I may write, I can write, &c.* each of them, although they repreſent the attribute as united to the energizer in ſome *paſt*, *preſent*, or *future* time, do not ſpecify any particular inſtant, and are therefore ſo many aoriſts or indefinite tenſes. Whereas in the *participle* the attribute is repreſented as in a ſtate of exertion, it neceſſarily follows, that if it be ever united to its energizer, it muſt point out the particular inſtant when that union took effect, and of conſequence form as great a variety of DEFINITE TENSES as the verb forms of indefinite. Thus, *I am writing*, neceſſarily implies that I am actually exerting this particular energy at the *very inſtant* that I declare it. So likewiſe if I ſay *I was writing*, it indicates, that at one *particular inſtant* of paſt duration, to which this has a reference, I was actually employed in that particular occupation. This inſtant is generally fixed by ſome collateral circumſtance; as, "upon the twentieth day of Auguſt laſt, at 12 o'clock, *I was writing*;" or, "when the thunder broke upon the tower in my neighbourhood, *I was writing*," *&c.* And the ſame may be ſaid of future time; as, "to-morrow at ten o'clock *I ſhall be writing*," *&c.* In all of which caſes it is obvious, that a particular *now* or *inſtant* is pointed out, in which the attribute is repreſented as united to its proper energizer. We might here proceed to ſhew the various times that each of theſe different ſtates of the verb might be made to indicate; the number of *tenſes* that each mode admitted of; the ſeveral changes that might be produced by joining the *participle perfect* with any object; which cannot be here called the *energizer*, but the *ſubject*; for as the energy is by this participle repreſented as compleated, if it has any connection with any perſon, as the attribute cannot be affected by any energizer after it is compleated, it muſt of neceſſity affect the perſon, inſtead of being affected by it; and hence it is that the ſeveral variations produced by this participle perfect have been called the PASSIVE VOICE of the verb. But as all theſe particulars only relate to the conſtruction of one particular language, it would lead us a great deal too far from the particular ſubject of which this article treats. We ſhall therefore only obſerve, that beſides the above variations of the verb, which the Greeks and Romans have thought proper to make, the terms of which we have adopted; there are many others that they might with equal propriety have made, but which they rather choſe to expreſs by the help of other words called *adverbs*. But ſome other languages have gone further in this reſpect, and endowed their verbal word with ſeveral variations to expreſs ſeveral other circumſtances than they do. This is particularly the caſe with the Hebrew language, which, beſides the variation for gender above mentioned, has allotted certain other variations of its verb to expreſs ſeveral other circumſtances. Thus, PAKAD in that language ſignifies *he viſited*; PAKEDA, *ſhe viſited, &c.* PIKKED, *he viſited diligently*; HEPHKED, *he made him viſit*; and HETHPEKED, *he viſited himſelf*. In this manner is every verb in that language varied; and each of theſe different conjugations of their verb admits of a particular variation for the paſſive of each.—Hence, therefore, the conjugation of a verb in that language admits of a great many variations which neither the Greeks nor Romans were acquainted with: for beſides the diſtinctions of *modes*, *tenſes*, *perſons*, and *number*, they have divided their verb into ſo many diſtinct diviſions to anſwer for theſe diſtinctions above mentioned, which they have denominated KAL, PIHEL, HIPHIL, and HITHPAHEL, with their paſſives NIPHAL, PUHAL, and HOPHAL; each of which admits of variations through all the *modes*, *tenſes*, *perſons*, *numbers*, and *genders* which any of their verbs admit of.

The only uſe which we meant to make of theſe obſervations on the Hebrew verbs, is this: That as the authors, who have formed their idea of grammar from the forms which the ſeveral parts of ſpeech admit of in the Greek and Latin languages, have ſuppoſed that every variation which theſe languages admitted of was a natural and neceſſary part of language; and that therefore every language which did not admit of the ſame number of variations,

tions with theirs in every part of ſpeech, was in ſo far defective and incomplete. So, for the ſame reaſon, an author who had formed his idea of grammar upon the model of the Hebrew tongue, would as naturally ſuppoſe, that the ſeveral variations which the verb admitted of in his own favourite language, were eſſential and neceſſary; and that, of conſequence, every language which did not admit of as many variations was imperfect and incomplete. But to any one who conſiders this matter with attention, it will appear, that there could be no end to theſe unneceſſary diſcuſſions and groundleſs claims of fancied ſuperiority: for if compound words have ſuch an advantage over ſimple, the Chineſe language, in which we are told almoſt every ſentence has a particular compound character to expreſs it, muſt be by far the moſt perfect in the world; but ſo far is this from being the caſe, that every one allows it to be the moſt imperfect and incomplete. The only method, therefore, which remains for us to conſider this ſubject is, to diregard every particular form of language, and conſider the words in themſelves, as diveſted of every extraneous circumſtance, and obſerve what variations they neceſſarily require, allowing every particular language to compound theſe with one another in what manner they ſhall think moſt proper. It is in this manner we have conſidered the verbal attributives, and endeavoured to diſentangle them from theſe unneceſſary fetters with which they have been loaded, and reſtore them to their own original freedom.

Beſides the variations above-mentioned, verbs have been diſtinguiſhed from one another in a different manner; the names and nature of which may be thus explained.

We have already ſeen, that all verbs, as they denote *energies*, neceſſarily have reference to certain *energizing ſubſtances*. For, how could there be ſuch energies as *to love, to fly, to wound?* &c. were there not ſuch beings as *men, birds, ſwords*, &c. Farther, every energy not only requires an energizer, but is neceſſarily converſant about ſome ſubject. For example, if we ſay, *Brutus loves*, we muſt needs ſupply—loves *Cato, Caſſius*, or ſome one. And thus it is, that every energy is neceſſarily ſituated between two ſubſtantives, an energizer which is *active*, and a ſubject which is *paſſive*. If the energizer leads the ſentence, the energy has been ſaid to follow its character, and becomes what we call a VERB ACTIVE: thus we ſay, BRUTUS AMAT, *Brutus loves*. On the contrary, if the paſſive ſubject be principal, it is ſaid to follow the character of this too, and becomes what we call a VERB PASSIVE: thus we ſay, PORTIA AMATUR, *Portia is loved*. But in ſome verbs it happens, that the energy *always keeps within the energizer*, and never paſſes out to any extraneous ſubject. Thus, when we ſay, *Cæſar walketh, Cæſar ſitteth*, it is impoſſible that the energy *ſhould paſs out*, becauſe both the *energizer* and the *paſſive ſubject* are united in the *ſame perſon*. For what is the cauſe of this walking or ſitting? it is the *will* and *vital powers* belonging to *Cæſar*: and what is the ſubject made ſo to move or ſit? it is the *body* and *limbs* belonging alſo to the ſame *Cæſar*. This ſpecies of verbs have been by grammarians diſtinguiſhed by the name of VERBS NEUTER, as if they were void both of *action* and *paſſion*, when perhaps they may be rather ſaid to imply both. It is in this manner, that verbs have been diſtinguiſhed into the three claſſes of *active, paſſive*, and *neuter*. Theſe, however, might with more propriety be divided into two claſſes, which might be called verbs TRANSITIVE, and NOT TRANSITIVE; the firſt claſs including all thoſe verbs which are uſually called *active*, with the *paſſives* belonging to them; for it is evident, that theſe paſſives are not verbs themſelves, but a variation only of a verb; and the ſecond claſs including thoſe verbs commonly called *neuter*.

Some languages, as the Greek and French, have another claſs of verbs, which are called by the firſt VERBS MIDDLE, and by the laſt RECIPROCAL VERBS; which are employed to denote that ſtate of any tranſitive verb, when the energizer himſelf becomes the ſubject; as thus, *Brutus killed himſelf*, &c. But as theſe only expreſs a ſlight variation of an accompaniment of a verb, they have no claim to be conſidered as a diſtinct ſpecies.

II. Of ADJECTIVES.

ADJECTIVES are all thoſe words which denote attributes whoſe eſſence does not conſiſt in motion or its privation; or, in other words, they are thoſe words which denote the attributes of quantity, quality, and relation; ſuch as, *many, few, great* and *little, black* and *white, good* and *bad, double, treble, quadruple*, &c.

As theſe attributes admit of no change of ſtate, nor can be effected by the variations of time, or any other accident, but are in their own nature perfectly fixed and invariable, the words which expreſs them ought to be in all ſituations and on all occaſions the ſame. For as the qualities *good* or *bad, black* or *white*, admit of no change in their own nature, whether they be applied to a *man*, to a *woman*, to *many*, or to *few*; neither ought the word which expreſſes any one of theſe attributes in ſtrictneſs to admit of any alteration, whether it be joined to one or other of theſe ſubſtantives. So that although in ſome languages, from the particular conſtruction of the other parts of ſpeech, it has been found neceſſary to endow their adjectives with the threefold diſtinction of *gender, number*, and *caſe*; yet this muſt only be conſidered as an accidental variation occaſioned by particular circumſtances, and not in the leaſt eſſential to language, but rather a deviation from the order of nature, which would require them to be kept invariably the ſame in all caſes. This order, the Engliſh language (which in this and almoſt every other caſe is moſt ſtrictly conformable to the nature of things than any other language we are acquainted with) moſt ſtrictly obſerves; as we ſay equally, *a good man*, or *a good woman, a good houſe*; or *good men, good houſes*, &c. mon

It has probably been from obſerving, that the adjectives in ſome particular languages are endowed with variations conformable to the *gender, number*, and *caſe* of their ſubſtantives, that grammarians have been led into the ſtrange abſurdity of ranging them with nouns, and ſeparating them from verbs; though with reſpect to verbs they are pefectly homogeneous, and with reſpect to nouns they are quite the contrary. Adjectives are homogeneous with reſpect to verbs, as both ſorts denote *attributes*;

attributes; they are heterogeneous with reſpect to nouns, as *never properly denoting ſubſtances*.

Beſides original adjectives, there is another claſs which are formed from ſubſtantives. Thus when we ſay, *the party of Pompey, the ſtyle of Cicero, the philoſophy of Socrates*; in theſe caſes, the party, the ſtyle, and philoſophy ſpoken of, receive a ſtamp and character from the perſons they reſpect, and actually paſs into attributives, and as ſuch aſſume the form of *adjectives*. And hence we ſay *the Pompeian party, the Ciceronian ſtyle,* and *the Socratic philoſophy*. In like manner, for a trumpet of braſs, we ſay, *a braſen trumpet*; for a crown of gold, *a golden crown*, &c. Even pronomial ſubſtantives admit the like mutation; as, inſtead of ſaying the book *of me, of thee*, or *of him*, we ſay, *my* book, *thy* book, *his* book, *&c.* Yet it muſt be acknowledged, that theſe, as they often ſerve rather to define a noun than to denote any quality appertaining it, they partake more of the nature of *articles* than *adjectives*; ſo that it is in many caſes difficult to aſcertain exactly to which claſs they are to be referred. But of this we have already taken particular notice, p. 713. col. 2. & 716. col. 2.

The nature of theſe variations of adjectives which have been called *degrees of compariſon*, will be more properly explained under the following ſection.

Section II. *Of Attributives of the Second Order, called* ADVERBS.

As the attributives hitherto mentioned denote the *attributes* of *ſubſtances*, ſo there is an inferior claſs of them which denote the *attributes* only of *attributes*. To explain theſe by examples of either kind: when we ſay, "*Cicero* and *Pliny* were both of them *eloquent*; *Statius* and *Virgil* both of them *wrote*;" in theſe inſtances, the attributes *eloquent* and *wrote*, are immediately referable to the ſubſtantives *Cicero, Virgil*, &c.: As, therefore, denoting the *attributes of ſubſtances*, we call them ATTRIBUTIVES OF THE FIRST ORDER. But when we ſay, "*Pliny* was *moderately* eloquent, but *Cicero exceedingly* eloquent; *Statius* wrote *indifferently*, but *Virgil* wrote *admirably*:" in theſe inſtances, the attributives *moderately, exceedingly, indifferently,* and *admirably*, are not referable to *ſubſtantives*, but to *other attributes*; that is, to the words *eloquent* and *wrote*: As, therefore, denoting *atributes* of *attributes*, we call them ATTRIBUTIVES OF THE SECOND ORDER. Theſe have been, by grammarians, called ADVERBS. And indeed, if we take the word VERB in its moſt comprehenſive ſignification, as including all the words which denote the *attributes* of *ſubſtances*, (which was the ſenſe in which Ariſtotle and many of the moſt ancient grammarians employed it) we ſhall find the name ADVERB to be a very juſt appellation, as denoting a *part of ſpeech the natural appendage of verbs*. So great is this dependence in grammatical ſyntax, that an *adverb* can no more ſubſiſt without its *verb*, than a *verb* can ſubſiſt without its *ſubſtantive*.

Among the attributes of ſubſtances are reckoned quantities and qualities. Thus we ſay, *a white garment, a high mountain*, &c. Now ſome of theſe quantities and qualities are capable of *intenſion* and *remiſſion*. Thus we ſay, *a garment* EXCEEDINGLY *white, a mountain* TOLERABLY or MODERATELY *high*. Hence, then, one copious ſource of ſecondary attributives, or adverbs, to denote theſe two, that is, *intenſion* and *remiſſion*; ſuch as, *greatly, vaſtly, extremely, ſufficiently, moderately, tolerably, indifferently*, &c.

But where there are different intenſions of the ſame attribute, they may be *compared* together: thus, if the garment A be EXCEEDINGLY *white*, and the garment B be MODERATELY *white*, we may ſay, the garment A is MORE *white* than the garment B. In theſe inſtances, the adverb MORE not only denotes intenſion, but *relative intenſion*. Nay, we ſtop not here, as we not only denote intenſion *merely relative*, but *relative intenſion than which there is none greater*. Thus we not only ſay, the *mountain A is* MORE *high than the mountain B*, but that *it is the* MOST *high of all mountains*. Even *verbs*, properly ſo called, as they admit of *ſimple intenſions*, ſo they admit alſo of theſe *comparative ones*. Thus, in the following example, *Fame he* LOVETH MORE *than riches, but virtue of all things he* LOVETH MOST; the words MORE and MOST denote the different *comparative intenſions* of the verbal attribute *loveth*.

Hence the riſe of COMPARISON of adjectives, and of its different *degrees*, which cannot well be more than the two ſpecies above-mentioned; one to denote *ſimple exceſs*, and one to denote *ſuperlative*. Were we indeed to introduce more degrees than theſe, we ought perhaps to introduce *infinite*, which is abſurd. For why ſtop at a limited number, when in all ſubjects ſuſceptible of intenſion the intermediate exceſſes are in a manner infinite? There are infinite degrees of *more white*, between the *firſt ſimple white*, and the ſuperlative *whiteſt*; and the ſame may be ſaid of *more* great, *more* ſtrong, *more* minute, &c. The doctrine of grammarians about three ſuch degrees of compariſon, which they call the *poſitive*, the *comparative*, and the *ſuperlative*, muſt be abſurd; both becauſe in their poſitive there is no compariſon at all, and becauſe their ſuperlative is a comparative as much as their comparative itſelf. Examples to evince this may be met with every where: *Socrates was the* MOST WISE *of all the Athenians*; *Homer was the* MOST SUBLIME *of all poets*, &c.

The authors of language have in ſome inſtances contrived a way to retrench theſe comparative adverbs, by expreſſing their force by an inflection of the primary attributive. Thus, inſtead of *more fair*, they ſay, FAIRER; inſtead of *moſt fair*, FAIREST: and the ſame method of compoſition takes place both in the Greek and Latin languages; with this difference however between the genius of theſe languages and ours, that we are at liberty to form the compariſon, either in the one method or the other: but in theſe languages, the compariſon is almoſt never formed by the aſſiſtance of the adverb, but always by the inflection of the adjective; and hence this inflection is always conſidered by them as a neceſſary accident of the adjective. But this method of expreſſing the power of the adverb has reached no farther than to adjectives, or to their participles, which were ſo nearly allied to adjectives. Verbs were perhaps thought to be too much diverſified, to admit of more variations without perplexity.

Some qualities admit of compariſon, others admit of none: ſuch, for example, are thoſe which denote *that quality of bodies ariſing from their figure*; as, when we ſay, a *circular* table, a *quadrangular* court, a *conical* piece of metal, *&c.* The reaſon is, that a million of things participating the ſame figure, participate it *equally* if they do it at all. To ſay, therefore, that while A and B are both quadrangular, that A is more or leſs quadrangular than B, is abſurd. The ſame holds in all attributives denoting *definite quantities* of whatever nature. For, as there can be no *compariſon* without *intenſion* or *remiſſion*, and as there can be no intenſion and remiſſion in things *always definite*, therefore theſe attributives can admit of no compariſon. By the ſame method of reaſoning, we diſcover the cauſe why *no ſubſtantive is ſuſceptible of theſe degrees of compariſon.* A *mountain* cannot be ſaid MORE TO BE or TO EXIST than a *mole-hill*; nor the *lion* A cannot be *more a lion* than the lion B: but the *more* or *leſs* muſt be ſought for in their quantities or qualities; a mountain is *more bulky* than a mole-hill, and the lion A is *more fierce* than the lion B; the exceſs being always derived from their attributes.

Of the adverbs or ſecondary qualities already mentioned, thoſe denoting intenſion and remiſſion may be called adverbs of QUANTITY CONTINUOUS; *once, twice, thrice,* &c. are adverbs of QUANTITY DISCRETE; *more* and *moſt*, *leſs* and *leaſt*, to which may be added *equally*, *proportionally*, &c. are adverbs of RELATION. There are others of QUALITY; as when we ſay, HONESTLY *induſtrious*, PRUDENTLY *brave*, *they fought* BRAVELY, *he painted* FINELY, *&c.*

The adverbs hitherto mentioned, are common *to verbs of every ſpecies*; but there are ſome which are confined to *verbs* properly ſo called, that is to ſay, to ſuch as denote *motions* or *energies* with their *privations*. All *motion* and *reſt* imply *time* and *place* as a kind of neceſſary coincidence. Hence, if we would expreſs the *place* or *time* of either, we muſt needs have recourſe to adverbs formed for this purpoſe; of PLACE, as when we ſay, *he ſtood* THERE, *he went* HENCE, *he travelled* FAR, *&c.*; or of TIME, as when we ſay, *he ſtood* THEN, *he went* AFTERWARD, *he travelled* FORMERLY, *&c.* Should it be aſked, Why *adverbs of time*, when verbs have *tenſes?* The anſwer is, though tenſes may be ſufficient to denote the greater diſtinctions of time, yet to denote them all by tenſes would be a perplexity without end. What a variety of forms would be neceſſary to denote *yeſterday*, *to day*, *to-morrow*, *formerly*, *juſt now*, *now*, *immediately*, *preſently*, *ſoon*, *hereafter?* &c.

To theſe adverbs juſt mentioned may be added thoſe which denote the *intenſions* and *remiſſions peculiar to* MOTION, ſuch as *ſpeedily*, *haſtily*, *ſwiftly*, *ſlowly*, &c.; as alſo adverbs of *place* made out of *prepoſitions*, ſuch as *upward* and *downward*, from *up* and *down*. In ſome inſtances the prepoſition ſuffers no change, but becomes an adverb by nothing more than its application; as when we ſay, *he rides* ABOUT, *he was* NEAR *falling*, &c.

There are likewiſe adverbs of INTERROGATION; ſuch as, *where*, *whence*, *whither*, *how*, &c. of which there is this remarkable, that when they loſe their *interrogative power*, they aſſume that of a *relative*, ſo as to repreſent the *relative* or *ſubjunctive pronoun*; as in this doggerel tranſlation of a line from Virgil,

> *And corn doth grow* WHERE *Troy town ſtood*;

that is to ſay, *corn groweth in that place* IN WHICH *Troy ſtood*, the power of the relative being implied in the adverb. It is in like manner, that the *relative pronoun* becomes an *interrogative*; as in this line from Milton,

> WHO *firſt ſeduc'd them to that foul revolt?*

The reaſon of this is as follows: the *pronoun* and *adverbs* here mentioned are all, in their original character, RELATIVES. Even when they become interrogatives, they loſe not this character, but are ſtill relatives as much as ever: the difference is, that *without* an interrogation they have reference to a ſubject which is *antecedent*, *definite*, and *known*; *with* an interrogation, to a ſubject which is *ſubſequent*, *indefinite*, and *unknown*, and which it is expected the anſwer ſhould expreſs and aſcertain. WHO *firſt ſeduc'd them?* The queſtion itſelf ſuppoſes a ſeducer, to which, though *unknown*, the pronoun *who* has a reference—*Th' infernal ſerpent.* Here, in the anſwer, we have the ſubject, which was *indefinite*, *aſcertained*; ſo that we ſee WHO, in the *interrogation*, is as much a *relative* as if it had been ſaid originally, without any interrogation at all, *It was the infernal ſerpent* WHO *firſt ſeduced them:* and thus interrogatives and relatives mutually paſs into one another.

Having thus conſidered all thoſe parts of ſpeech which ARE SIGNIFICANT OF THEMSELVES, we proceed to thoſe AUXILIARY PARTS, which are ONLY SIGNIFICANT WHEN ASSOCIATED WITH OTHERS, which we have already ſaid are either DEFINITIVES or CONNECTIVES. Of which in their order.

CHAPTER III.

Concerning DEFINITIVES commonly called ARTICLES.

THE knowledge of man is at beſt but limited and confined. Although we have invented words to denominate almoſt all the ſubſtances which exiſt, yet as it is impoſſible for any perſon to be acquainted with all of theſe, it was neceſſary to fall upon ſome contrivance in language to obviate the difficulties which would ariſe from this cauſe. With this view, we have already ſeen, that ſubſtances have been diivded into general claſſes, each of which includes under it ſeveral leſſer ſubdiviſions; the names of which general claſſes, being but few, may be more eaſily retained, as *animal*, *edifice*, *motion*, &c. for by referring the ſeveral objects that we may accidentally ſee, and with which we are unacquainted, to the ſeveral claſſs to which they may belong, we are in ſome meaſure enabled to communicate our ideas without the knowledge

ledge of the particular names. But as this particular object muſt in ſome manner be diſtinguiſhed from others of the ſame claſs to which it belongs, a particular claſs of words was found neceſſary to define and aſcertain theſe individuals, which has given riſe to this order of words of which we now treat, and which we have called *definitives*, becauſe they ſerve to *define and aſcertain any particular object, ſo as to ſeparate it from the general claſs to which it does belong, and, of courſe, denote its individuality*. The principal of theſe definitives have been uſually called ARTICLES, the nature of which may be explained as follows.

Suppoſing I ſee an object with which I am totally unacquainted, having a head and limbs, and appearing to poſſeſs the powers of ſelf-motion and ſenſation. If I know it not as an individual, I refer it to its proper ſpecies, and call it *a dog*, *a horſe*, *a lion*, or the like; and if none of the names of any ſpecies with which I am acquainted fit it, I refer it to the genus, and call it *an animal*.

But this is not enough. The object at which we are looking, and want to diſtinguiſh, is perhaps an individual.—Of what kind? *Known* or *unknown?* Seen now *for the firſt time*, or *ſeen before* and now remembered? It is here we ſhall diſcover the uſe of the two articles A and THE; for the article A reſpects our *primary* perception, and denotes individuals as *unknown*; whereas THE reſpects our *ſecondary* perception, and denotes individuals as *known*. To explain this by an example, I ſee an object paſs by which I never ſaw till then: What do I ſay? *There goes* A *beggar with* A *long beard*. The man departs, and returns a week after: What do I then ſay? *There goes* THE *beggar with* THE *long beard*. Here the article only is changed, the reſt remains unaltered. Yet mark the force of this apparently minute change. The individual *once vague* is now recogniſed as *ſomething known*, and that merely by the efficacy of this latter article, which tacitly inſinuates a kind of *previous* acquaintance, by referring a preſent perception to a like perception already paſt. Hence therefore we ſee, that although the articles A and THE are both of them *definitives*, as they circumſcribe the latitude of genera and ſpecies, by reducing them, for the moſt part, to denote individuals; yet they differ in this reſpect, that the article A leaves the individual itſelf *unaſcertained*, but the article THE *aſcertains the individual alſo*, and is for that reaſon the more accurate definitive of the two. They differ likewiſe in this reſpect, that as the article A ſerves only to ſeparate one particular object from the general claſs to which it belongs, it cannot be applied to plurals. But as the article THE ſerves to define objects, or refer to them as already known, without relation to number, or any other circumſtances, it is applicable to both numbers indiſcriminately, as well as nouns of every *gender*, without ſuffering any ſort of change; for it is evident, that no variation of the nature of the noun can make any difference in thoſe words which ſerve to define or denote a certain reference to them. So that although we find ſome modern languages which admit of a variation of their article, which relates to the gender of the noun with which it is aſſociated, yet this cannot be conſidered as eſſential to this ſpecies of words: and ſo far is this from being an improvement to the language, that it only ſerves to perplex and confuſe, as it always preſents a particular idea of ſex, where in many caſes it is not in the leaſt neceſſary.

Of all the parts of ſpeech which may be conſidered as eſſential to language, there is none in which we find ſo many languages defective as in this. For we know of no language, except our own, which has the particular article A; and the Latin language has no word of the ſame import with the word THE. The reaſon of which deficiency is, that as other parts of ſpeech may be ſo eaſily converted from their original meaning, and be made to aſſume the character of definitives, they have made ſome of theſe perform both of theſe offices; and as the article A only ſeparates a particular object, and is therefore ſo nearly allied to a *numeral*, many languages, as the *French*, *Italian*, *Spaniſh*, and *German*, have made the numeral word ONE ſupply its office, while others, as the Greek, have denoted this particular object by a mere negation of the other article; and as the article THE agrees with pronouns in this reſpect, that they both *denote reference*, the Latins made their pronoun, by a forced periphraſis, ſupply the place of this. But all of theſe methods of ſupplying the want of the genuine article are defective, as will appear more particularly by and by.

As articles are by their nature definitives, it follows of courſe, that they cannot be united with ſuch words as are in their own nature *as definite as they may be*; nor with ſuch words which, *being indefinite*, *cannot properly be made otherwiſe*; but only with thoſe words *which, tho' indefinite, are yet capable, through the article, of becoming definite*. Hence we ſee the reaſon why it is abſurd to ſay THE I, or THE THOU, becauſe nothing can make theſe pronouns more *definite* than they are; and the ſame may be ſaid of proper names. Neither can we ſay THE BOTH, becauſe theſe words are *in their own nature* each of them perfectly defined. Thus, if it be ſaid, "I have read BOTH poets," this plainly indicates *a definite pair*, of whom ſome mention has been made already. On the contrary, if it be ſaid, "I have read TWO poets," this may mean *any pair* out of all that ever exiſted. And hence this numeral, being in this ſenſe *indefinite*, (as indeed are all others as well as itſelf,) is forced *to aſſume the article* whenever it would become *definite*. Hence alſo it is, that as TWO, when taken alone, has reference to ſome *primary* and *indefinite* perception, while the article THE has reference to ſome perception *ſecondary* and *definite*, it is bad language to ſay TWO THE MEN, as this would be *blending of incompatibles*, that is to ſay, of *a defined ſubſtantive* with an *undefined attributive*. On the contrary, to ſay BOTH THE MEN, is good and allowable; becauſe the ſubſtantive cannot poſſibly be leſs apt, by being defined, to coaleſce with an attributive which is defined as well as itſelf. So likewiſe it is correct to ſay, THE TWO MEN; becauſe here the article, being placed at the beginning, *extends its power* as well through ſubſtantive as attributive, and equally tends to *define* them both.

As ſome of the words above admit of no article, *be-*

cauſe they are by nature as definite as may be; ſo there are others which admit it not, *becauſe they are not be defined at all*. Of this ſort are all INTERROGATIVES. If we queſtion about ſubſtances, we cannot ſay THE WHO IS THIS; but WHO IS THIS? And the ſame as to *qualities*, and both kinds of *quantities*: for we ſay, without an article, WHAT SORT OF, HOW MANY, HOW GREAT? The reaſon is, the article THE reſpects beings *already known*, and interrogatives reſpect beings *about which we are ignorant*; for as to what we know, interrogation is ſuperfluous. In a word, the *natural aſſociators with articles* are ALL THOSE COMMON APPELLATIVES WHICH DENOTE THE SEVERAL GENERA AND SPECIES OF BEINGS. It is theſe, which, by aſſuming a different article, ſerve either to explain an individual upon its firſt being perceived, or elſe to indicate, upon its return, a recognition or repeated knowledge.

But although proper names do not admit of the article, being in their own nature *definite*; yet as theſe often fall into *homonymic*, that is, different perſons often go by the ſame name, it is neceſſary to diſtinguiſh theſe from one another, to prevent the ambiguity that this would occaſion. For this purpoſe we are obliged to have recourſe to *adjectives* or *epithets*. For example, there were two *Grecian chiefs* who bore the name of *Ajax*; and was it not without reaſon that *Mneſtheus* uſes *epithets*, when his intention was to diſtinguiſh the one from the other: "If both *Ajaxes* cannot be ſpared, (ſays he) "at leaſt let mighty *Telamonian Ajax* come." But as epithets are in their own nature perfectly *indefinite*, ſeeing the ſame adjective may be applied to infinite ſubjects, it is neceſſary to define theſe when we want to apply them to any particular object; ſo that it is neceſſary to endow theſe with an article, that they may have a *reference to ſome ſingle perſon only*. And thus it is we ſay, *Trypho* THE *grammarian*, *Appolodorus* THE *Cyrenian*, &c. It is with reaſon, therefore, that the article is here alſo added, *as it brings the adjective to an individuality as preciſe as the proper name*. Even common appellatives, by the help of an article, come to have the force of proper names, without the aſſiſtance of any epithet whatever. Thus, in Engliſh, *city* is a name common to many places, and *ſpeaker* a name common to many men. Yet if we prefix the article, THE CITY means our metropolis; and the THE SPEAKER, a high officer in the Britiſh parliament. And hence, by an eaſy tranſition, the article, from denoting *reference*, comes to denote *eminence* alſo; that is to ſay, from implying an *ordinary* pre-acquaintance, to preſume a kind of *general and univerſal notoriety*. Thus, among the Greeks, THE POET meant *Homer*, and THE STAGYRITE meant *Ariſtotle*; not but that there were many poets beſide *Homer*, and many *ſtagyrites* beſides *Ariſtotle*, but none equally illuſtrious.

The articles already mentioned are thoſe ſtrictly ſo called; but, beſides theſe, there are the PRONOMIAL ARTICLES, ſuch as *this*, *that*, *any*, *ſome*, *all*, *other*, *none*, &c. Of theſe we have already ſpoken in the chapter upon pronouns, where we have ſhewn when they may be taken as pronouns, and when as articles. Yet, in truth, if the eſſence of an article be to *define* and *aſcertain*, they are much more ſtrictly articles than any thing elſe, and ought to be conſidered as ſuch in univerſal grammar. Thus, when we ſay, "THIS picture I approve, but THAT I diſlike;" what do we perform by the help of theſe definitives, but bring down the common appellatives to denote individuals? So when we ſay, "SOME men are virtuous, but ALL men are mortal;" what is the natural effect of this ALL and SOME, but to define that *univerſality* and *particularity* which would remain indefinite were we to take them away? The ſame is evident in ſuch ſentences as theſe: "SOME ſubſtances have ſenſation, OTHERS want it; chooſe ANY way of acting, and SOME men will find fault, *&c.*" For here, SOME, OTHER, and ANY, ſerve all of them to *define* different parts of a given whole; SOME, to denote a *definite part*; ANY, to denote an *indefinite*; and OTHER, to denote the *remaining part*, when a part has been already aſſumed. Even the attributive pronouns, *my*, *thy*, *his*, *her's*, &c. are, in ſtrictneſs, more properly articles than any thing elſe, ſeeing each of them ſerve only to define and aſcertain the individual object to which they are applied. As when we ſay, "MY houſe is leſs commodious than YOUR'S; HER form is more elegant than HIS, *&c.*" For in theſe examples what do the words MY and YOUR'S do, but aſcertain two individual *houſes*; or the words HIS and HER'S, but aſcertain two individual *forms*, which are compared with one another? In the ſame manner we have already ſeen nouns ſometimes lay aſide their own proper character, and become definitives, as in the words ALEXANDER'S, CÆSAR'S, POMPEY'S, *&c.* which may be ſaid to form ſo many NOMIAL ARTICLES. But of theſe we have ſpoken ſo fully in the chapter of nouns, that it is unneceſſary to ſay more of them in this place.

Before we leave this ſubject, we ſhall produce one example to ſhew the utility of this ſpecies of words; which, although of themſelves inſignificant, and ſeemingly of ſmall importance; yet, when properly applied, ſerve to make a few general terms be ſufficient for the accurate expreſſion of a great variety of particulars, and thus makes language capable of expreſſing things *infinite*, without wandering into infinitude itſelf.——To explain this, let the general term be MAN, which I have occaſion to employ for the denoting of ſome particular. Let it be required to expreſs this particular, as *unknown*; I ſay, A *man*:—*Known*; I ſay, THE *man*:—*Definite*; A CERTAIN *man*:—*Indefinite*; ANY *man*:—*Preſent and near*; THIS *man*:—*Preſent and diſtant*; THAT *man*:—*Like like to ſome other*; SUCH *a man*:—*Different from ſome other*; ANOTHER *man*:—*An indefinite multitude*; MANY *men*:—*A definite multitude*; A THOUSAND *men*:—*The ones of a multitude, taken throughout*; EVERY *man*:—*The ſame ones, taken with diſtinction*; EACH *man*:—*Taken in order*; FIRST *man*, SECOND *man*, &c.—*The whole multitude of particulars taken collectively*; ALL *men*:—*The negation of that multitude*; NO *man*:—*A number of particulars preſent, and at ſome diſtance*; THESE *men*:—*At a greater diſtance, or oppoſed to others*; THOSE *men*:—*A number preſent and near*; THESE *men*:—*A number of individuals different from another number*;

ber; OTHER *men*:—*A great number of individuals taken collectively*; MANY *men*:—*A ſmall number*; FEW *men*:—*A proportionally greater number*; MORE *men*:—*Smaller number*; FEWER *men*:—And ſo on we might go almoſt to infinitude. But not to dwell longer upon this article, we ſhall only remark, " that minute changes in PRINCIPLES, lead to mighty changes in EFFECTS; ſo that PRINCIPLES are well entitled to regard, however trivial they may appear.

CHAPTER IV.

Of CONNECTIVES.

CONNECTIVES, according as they connect either *ſentences* or *words*, are called by the different names of CONJUNCTIONS, OR PREPOSITIONS. Of theſe names, that of the *prepoſition* is taken from a mere accident, as it commonly ſtands in connection before the part which it connects. The *conjunction*, as is evident, has reference to its *eſſential character*. We ſhall treat of theſe two ſeparately.

Section I. *Of* CONJUNCTIONS.

A CONJUNCTION is *a part of ſpeech void of ſignification itſelf, but ſo formed as to help ſignification, by making* TWO *or more ſignificant ſentences to be* ONE *ſignificant ſentence*. As, therefore, it is the *eſſence* of a conjunction to *connect ſentences*; at the ſame time that they do this, they muſt either *connect* their *meaning* or *not*. For example, let us take theſe two ſentences, *Rome was enſlaved,—Cæſar was ambitious*, and connect them together by the conjunction BECAUSE; *Rome was enſlaved*, BECAUSE *Cæſar was ambitious*. Here the *meanings*, as well as the *ſentences*, appear to be connected. But if I ſay, *manners muſt be reformed*, OR *liberty will be loſt*; here the conjunction OR, though it join the ſentences, yet, as to their reſpective *meanings*, is a perfect *disjunctive*. And thus it appears, that though all conjunctions *conjoin ſentences*, yet, with reſpect to the *ſenſe*, ſome are CONJUNCTIVE, and others are DISJUNCTIVE.

Thoſe *conjunctions which conjoin both ſentences* and their meanings are either COPULATIVES OR CONTINUATIVES. The principal copulative in *Engliſh* is AND. The continuatives are much more numerous; IF, BECAUSE, THEREFORE, WHEREFORE, HENCE, THAT, &c. The difference between theſe is this: The *copulative* does no more than barely *couple* ſentences, and is therefore applicable to all ſubjects whoſe natures are *not incompatible*: *Continuatives*, on the contrary, by a more intimate connection, conſolidate ſentences *into one continuous whole*; and are therefore applicable only to ſubjects which have an *eſſential coincidence*: For example, it is no way improper to ſay, *Lyſippus was a ſtatuary*, AND *Priſcian a grammarian*; *the ſun ſhineth*, AND *the ſky is clear*; becauſe theſe are things that may co-exiſt, and yet imply no abſurdity. But it would be abſurd to ſay, *Lyſippus was a ſtatuary*, BECAUSE *Priſcian was a grammarian*; though not to ſay, *the ſun ſhineth* BECAUSE *the ſky is clear*. The reaſon is, with reſpect to the firſt, the *co-incidence* is merely *accidental*: with reſpect to the laſt, it is *eſſential*, and founded in nature.

As to the *continuatives*, they are SUPPOSITIVE, ſuch as *if*; or POSITIVE, ſuch as *becauſe, therefore, as, &c.* Take examples of each:—*You will live happily* IF *you live honeſtly*:—*You live happily* BECAUSE *you live honeſtly*:—*You live honeſtly*, THEREFORE *you live happily*. The difference between theſe *continuatives* is this: The *ſuppoſitives* denote *connection*, but do not aſſert actual exiſtence; the *poſitives* imply both the *one* and the *other*.

Theſe *poſitives* above-mentioned are either CASUAL, ſuch as *becauſe, ſince, as, &c.* or COLLECTIVE, ſuch as *therefore, wherefore, &c.* The difference between which is this: The *caſuals* ſubjoin *cauſes* to *effects*; " *the ſun is in ecclipſe* BECAUSE *the moon intervenes*:" The *collectives* ſubjoin *effects* to *cauſes*; " *the moon intervenes*, THEREFORE *the ſun is in eclipſe*." We therefore uſe *caſuals* in thoſe inſtances where the *effect* being conſpicuous we ſeek for its *cauſe*; and *collectives*, in demonſtrations and ſcience, properly ſo called, where the *cauſe* being firſt known, by its help we diſcern *effects*.

All theſe *continuatives* are reſolvable into *copulatives*: For, inſtead of ſaying, BECAUSE *it is day, it is light*; we may ſay, *It is day*, AND *it is light*. Inſtead of IF *it is day, it is light*; we may ſay, *It is at the ſame time neceſſary to be day*, AND *to be light*. The reaſon is, That the power of the *copulative* extends to all connections, as well to the *eſſential* as to the *caſual*. Hence the continuative may be reſolved into a *copulative and ſomething more*; that is to ſay, into a *copulative* implying an *eſſential* coincidence in the ſubjects conjoined.

As to *caſual conjunctions*, we may further obſerve, that there is no one of the four ſpecies of cauſes which they are not capable of denoting. For example, *the* MATERIAL *cauſe*; *The trumpet ſounds*, BECAUSE *it is made of metal*. *The* FORMAL; *The trumpet ſounds*, BECAUSE *it is long and hollow*. *The* EFFICIENT; *The trumpet ſounds*, BECAUSE *an artiſt blows it*. *The* FINAL; *The trumpet ſounds*, THAT *it may rouſe our courage*. It is worth obſerving, that the three firſt cauſes are expreſſed by the ſtrongeſt affirmation; becauſe, if the *effect* actually be, that muſt be alſo. But this is not the caſe with reſpect to the laſt, which is only affirmed as a thing that *may* happen. The reaſon is, That however this may be the end which ſet the artiſt firſt to work, it may ſtill be beyond his power to obtain, and which, like all other contingents, may either happen or not. Hence alſo it is connected by a particular conjunction, THAT, abſolutely confined to this *cauſe*.

We now come to the DISJUNCTIVE CONJUNCTIONS; a ſpecies of words which bear this contradictory name, becauſe, while they DISJOIN *the ſenſe*, they CONJOIN *the ſentences*.

With reſpect to theſe, we may obſerve, that as there is a principle of UNION diffuſed through all things by which THIS WHOLE is kept together and preſerved from diſſipation; ſo there is, in like manner, a principle of DI-

VERSITY diffuſed through all, the ſource of *diſtinction*, of *number*, and of *order*. Now, it is to expreſs in ſome degree the *modifications of this diverſity*, that DISJUNCTIVE CONJUNCTIONS ſeem at firſt to have been invented.

Of theſe *disjunctives*, ſome are SIMPLE, ſome ADVERSATIVE. *Simple*; as when we ſay, EITHER *it is day*, OR *it is night*:—*Adverſative*; as when we ſay, *It is not day*, BUT *it is night*. The difference between theſe is, that the *ſimple* do no more than *merely* disjoin; the *adverſative* disjoin with a concomitant *oppoſition*. Add to this, that the *adverſative* are *definite*; the *ſimple indefinite*. Thus, when we ſay, *the number three is not an even number*, BUT *an odd*; we not only *disjoin* two oppoſite attributes, but we *definitely* affirm one, and deny the other. But when we ſay, *the number of the ſtars is* EITHER *even* OR *odd*; though we aſſert one attribute *to be*, and the other *not to be*, yet the alternative is notwithſtanding left *indefinite*.

As to *adverſative disjunctives*, it has been already ſaid, that they imply OPPOSITION. Now, there can be no oppoſition of the *ſame* attribute in the *ſame* ſubject; as when we ſay, *Nereus was beautiful*: but the oppoſition muſt be either of the *ſame* attribute in different ſubjects, as when we ſay, "*Brutus* was a *patriot*, BUT *Cæſar* was not;" or of *different* attributes in the *ſame* ſubject, as when we ſay, "*Gorgius* was a *ſophiſt*, BUT not a *philoſopher*;" or of *different* attributes in *different* ſubjects, as when we ſay, "*Plato* was a *philoſopher*, BUT *Hippias* was a *ſophiſt*." The conjunctions uſed for all theſe purpoſes may be called *abſolute* adverſatives.

But there are *other* adverſatives beſides theſe; as when we ſay, "*Nereus* was more beautiful THAN *Achilles*;—*Virgil* was AS great a *poet* AS *Cicero* was an *orator*." The character of theſe latter is, that they go farther than the former, by marking not only *oppoſition*, but that *equality* or *exceſs* which ariſes from the compariſon of ſubjects; and therefore they may be called *adverſatives of compariſon*.

Beſides the adverſatives here mentioned, there are two other ſpecies, of which the moſt eminent are UNLESS and ALTHOUGH: For example, "*Troy* will be taken, UNLESS the *Palladium* be preſerved; *Troy* will be taken, ALTHOUGH *Hector* defend it." The nature of theſe adverſatives may be thus explained. As every *event* is naturally allied to its *cauſe*, ſo, by parity of reaſon, it is oppoſed to its *preventive*; and as every cauſe is either *adequate* or *inadequate*, (inadequate, when it endeavours, without being effectual), ſo in like manner is every *preventive*. Now, *adequate* preventives are expreſſed by ſuch adverſatives—as UNLESS: "*Troy* will be taken, UNLESS the *Palladium* be preſerved;" that is, that this alone is *ſufficient* to prevent it. The *inadequate* are expreſſed by ſuch adverſatives as ALTHOUGH: "*Troy* will be taken, ALTHOUGH *Hector* defend it;" that is, *Hector*'s defence will prove *ineffectual*. Theſe may be called adverſatives ADEQUATE and INADEQUATE.

Before we leave this ſubject, we may obſerve, that the words *when* and *where*, and all others of the ſame nature, ſuch as *whence*, *whether*, *whenever*, *where-ever*, *&c.* may be called ADVERBIAL conjunctions; becauſe they participate the nature both of adverbs and conjunctions; of *conjunctions*, as they *conjoin* ſentences; of *adverbs*, as they denote the attributes either of *time* or *place*. And theſe *adverbial* conjunctions (contrary to the character of *acceſſary* words, which have ſtrictly no ſignification but when aſſociated with other words) have a kind of *obſcure* ſignification when taken alone, by denoting theſe attributives of time and place. And hence it is, that they appear in grammar like *zoophytes* in nature, a kind of middle beings, of amphibious character, which, by ſharing the attributes of the higher and the lower, conduce to link the whole together.

Section II. *Of thoſe* Connectives, *called* PREPOSITIONS.

A PREPOSITION *is a part ſpeech devoid itſelf of ſignification, but ſo formed as to unite two words that are ſignificant and that refuſe to coaleſce of themſelves.* This connective power (which relates to words only, and not to ſentences) will be better underſtood by the following obſervations.

Some things naturally coaleſce and unite of *themſelves*, while others refuſe to do ſo *without help*, and as it were by compulſion. For example, all quantities and qualities coaleſce immediately with their ſubſtances: thus it is we ſay, *a fierce lion, a vaſt mountain*, &c. In like manner actions coaleſce with their agents, and paſſions with their patients: thus it is we ſay, *Alexander conquers, Darius is conquered*. Nay, as every energy is a kind of medium between its agent and patient, the whole three, agent, energy, and patient, coaleſce with the ſame facility; as when we ſay, *Alexander conquers Darius*. Farther than this, as the greateſt part of attributives themſelves may be characteriſed, as when we ſay of ſuch attributives as *ran, beautiful, learned*, &c. "he ran *ſwiftly*, ſhe was *very* beautiful, he was *moderately* learned," *&c.* theſe muſt readily coaleſce with the attributes which they thus characteriſe. From all which it appears, that *thoſe parts of ſpeech unite of themſelves in grammar whoſe original archetypes unite of themſelves in nature.* Hence, therefore, it is, that although ſubſtances naturally coincide with their attributes, yet they abſolutely refuſe doing ſo one with another: and hence thoſe known maxims in phyſics, that *body is impenetrable*, that *two bodies cannot poſſeſs the ſame place*, &c.

From theſe principles it follows, that when we form a ſentence, the ſubſtance without difficulty coincides with the verb, from the natural coincidence of ſubſtance with energy; *the* SUN WARMETH: ſo likewiſe the energy with the ſubject on which it operates; WARMETH *the* EARTH: ſo likewiſe both ſubſtance and energy with their proper attributes; *the* SPLENDID SUN GENIALLY WARMETH *the* FERTILE EARTH. But ſuppoſe we are to add other ſubſtantives, as, for inſtance, *air*, or *beams*; how could theſe coincide, or under what character be introduced? not either as the *energizer* of the verb, nor as *the ſubject on which it operates*; for both of theſe places are already filled up, the firſt by the word SUN, and the laſt by the ſubſtance EARTH: not as *attributes* to theſe laſt, or to any other thing; for attributes by nature they neither *are* nor *can be made*. Here, then, we perceive the riſe and uſe of *prepoſitions*: by theſe we connect thoſe ſubſtantives to ſentences, which, at the time, are unable to *coaleſce of themſelves*. Let us aſſume, for inſtance, a pair of theſe connectives, THROUGH and WITH, and mark their effect upon the ſubſtances here mentioned; *the ſplendid ſun* WITH *his beams genially warmeth* THROUGH *the air the fertile earth*: the ſentence, as before, remains entire and one; the ſubſtantives required are both introduced, and not a word which was there before is diſplaced from its proper ſtation.

It muſt be here obſerved, that *moſt* if not *all* prepoſitions ſeem originally formed to denote the relations of *place*; becauſe this is that grand *relation* which *bodies* or *natural ſubſtances* maintain at all times to one another, whether they are contiguous or remote, whether in motion or at reſt: thus we have prepoſitions to denote the *contiguous relation of body*; as when we ſay, *Caius walked* WITH *a ſtaff*; *the ſtatue ſtood* UPON *a pedeſtal*; *the river ran* OVER *a precipice*: others for the *detached relation*; as when we ſay, *he is going* TO *Italy*; *the ſun is riſen* ABOVE *the hills*; *theſe figs came* FROM *Turkey*: So as to *motion* and *reſt*; only with this difference, that here the prepoſition varies its character with the verb: thus if we ſay, *that lamp hangs* FROM *the ceiling*, the prepoſition FROM aſſumes the character of *quieſcence*: but if we ſay, *that lamp is falling* FROM *the ceiling*, the prepoſition aſſumes a character of *motion*. So in Milton;

——*To ſupport uneaſy ſteps*
OVER *the burning marle*——

Again,

——*He with looks of cordial love*
Hung OVER *her enamour'd.*——

In the firſt of theſe examples, OVER denotes *motion*, and in the laſt it denotes *reſt*.

But though the original uſe of prepoſitions was to denote the relations of *place*, they could not be confined to this office only; but by degrees extended themſelves to ſubjects *incorporeal*, and came to denote relations as well *intellectual* as *local*. Thus becauſe, in *place*, he who is *above* has commonly the advantage of him who is *below*, we transfer OVER and UNDER to *dominion* and *obedience*: of a king we ſay, *he ruled* OVER *his people*; of a common ſoldier, *he ſerved* UNDER *ſuch a general*: ſo too we ſay, WITH *thought*; WITHOUT *attention*; *thinking* OVER *a ſubject*; UNDER *anxiety*; FROM *fear*; OUT OF *love*; THROUGH *jealouſy*, &c. All which inſtances, with many of the like kind, ſhew, that the *firſt words* of men, like their *firſt ideas*, had an immediate reference to *ſenſible objects*; and that, in after days, when they began to diſcern with their *intellect*, they took theſe words which they found already made, and transferred them, by *metaphor*, to *intellectual conceptions*. There is indeed no method to expreſs new ideas, but either by *metaphor*, or by *coining new words*; both which have been practiſed by philoſophers, according to the nature and exigence of the occaſion.

In the foregoing uſe of prepoſitions, we have ſeen how they are employed by way of *juxta-poſition*; that is to ſay, where they are prefixed to a word without becoming a part of it: but they may be alſo uſed by way of *compoſition*; that is, they may be prefixed to a word ſo as to become a part of it: thus, to UNDER*ſtand*, to FORE*tell*, to OVER*act*, to UNDER*value*, to OUT*go*, &c. are ſo many diſtinct words formed by prepoſitions joined intimately with ſome other word: in all which caſes, the prepoſitions commonly transfuſe ſomething of their own meaning into the word with which they are compounded; and this imparted meaning, in moſt inſtances, will be found reſolvable into ſome of the relations of *place*, as uſed either in its *proper* or *metaphorical* acceptation.

BESIDES the above parts of ſpeech, there is another, which cannot be comprehended under any of the foregoing claſſes, called INTERJECTIONS: of this kind are the words, AH! ALAS! FIE! *&c. This ſpecies of words coincide with no part of ſpeech, but are either uttered alone, or elſe thrown into a ſentence, without altering its form either in ſyntax or ſignification.* It may be therefore objected, that as we ſay, that all language is divided into the ſeveral parts above enumerated, and this claſs cannot be comprehended in any of theſe diviſions; of courſe, the analyſis that we have made cannot be juſt, becauſe it does not comprehend the whole. To this objection it may be anſwered, that the language of which we have been treating, is that which has been formed by mutual compact, for the purpoſes of reaſoning and ſpeculation; that beſides this artificial language, man, like every other ſenſitive animal, is endowed with a natural language, by which he can expreſs any ſtrong ſenſation. This language does not owe its characteriſtical expreſſion to the arbitrary form of articulation; but derives its whole force from the tone of voice, and modification of countenance and geſture: and of conſequence theſe tones and geſtures expreſs the ſame meaning without any relation to the articulation which they may aſſume, and are therefore univerſally underſtood by all mankind. Now, *interjection* is the name by which we diſtinguiſh theſe natural expreſſions: theſe cannot be properly called words, or parts of ſpeech; but certain adventitious ſounds, or voices of nature, expreſſing thoſe paſſions and natural emotions which ſpontaneouſly ariſe in the mind upon the view or narrative of intereſting events. We muſt, therefore, ſtill conclude, that all language properly ſo called is compoſed of *words*, all of which may be arranged into the ſeveral claſſes above-mentioned; and as a recapitulation of the whole that we have ſaid, we ſubjoin the following table, which preſents at one view the ſeveral claſſes and ſubdiviſions of words.

GRAMMONT, a town of the Auſtrian Netherlands, in the province of Flanders, ſituated on the river Dender: E. long. 3° 50′, and N. lat. 50° 55′.

GRAMPOUND, a borough-town of Cornwal, thirty-eight miles ſouth-weſt of Launceſton: W. long. 5° 25′, and N. lat. 50° 20′. It ſends two members to parliament.

GRAMPUS, in ichthyology. See DELPHINUS.

GRANADA, a province of Spain, bounded by Andaluluſia on the north, by Murſia and the Mediterranean on the eaſt, by the ſame ſea on the ſouth, and by Andaluſia on the weſt.

GRANADA, the capital city of the provine of Granada in Spain, ſituated two hundred miles ſouth of Madrid: W. long. 3° 40′, and N. lat. 37° 15′.

GRANADA, a province of Terra Firma, in South America, bounded on the north by the provinces of Carthagena and St Martha, on the eaſt by Zeneguela, by Popoyan on the ſouth, and by Darien on the weſt.

GRANADA, a city of Mexico, in North America, ſituated on the ſide of the lake Nicaragua: W. long. 89°, and N. lat. 11° 8′.

GRANADA is alſo the moſt ſoutherly of the Caribbee-iſlands, ſituated one hundred and fifty miles ſouth-weſt of Barbadoes: W. long. 61° 30′, and N lat. 12° 15.

GRANADIER, a ſoldier armed with a ſword, a firelock, a bayonet, and a pouch full of hand-granadoes. They wear high caps, are generally the talleſt and briſkeſt fellows, and are always the firſt upon all attacks.

Every battalion of foot has generally a company of granadiers belonging to it, or elſe four or five granadiers belong to each company of the battalion; which, on occaſion, are drawn out, and form a company of themſelves. Theſe always take the right of the battalion.

GRANADILLA. See PASSIFLORA.

GRANADILLOS, ſome of the Caribbee-iſlands, ſituated between the iſland of St Vincent and Granada; but ſo inconſiderable, that no nation has thought them worth poſſeſſing.

GRANADO, a hollow ball or ſhell, of iron or other metal, about two inches and a half in diameter; which, being filled with fine powder, is ſet on fire by means of a ſmall fuſee, faſtened to the touch-hole, made of the ſame compoſition as that of a bomb: as ſoon as the fire enters the ſhell, it burſt into many pieces, much to the damage of all that ſtand near.

GRANARY, a building to lay or ſtore corn in, eſpecially that deſigned to be kept a conſiderable time.

Sir Henry Wotton adviſes, to make it look towards the north, becauſe that quarter is the cooleſt and moſt temperate. Mr Worlidge obſerves, that the beſt granaries are built of brick, with quarters of timber wrought in the inſide, to which the boards may be nailed, with which the inſide of the granary muſt be lined ſo cloſe to the bricks, that there may not be any room left for vermin to ſhelter themſelves. There may be many ſtories one above another, which ſhould be near the one to the other; becauſe the ſhallower the corn lies, it is the better, and more eaſily turned.

GRAND JURY, in Engliſh law, is the jury who find bills of indictment before juſtices of peace and goal-delivery, or of oyer and terminer, *&c.* againſt any offenders that may be tried for the fact.

GRANDE, a branch of the river Niger in Africa, which diſcharges itſelf into the Atlantic ocean, in 15° W. long. and 11° N. lat.

GRANDE, is alſo a river of Braſil, in the province of Del Rey, in South America, which diſcharges itſelf into the Atlantic ocean, in 51° W. long and 32° S. lat.

GRANDEE, a deſignation given to a nobleman of Spain or Portugal.

The grandees are ſuffered to be covered before the king, who treats them like princes, ſtyling them Illuſtrious, in his letters; and in ſpeaking to them, or of them, they are ſtyled Eminences.

GRANDENTZ, or GRAUDENTZ, a city of Poland, forty-two miles ſouth of Dantzick: E. long. 19°, and N. lat. 53° 30′.

GRANDPRE, a town of Champaign, in France, thirty miles eaſt of Rheims: E. long. 4° 56′, and N. lat. 49° 18′.

GRANICUS, a little river near the Helleſpont, in the Leſſer Aſia, where Alexander fought the firſt battle with the forces of Darius.

GRANITE, in natural hiſtory, a diſtinct genus of ſtones, compoſed of ſeparate and very large concretions rudely compacted together; of great hardneſs, giving fire with ſteel, not fermenting with acids, and ſlowly and imperfectly calcinable in a great fire.

Of this genus there are three ſpecies: 1. The hard white granite, with black ſpots, commonly called moor-ſtone: this is a very valuable kind, conſiſting of a beautiful congeries of very variouſly conſtructed and differently coloured particles, not diffuſed among or running in one another, but each pure and diſtinct, though firmly adhering to whichever of the others it comes in contact with, and forming a very firm maſs: it is much uſed in London for the ſteps of public buildings, and on other occaſions where great ſtrength and hardneſs are required. 2. The hard red granite, variegated with black and white, and common in Egypt and Arabia. 3. The pale whitiſh granite, variegated with black and yellow. This is ſometimes found in ſtrata, but more frequently in looſe nodules, and is uſed for paving the ſtreets.

GRANIVOROUS, an appellation given to animals which feed on corn or ſeeds. Theſe are principally of the bird-kind.

GRANT, in law, a conveyance in writing of ſuch things as cannot paſs or be conveyed by word only; ſuch are rents, reverſions, ſervices, *&c.*

GRANTHAM, a borough-town of Lincolnſhire, twenty-two miles ſouth of Lincoln. It ſends two members to parliament.

GRANVILLE, a port-town of Normandy, from whence the noble family of Carteret take the title of earl.

GRANULATED, ſomething that has undergone granulation. See the next article.

GRANULATION, according to Cramer, is the reducing metals to ſmall particles, in order to promote their fuſion and mixture with other bodies.

GRAPE, the fruit of the vine. See VINE.

GRAPHOMETER, a mathematical inſtrument, otherwiſe called a ſemi-circle, the uſe of which is to obſerve any angle whoſe vertex is at the centre of the inſtrument in any plane (though it is moſt commonly horizontal, or nearly ſo), and to find how many degrees it contains. See GEOMETRY, p. 696. and Plate XCV. fig. 14.

GRAPNELS, a ſort of anchors with four flooks, ſerving for boats to ride by.

There is alſo a kind called fire and chain grapnels, made with four barbed claws inſtead of flooks, and uſed to catch hold of the enemy's rigging, or any other part, in order for boarding them.

GRASS, in botany, *&c.* a name given to ſeveral diſtinct plants; as, the agroſtis, or couch graſs; the briza, or quaking-graſs, *&c.* Under the term graſs are alſo comprehended all manner of herbaceous plants ſerving for the food of cattle, as clover, rye-graſs, *&c.*

GRASSHOPPER, in zoology. See GRYLLUS.

GRATIOLA, in botany, a genus of the diandria monogynia claſs. The corolla is irregular; the capſule has two cells; and the calix conſiſts of ſeven leaves. There are four ſpecies, noneof them natives of Britain.

GRATZ, a city of Germany, and capital of the duchy of Stiria, ſixty-five miles ſouth of Vienna: E. long. 15° 55′, and N. lat 47° 20′.

GRAVE, in muſic, is applied to a ſound, which is of a low or deep tone.

Grave, in geography, a ſtrong city of the Netherlands, in the province of Dutch Brabant, eight miles ſouth of Nimeguen: E. long. 5° 45′, N. lat. 51° 50′.

GRAVEL, in natural hiſtory and gardening, a congeries of pebbles, which, mixed with a ſtiff loam, makes laſting and elegant gravel walks; an ornament peculiar to our gardens, and which gives them the advantage over thoſe of other nations.

Gravel, in medicine. See MEDICINE.

GRAVESEND, a port-town of Kent, ſituated on the ſouthern ſhore of the river Thames, twenty miles eaſt of London.

GRAVINA, a city and biſhop's ſee of the kingdom of Naples, twenty-ſeven miles ſouth-weſt of Barri: E. long. 17°, and N. lat. 41°.

GRAVITATION. See MECHANICS.

GRAVITY. See MECHANICS.

Specific **Gravity**. See HYDROSTATICS.

GRAY, in geography, a city of Franche Compte in France, twenty-two miles north-weſt of Beſançon: E. long. 5° 32′, N lat. 47° 30′.

GREASE, a ſwelling and gourdineſs of the legs of a horſe. See FARRIERY.

GREECE, the preſent Rumelia, and the ancient Hellas, is ſituated between 20° and 26° E. long and between 36° and 44° N. lat.

It reaches from the Adriatic ſea eaſtward to the Archipelago, and is generally a healthy and fruitful country.

GREEK, or **Grecian**, any thing belonging to ancient Greece.

The Greek language, as preſerved in the writings of the celebrated authors of antiquity, as Homer, Heſiod, Demoſthenes, Ariſtotle, Plato, Xenophon, *&c.* has a great variety of terms and expreſſions, ſuitable to the genius and occaſions of a polite and learned people, who had a taſte for arts and ſciences.

Greek bible. See BIBLE.

Greek Church. See CHURCH.

Greek monks and **nuns**, of whatever order, conſider St Baſil as their founder and common father, and eſteem it the higheſt crime to deviate in the leaſt from his conſtitutions. There are ſeveral beautiful convents with churches, in which the monks perform divine ſervice day and night. Some of the monks are cœnobites, or live together, wear the ſame habit, eat at the ſame table, and purſue the ſame exerciſes and employments.

GREEN, one of the original colours, exhibited by the rays of light. See OPTICS.

Green, among painters. See BOTANY, p. 634.

Gamboge will give five or ſix ſorts of green with verdigreaſe. But the yellow, which ſome prefer before all others, is made of French berries; which is either deeper or fainter, according as the liquor is more or leſs ſtained by them. In like manner, a yellow, drawn from the roots of the barberry or mulberry, will anſwer the ſame purpoſe, being mixed with tranſparent verdigreaſe. As to verdigreaſe itſelf, it produces a fine bluiſh green, flows readily in the pencil, and may even ſerve as an ink to write with; but is ſubject to decay. Mountain-green is uſed for a graſs colour. Verditer is a light green, ſeldom uſed but to colour landſkips that ſeem afar off. Sap-green is dark and dirty, and therefore never uſed but to ſhadow over greens in the darkeſt places Copper-green is an excellent tranſparent and ſhining graſs-green, if thickened in the ſun ſhine, or over a gentle fire. It is the moſt uſed of any green in waſhing of prints or maps.

Green-cloth, a board, or court of juſtice, held in the compting-houſe of the king's houſhold, compoſed of the lord ſteward, and officers under him, who ſit daily. To this court is committed the charge and overſight of the king's houſhold in matters of juſtice and government, with a power to correct all offenders, and to maintain the peace of the verge, or juriſdiction of the court royal; which is every way about two hundred yards from the laſt gate of the palace where his majeſty reſides.

It takes its name, *board of green cloth*, from a green cloth ſpread over the board where they ſit.

Without a warrant firſt obtained from this court, none of the king's ſervants can be arreſted for debt.

Clerks of the **Green Cloth**, are two officers of the board of green-cloth, who appoint the diet of the king and his houſhold; and keep all records, ledgers and papers relating thereto; make up bills, parcels and debentures for ſalaries, and proviſions and neceſſaries for the officers of the pantry, buttery, cellar, *&c.*

They alſo wait upon foreign princes when entertained by his majeſty.

Green finch, in ornithology, the Engliſh name of the greeniſh fringilla, with the wings and tail variegated with yellow. See Fringilla.

GREEN-HOUSE, or conſervatory, a houſe in a garden contrived for ſheltering and preſerving the moſt tender and curious exotic plants, which, in our climate, will not bear to be expoſed to the open air during the winter ſeaſon. Theſe are generally large and beautiful ſtructures, equally ornamental and uſeful.

GREENLAND, or *Weſt* Greenland, extends from the meridian of London to 50° W. long. and from 60° to 80° N. lat.

The Danes have ſome colonies here, and pretend to the property of the whole. However, the Dutch make very free with the fiſhery on this coaſt, notwithſtanding the repreſentations and even menaces of the Danes on that head.

GREENWICH, a town of Kent, ſituated on the ſouthern ſhore of the Thames, five miles eaſt of London; remarkable for its royal and magnificent hoſpital, erected for decayed or diſabled ſeamen who have ſerved their country, and for its palace and moſt delightful park.

On the top of a ſteep hill in the park, ſtands the royal obſervatory, built by Charles II. and furniſhed with all manner of inſtruments for aſtronomical obſervations, and a deep dry well for obſerving the ſtars by day.

GREGARIOUS, among zoologiſts, a term applied to ſuch animals as do not live ſolitary, but in herds, flocks, or coveys.

GREGORIAN calendar, that which ſhews the new and full moon, with the time of Eaſter, and the moveable feaſts depending thereon, by means of epacts, diſpoſed through the ſeveral months of the Gregorian year. See Astronomy, p. 490.

Gregorian year. See Astronomy, p. 490.

GRENOBLE, a city of France, capital of Dauphiny, forty-five miles ſouth-eaſt of Lyons, and thirty-ſix miles ſouth-weſt of Chamberry: E. long. 5° 28′, and N. lat. 45° 12′.

GRENOCK, or Greenock, a port-town of Scotland, near the mouth of the river Clyde; being the principal ſtation for the herring-fiſhery.

GREWIA, in botany, a genus of the gynandria polyandria claſs. The calix conſiſts of five leaves; the petals are five; at the baſe of each petal there is a nectariferous ſcale; and the berry has four cells. There are two ſpecies, none of them natives of Britain.

GREY, or Gray, a mixed colour partaking of the two extremes, black and white.

GRIFFON, in heraldry, an imaginary animal, feigned by the ancients to be half eagle and half lion; by this form they intended to give an idea of ſtrength and ſwiftneſs joined together, with an extraordinary vigilance in guarding the things intruſted to its care. Thus the heathen naturaliſts perſuaded the ignorant, that gold mines were guarded by theſe creatures with incredible watchfulneſs and reſolution.

GRIMPERG, a city of Germany, in the circle of the Lower Rhine, and earldom of Triers: E. long. 6° 35′, N lat. 49° 40′.

GRIMSBY, a borough and port-town of Lincolnſhire, ſituated at the mouth of the Humber: E. long. 4′, N. lat. 53° 34′. It ſends two members to parliament.

GRINDING, the reducing hard ſubſtances to fine powders.

Method of Grinding *optic glaſſes*. Mr Huygens directs, in general, to make the breadth of the concave tool, plate, diſh, or form, in which an object-glaſs muſt be ground, almoſt three times the breadth of the glaſs. Though in another place he ſpeaks of grinding a glaſs whoſe focal diſtance was 200 feet, and breadth 8¼ inches, in a plate only fifteen inches broad. But for eye-glaſſes, and others of leſſer ſpheres, the tools muſt be broader in proportion to the breadth of theſe glaſſes, to afford room enough for the motion of the hand in poliſhing. Mr Huygens made his tools of copper, or of caſt braſs, which, for fear they ſhould change their figure by bending, can hardly be caſt too thick: however, he found by experience, that a tool fourteen inches broad, and half an inch thick, was ſtrong enough for the forming glaſſes to a ſphere of thirty-ſix feet diameter; when the tool was ſtrongly cemented upon a cylindrical ſtone an inch thick, with hard cement made of pitch and aſhes.

In order to make moulds for caſting ſuch tools as are pretty much concave, he directs, that wooden patterns ſhould be turned in a lathe, a little thicker and broader than the tools themſelves; but for tools that belong to ſpheres above twenty or thirty feet diameter, he ſays it is ſufficient to make uſe of flat boards turned circular to the breadth and thickneſs required. When the plates are caſt, they muſt be turned in a lathe exactly to the concavity required; and for this purpoſe it is requiſite to make a couple of braſs gages in the manner following, according to the directions of Mr Molyneux.

Take a wooden pole, a little longer than the radius of the ſpherical ſurface of the glaſs to be formed; and through the ends of it ſtrike two ſmall ſteel points, at a diſtance from each other equal to the radius of the ſphere intended; and by one of the points hang up the pole againſt a wall, ſo that this upper point may have a circular motion in a hole or ſocket made of braſs or iron, fixt firmly to the wall. Then take two equal plates of braſs or copper, well hammered and ſmoothed, whoſe length is ſomewhat more than the breadth of the tool of caſt braſs, whoſe thickneſs may be about a tenth or a twelfth of an inch, and whoſe breadth may be two or three inches. Then having faſtened theſe plates flat againſt the wall in a horizontal poſition, with the moveable point in the pole, ſtrike a true arch upon each of them. Then file away the braſs on one ſide exactly to the arch ſtruck, ſo as to make one of the braſs edges convex, and the other concave; and to make the arches correſpond more exactly, fix one of the plates flat upon a table, and grind the other againſt it with emery. Theſe are the gages to be made uſe of in turning the braſs tools exactly to the ſphere required.

GRINDSTEAD, or *Eaſt* GRINDSTEAD, a borough-town of Suſſex, twenty-four miles directly ſouth of London, which ſends two members to parliament.

GRIPSWALD, a town of Germany, in the circle of Upper Saxony, and province of Swediſh Pomerania, ſituated on a bay of the Baltic ſea: E. long. 13° 40′, N. lat. 54° 15′.

GRISONS, allies of Switzerland; their country is almoſt of a circular form, about ſixty miles over every way, and is bounded on the north by Tyrol and part of Switzerland; on the eaſt, by Tyrol and Trent; on the ſouth, by Italy; and by the Swiſs cantons on the weſt.

GRIST, in country-affairs, denotes corn-ground, or ready for grinding.

GROATS, in country-affairs, oats after the hulls are off, or great oat-meal.

GROCERS, anciently were ſuch perſons as engroſſed all merchandize that was vendible; but now they are incorporated, and make one of the companies of the city of London, which deals in ſugar, foreign fruits, ſpices, *&c.*

GROENLAND, or SPITZBERGEN, a cold miſerable country without inhabitants, and with very few animals or vegetables, ſituated between 10° and 30° E. long. and between 77° and 82° N. lat.

GROGRAM, a kind of ſtuff, made of ſilk and mohair.

GRONINGEN, the capital of a province of the ſame name, which makes one of the ſeven united provinces: E. long. 6° 40′, N. lat. 53° 20′.

GRONOVIA, in botany, a genus of the pentandria monogynia claſs. The petals are five, inſerted along with the ſtamina into a bell-ſhaped calix; and the berry is dry, contains one ſeed, and ſituate below the flower. There is but one ſpecies.

GROOM, a name particularly applied to ſeveral ſuperior officers belonging to the king's houſehold, as groom of the chamber, groom of the ſtole. See STOLE, and WARDROBE.

GROOM is more particularly uſed for a ſervant appointed to attend on horſes in the ſtable.

GROOVE, among miners, is the ſhaft or pit ſunk into the earth, ſometimes in the vein, and ſometimes not.

GROOVE, among joiners, the channel made by their plough in the edge of a moulding, ſtyle, or rail, to put their pannels in, in wainſcotting.

GROSS-BEAK, in ornithology. See LOXIA.

GROSSULARIA. See RIBES.

GROTESQUE, or GROTESK, in ſculpture and painting, ſomething whimſical, extravagant, and monſtrous; conſiſting either of things that are merely imaginary, and have no exiſtence in nature; or of things ſo diſtorted, as to raiſe ſurprize and ridicule.

GROTSKA, a city of Sileſia, and capital of a duchy of the ſame name, thirty miles ſouth of Breſlaw: E. long. 17°, N. lat. 50° 40′.

GROTTO, a large deep cavern or den in a mountain or rock.

Of theſe we find ſeveral remarkable ones in different parts of the world. The moſt celebrated one of our own country, is that called Ookley-hole, on the ſouth ſide of Mendip-hills. Its length is about two hundred yards, and its height various; being in ſome places very low, and in others eight fathoms. There is another at Puzzoli, about four leagues from Naples, called the Dog's Grotto; becauſe a dog thrown into it is immediately killed, by a deſtructive vapour equally fatal to all animals within its reach. The milky grotto, *crypta lactea*, about a mile from the ancient village of Bethlehem, is ſaid to have been thus called from the holy virgin's letting fall ſome drops of her milk in it; on which account the earth of this cavern has been ſuppoſed to poſſeſs the virtue of reſtoring womens milk.

GROTTO is alſo uſed for a ſmall artificial edifice made in a garden, in imitation of a natural grotto.

The outſides of theſe grottos are uſually adorned with ruſtic architecture, and their inſide with ſhell-work, coral, *&c.* and alſo furniſhed with various fountains, and other ornaments.

The following is recommended as a good cement for grotto-work. Take two parts of white roſin, melt it clear, add to it four parts of bees-wax; when melted together, add ſome flower of the ſtone you deſign to cement, two or three parts, or ſo much as will give the cement the colour of the ſtone; to this add one part of the flower of ſulphur: firſt incorporate all together over a gentle fire, and afterwards knead it with your hands in warm water. With this faſten the ſtones, ſhells, *&c.* after they are well dried, and warmed before the fire.

GROVE, in gardening, a ſmall wood impervious to the rays of the ſun.

Groves are not only great ornaments to gardens, but are alſo the greateſt relief againſt the violent heats of the ſun, affording ſhade to walk under in the hotteſt parts of the day, when the other parts of the garden are uſeleſs.

GROUND, in agriculture, is much the ſame with earth or ſoil. See AGRICULTURE, p. 50.

GROUND-IVY, in botany. See GLECHOMA.

GROUND-PINE, in botany. See TEUCRIUM.

GROUP, in painting and ſculpture, is an aſſemblage of two or more figures of men, beaſts, fruits, or the like, which have ſome apparent relation to each other.

GROUSE, or GROWSE. See TETRAO.

GRUBS, in medicine, certain unctuous pimples ariſing in different parts of the face, but chiefly in the alæ of the noſe

GRUBBING, in agriculture, the digging or pulling up the ſtubs and roots of trees.

GRUBENHAGEN, a town and caſtle of Lower Saxony, and duchy of Brunſwic, remarkable for its mines of ſilver, copper, iron, and lead: E. long. 9° 36′, and N. lat. 51° 45′.

GRUME, in medicine, denotes a concreted clot of blood, milk, or other ſubſtance. Hence grumous blood is that which approaches to the nature of grume, and by its viſcidity, and ſtagnating in the capillary veſſels, produces ſeveral diſorders.

GRUMOSE *roots*, ſuch as are knotty, and faſtened to one head, like thoſe of celandine and anemonies.

GRUS, in ichthyology. See Ardea.

GRYLLUS, in zoology, the name of the cricket and locuſt kind, which, together with the graſshoppers, make only one genus of inſects, belonging to the order of hemiptera: the characters of which are theſe: the antennæ are ſetaceous and filiform; the exterior wings are membranaceous, narrow, and have much of the appearance of the wings of ſome of the fly kind; the thorax is compreſſed and angulated; and the legs are formed for leaping. There are no leſs than 64 ſpecies. See Plate LXXXVI. fig. 3. 4. 5.

GRYPHITES, in natural hiſtory, an Engliſh crow's stone, an oblong foſſile ſhell, very narrow at the head, and becoming gradually wider to the extremity, where it ends in a circular limb; the head or beak of this is very hooked or bent inward.

GUADALAJARA, a city of Mexico, in North America, and the capital of Guadalajara, or New Galicia: W. long. 108°, and N. lat. 20° 45′.

GUADALAVIAR, a river of Spain, which riſes in the province of Arragon, and runs ſouth-eaſt through the province of Valencia, falling into the Mediterranean a little below the city of Valencia.

GUADALAXARA, a city of Spain, in the province of New Caſtile, twenty-eight miles north-weſt of Madrid: W long. 3° 50′, and N. lat. 40° 40′.

GUADALUPE, one of the largeſt of the Caribbee-iſlands, eighty miles north of Martinico, ſubject to France: W. long. 61°, and N. lat. 16° 30′.

GUADIANA, a river of Spain, which riſes in the middle of New Caſtile, and running through Eſtremadura, enters Portugal; where, paſſing through the provinces of Alentejo and Algarva, it diſcharges itſelf into the Atlantic ocean.

GUADILBARBAR, a river of Africa, which riſes in the mountains of Atlas, runs through the kingdom of Tunis, and falls into the Mediterranean ſea near Bona.

GUADILQUIVIR, a river of Spain, which riſes in the mountains of Segura in New Caſtile, runs the whole length of Andaluſia, and paſſing by Cordova and Seville falls into the Atlantic ocean at St Lucar.

GUADIX, a city of Spain, in the province of Granada: W long 3°, and N. lat. 37° 15′.

GUAJACUM, in botany, a genus of the decandria-monogynia claſs. The calix conſiſts of five unequal ſegments; the petals are five, and inſerted into the calix; and the capſule is angular, and has from three to five cells. There are three ſpecies, all natives of the Indies.

The wood is very ponderous, of a cloſe compact texture; the outer part is of a yellow colour, the heart of a deep blackiſh green, or variegated with black, green, pale, and brown colours: the bark is thin, ſmooth, externally of a dark greyiſh hue: both have a lightly aromatic, bitteriſh, pungent taſte: the bark is ſomewhat the weakeſt. The reſin (which exſudes from inciſions made in the trunk of the tree) is brought to us in irregular maſſes, uſually friable, of a duſky greeniſh, and ſometimes of a reddiſh caſt, with pieces of the wood among them: its taſte is more acrid and pungent than that of the wood or bark.

Their general virtues are thoſe of a warm, ſtimulating medicine: they ſtrengthen the ſtomach and other viſcera; and remarkably promote the urinary and cuticular diſcharge: hence in cutaneous defedations, and other diſorders proceeding from obſtructions of the excretory glands, and where ſluggiſh ſerous humours abound, they are eminently uſeful: rheumatic and other pains have often been relieved by them. The reſin is the moſt active of theſe drugs; and the efficacy of the others depends upon the quantity of this part contained in them: the reſin is extracted from the wood in part by watery liquors, but much more perfectly by ſpiritous ones; the watery extract of this wood, kept in the ſhops, proves not only leſs in quantity, but conſiderably weaker than one made with ſpirit. This laſt extract is of the ſame quality with the native reſin, and differs from that brought to us only in being purer. The gum, or extracts, are given from a few grains to a ſcruple or half a dram; which laſt doſe proves for the moſt part conſiderably purgative.

GUALEOR, a city of the Hither India, and the capital of the province of Gualeor, ſituated forty miles ſouth of Agra: E. long. 79°, and N. lat. 26°.

GUAM, the chief of the Ladrone-iſlands, in the Pacific ocean: E long. 140°, and N. lat. 14°.

GUANIHANI, or St Salvador, now called Catt-iſland, one of the Bahama iſlands in the Atlantic ocean, in North America: W. long. 76°, N. lat. 24°.

GUANUCO, a town of Peru, in South America, one hundred and eighty miles north-eaſt of Lima: W. lon. 75° 15′, and S. lat. 10°.

GUARANTY, in matters of polity, the engagement of mediatorial or neutral ſtates, whereby they plight their faith, that certain treaties ſhall be inviolably obſerved, or that they will make war againſt the aggreſſor.

GUARD, in a general ſenſe, ſignifies the defence or preſervation of any thing; the act of obſerving what paſſes, in order to prevent ſurprize; or the care, precaution, and attention, we make uſe of, to prevent any thing happening contrary to our intention or inclinations.

Guard, in the military art, is a duty performed by a body of men, to ſecure an army or place from being ſurpriſed by an enemy.

Advanced **Guard**, is a party of either horſe or foot, that marches before a more conſiderable body, to give notice of any approaching danger.

Artillery **Guard**, is a detachment from the army, to ſecure the artillery: their corps de garde is in the front, and their centries round the park. This is a forty eight hours guard: and upon a march, they go in the front and rear of the artillery, and muſt be ſure to leave nothing behind; if a gun or waggon break down, the captain is to leave a part of his guard to aſſiſt the gunners and matroſſes in getting it up again.

Corps de **Garde**, are ſoldiers entruſted with the guard of a poſt, under the command of one or more officers.

Forrage-**Guard**, a detachment ſent out to ſecure the forragers, which are poſted at all places, where either the enemy's party may come to diſturb the forragers, or where they may be ſpread too near the enemy, ſo as to be in danger of being taken. They conſiſt both of horſe and foot, and muſt ſtay at their poſts till the forragers all come off the ground.

Grand **GUARD**, three or four ſquadrons of horſe, commanded by a field officer, poſted at about a mile and a half from the camp, on the right and left wings, towards the enemy, for the ſecurity of the camp.

Main **GUARD**, that from whence all the other guards are detached.

Picquet-**GUARD**, a good number of horſe and foot always in readineſs in caſe of an alarm: the horſe are all the time ſaddled, and the riders booted. The foot draw up at the head of the battalion, at the beating of the tattoo; but afterwards return to their tents, where they hold themſelves in readineſs to march, upon any ſudden alarm. This guard is to make reſiſtance, in caſe of an attack, till the army can get ready.

Quarter-**GUARD**, a ſmall guard, commanded by a ſubaltern officer, poſted by each battalion, about an hundred yards before the front of the regiment.

Rear-**GUARD**, that part of the army which brings up the rear, which is generally the old grand-guards of the camp. The rear-guard of a party is ſix or eight horſe, that march about four or five hundred paces behind the party. The advanced-guard of a party on its going out, make the rear-guard on its return.

Standard-**GUARD**, a ſmall guard, under a corporal, out of each regiment of horſe, and placed on foot, in the front of each regiment.

Van-**GUARD**, that part of the army which marches in the front.

GUARD is more particularly underſtood of a ſoldier detached from a company or corps,, to protect, detain, or ſecure any perſon, *&c.*

GUARDS, are alſo troops kept to guard the king's perſon, called alſo royal-guards, life-guards, gardes du corps, *&c.* Theſe are diſtinguiſhed into horſe, foot, granadiers, and yeomen.

The Engliſh horſe-guards are diſtinguiſhed by troops, and the foot-guards by regiments.

Yeomen of the **GUARDS**. See YEOMAN.

The French **GUARDS** are divided into thoſe within, and thoſe without the palace: the firſt conſiſts of the guards du corps, or body-guard, which conſiſts of four companies of horſe, the firſt of which companies was anciently Scotch, and ſtill retains the name, though it now conſiſts wholly of Frenchmen. The guards without, are the gens d'armes, light horſe, muſqueteers, and two other regiments, the one of which is French and the other Swiſs. See GENDARMES.

GUARD, in fencing, is a poſture proper to defend the body from an enemy's ſword.

GUARDIAN, in law, a perſon who has the charge of any thing; but more commonly it ſignifies one who has the cuſtody and education of ſuch perſons as have not ſufficient diſcretion to take care of themſelves and their own affairs, as children and ideots.

GUBEN, a town of Germany, in the circle of Upper Saxony: E. long. 15°, and N. lat. 51° 50′.

GUDGEON, in ichthyology. See GOBIUS.

GUENGA, a great river of the Hither India, which riſing in the mountains of Balagate, runs north-eaſt, and falls into the weſt branch of the river Ganges in Bengal.

GUERET, a town of France, in the province of Lionois: E. long 2°, and north lat. 46° 5′.

GUERNSEY, or **GARNSEY**, an iſland in the Engliſh channel, on the coaſt of Normandy, fifty-eight miles ſouth of Portland, in Dorſetſhire, and twenty two weſt of cape la Hogue, in Normandy; about ten miles long and as many broad, containing ten pariſhes. The natives, who ſpeak French, are ſtill governed by the Norman laws, but are ſubject to England.

GUIAQUIL, a city and port-town of Peru, ſituated near the Pacific ocean: W. long. 80°, and S. lat. 3°.

GUIARA, a port-town on the Caracoa-coaſt, in Terra Firma, in South America: W. long. 66°, and N. lat. 10° 35′.

GUIDON, a ſort of flag or ſtandard, borne by the king's life-guards; being broad at one extreme, and almoſt pointed at the other, and ſlit or divided into two.

GUIDON, alſo denotes the officer who bears the guidon. He is the ſame in the horſe-guards that the enſign is in the foot. The guidon of a troop of horſe takes place next below a cornet.

GUIENNE, a province of France, bounded by the Orleannois on the north, by Gaſcony, from which it is ſeparated by the river Garonne, on the ſouth, by Languedoc on the eaſt, and by the bay of Biſcay on the weſt.

GUILANDINA, in botany, a genus of the decandria monogynia claſs. The calix conſiſts of one leaf; the petals are inſerted into the neck of the calix; and the capſule is angular, and contains from three to ſix cells. There are five ſpecies, none of them natives of Britain.

GUILD, a fraternity or company. As to the original of theſe guilds or companies, it was a law among the Saxons, that every freeman of fourteen years of age ſhould find ſureties to keep the peace, or be committed; upon which the neighbours enter into an aſſociation, and become bound for each other, either to produce him who committed any offence, or to make ſatisfaction to the injured party; in order to which they raiſed a ſum among themſelves, which they put into a common ſtock; out of which they, upon occaſion, made a pecuniary compenſation according to the quality of the offence committed. Theſe guilds are now companies joined together with laws and orders made by themſelves, by the licence of the prince.

Dean of Guild, in Scots law, a magiſtrate of a royal borough, who is head of the merchant-company. See SCOTS LAW, title 4.

GUILDFORD, or **GULDEFORD**, a borough-town of Surry, ſituated on the river Wye, thirty miles ſouth-weſt of London. It ſends two members to parliament.

GUILLESTRE, a city of France, in the province of Dauphiny: E. long. 6° 20′, and N. lat. 44° 45′.

GUINEA, a large country of Africa, ſituated between 15° E. and 15° W. long. and between 4° and 10° N.

lat. The Britiſh, Dutch, French, and other nations, have forts and factories on this coaſt.

Guinea is alſo the name of a Britiſh gold goin, value 1 l. 1 s. Sterling.

Guinea-pig, in zoology. See Mus.

GUIPUSCOA, the north-eaſt diviſion of the province of Biſcay, in Spain, ſituated on the confines of Navarre in France.

GUIRA, or Guara guainumbi, in ornithology, the Braſilian name of the green iſpida, with a creſted head and very long tail.

GUISE, a town of France, in the province of Picardy, ſituated on the river Oyſe: E. long 3° 36′, and N. lat 49° 55′.

GUITAR, Guitarra, a muſical inſtrument of the ſtring-kind, with five double rows of ſtrings, of which thoſe that are baſs are in the middle, unleſs it be for the burden, an octave lower than the fourth.

This inſtrument was firſt uſed in Spain, and by the Italians.

GULA, or Gola, in architecture, a wavy member, the contour of which reſembles the letter S, which the Greeks call cymatium, and our architects an ogee. See Architecture.

GULES, in heraldry ſignifies the colour red, which is expreſſed in engraving by perpendicular lines falling from the top of the eſchutcheon to the bottom. See Plate CI. fig. 6.

It is the firſt of all colours in armory, and was formerly prohibited to be worn by any perſon in his coat-armour, unleſs he were a prince, or had a permiſſion from him. This colour is a ſymbol of charity, valour, and generoſity, and repreſents blood colour, and true ſcarlet.

The Romans, according to Spelman, painted the bodies of their gods, and generals that triumphed, with vermilion; and under the conſuls, their ſoldiers were clad in red; hence called ruſſati. And we are told, that the Lacedemonians wore ſcarlet, to prevent ſeeing the blood iſſue from their wounds. Thoſe who bear this colour are obliged to relieve ſuch as are in danger of being oppreſſed by injuſtice.

GULL. See Larus.

GULPH, or Gulf, in geography, a part of the ſea, almoſt ſurrounded by lands, the gulph of Mexico, gulph of Venice, of Lyons, *&c.*

GUM, in pharmacy, a concreted vegetable juice, which tranſudes through the bark of certain trees, and hardens upon the ſurface.

Gum arabic. See *Gum* Arabic.

Gum Seneca, is a gum extremely reſembling gum arabic. It is brought to us from the country through which the river Senega runs, in looſe or ſingle drops, but theſe are much larger than thoſe of the gum arabic uſually are; ſometimes it is of the bigneſs of an egg, and ſometimes much larger: the ſurface is very rough, or wrinkled, and appears much leſs bright than the inner ſubſtance, where the maſſes are broken. It has no ſmell, and ſcarce any taſte. We are not acquainted with the tree which produces it. The virtues of it are the ſame with the gum arabic; but it is rarely uſed in medicine, unleſs as mixed with the gum arabic: the dyers and other artificers conſume the great quantities of it that are annually imported here. The negroes diſſolve it in milk, and in that ſtate make it a principal ingredient in many of their diſhes; and often feed on it thus alone.

Gum Tragacanth. See Tragacanth.

Gum manna. See Manna.

Other ſubſtances known by the name of gums, are as follow.

Gum aloes, a preparation of aloes, as ſet down in the London Diſpenſatory.

It is made thus: Take of ſuccotrine aloes, four ounces; of water, a quart: boil the aloes till it is diſſolved as much as may be; and ſet all by for a night: the reſin will be precipitated to the bottom of the veſſel; the liquor poured off and ſtrained, being evaporated, will have the gum. The intention of this ſeparation of the reſin, is to procure, in the gum, a medicine leſs purgative, but more agreeable to the ſtomach, than the crude aloes.

Gum ammoniac. See Ammoniac.

Gum elemi. See Elemi.

Gum guaiacum. See Guaiacum.

Gum lacca. See Lacca.

Gums, in anatomy, See Anatomy, p. 305.

GUN, a fire arm, or weapon of offence, which forcibly diſcharges a ball, ſhot, or other offenſive matter, thro' a cylindrical barrel, by means of gun-powder. See Gun-powder.

Gun is a general name, under which are included divers or even moſt ſpecies of fire-arms. They may be divided into great and ſmall.

Great guns, called alſo by the general name cannons, make what we alſo call ordinance, or artillery; under which come the ſeveral ſorts of cannons, as cannon-royal, demi-cannon, *&c.* Culverins, demi-culverins, ſakers, minions, falcons, *&c.* See Cannon.

Small guns include muſquets, muſquetoons, carabines, blunderbuſſes, fowling-pieces, *&c.* See Musquet, *&c.*

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Grand GUARD, three or four ſquadrons of horſe, commanded by a field officer, poſted at about a mile and a half from the camp, on the right and left wings, towards the enemy, for the ſecurity of the camp.

Main GUARD, that from whence all the other guards are detached.

Picquet-GUARD, a good number of horſe and foot always in readineſs in caſe of an alarm: the horſe are all the time ſaddled, and the riders booted. The foot draw up at the head of the battalion, at the beating of the tattoo; but afterwards return to their tents, where they hold themſelves in readineſs to march, upon any ſudden alarm. This guard is to make reſiſtance, in caſe of an attack, till the army can get ready.

Quarter-GUARD, a ſmall guard, commanded by a ſubaltern officer, poſted by each battalion, about an hundred yards before the front of the regiment.

Rear-GUARD, that part of the army which brings up the rear, which is generally the old grand-guards of the camp. The rear-guard of a party is ſix or eight horſe, that march about four or five hundred paces behind the party. The advanced-guard of a party on its going out, make the rear-guard on its return.

Standard-GUARD, a ſmall guard, under a corporal, out of each regiment of horſe, and placed on foot, in the front of each regiment.

Van-GUARD, that part of the army which marches in the front.

GUARD is more particularly underſtood of a ſoldier detached from a company or corps,, to protect, detain, or ſecure any perſon, *&c.*

GUARDS, are alſo troops kept to guard the king's perſon, called alſo royal-guards, life-guards, gardes du corps, *&c.* Theſe are diſtinguiſhed into horſe, foot, granadiers, and yeomen.

The Engliſh horſe-guards are diſtinguiſhed by troops, and the foot-guards by regiments.

Yeomen of the GUARDS. See YEOMAN.

The French GUARDS are divided into thoſe within, and thoſe without the palace: the firſt conſiſts of the guards du corps, or body-guard, which conſiſts of four companies of horſe, the firſt of which companies was anciently Scotch, and ſtill retains the name, though it now conſiſts wholly of Frenchmen. The guards without, are the gens d'armes, light horſe, muſqueteers, and two other regiments, the one of which is French and the other Swiſs. See GENDARMES.

GUARD, in fencing, is a poſture proper to defend the body from an enemy's ſword.

GUARDIAN, in law, a perſon who has the charge of any thing; but more commonly it ſignifies one who has the cuſtody and education of ſuch perſons as have not ſufficient diſcretion to take care of themſelves and their own affairs, as children and ideots.

GUBEN, a town of Germany, in the circle of Upper Saxony: E. long. 15°, and N. lat. 51° 50′.

GUDGEON, in ichthyology. See GOBIUS.

GUENGA, a great river of the Hither India, which riſing in the mountains of Balagate, runs north-eaſt, and falls into the weſt branch of the river Ganges in Bengal.

GUERET, a town of France, in the province of Lionois: E. long 2°, and north lat. 46° 5′.

GUERNSEY, or GARNSEY, an iſland in the Engliſh channel, on the coaſt of Normandy, fifty-eight miles ſouth of Portland, in Dorſetſhire, and twenty two weſt of cape la Hogue, in Normandy; about ten miles long and as many broad, containing ten pariſhes. The natives, who ſpeak French, are ſtill governed by the Norman laws, but are ſubject to England.

GUIAQUIL, a city and port-town of Peru, ſituated near the Pacific ocean: W. long. 80°, and S. lat. 3°.

GUIARA, a port-town on the Caracoa-coaſt, in Terra Firma, in South America: W. long. 66°, and N. lat. 10° 35′.

GUIDON, a ſort of flag or ſtandard, borne by the king's life-guards; being broad at one extreme, and almoſt pointed at the other, and ſlit or divided into two.

GUIDON, alſo denotes the officer who bears the guidon. He is the ſame in the horſe-guards that the enſign is in the foot. The guidon of a troop of horſe takes place next below a cornet.

GUIENNE, a province of France, bounded by the Orleannois on the north, by Gaſcony, from which it is ſeparated by the river Garonne, on the ſouth, by Languedoc on the eaſt, and by the bay of Biſcay on the weſt.

GUILANDINA, in botany, a genus of the decandria monogynia claſs. The calix conſiſts of one leaf; the petals are inſerted into the neck of the calix; and the capſule is angular, and contains from three to ſix cells. There are five ſpecies, none of them natives of Britain.

GUILD, a fraternity or company. As to the original of theſe guilds or companies, it was a law among the Saxons, that every freeman of fourteen years of age ſhould find ſureties to keep the peace, or be committed; upon which the neighbours enter into an aſſociation, and become bound for each other, either to produce him who committed any offence, or to make ſatisfaction to the injured party; in order to which they raiſed a ſum among themſelves, which they put into a common ſtock; out of which they, upon occaſion, made a pecuniary compenſation according to the quality of the offence committed. Theſe guilds are now companies joined together with laws and orders made by themſelves, by the licence of the prince.

Dean of Guild, in Scots law, a magiſtrate of a royal borough, who is head of the merchant-company. See SCOTS LAW, title 4.

GUILDFORD, or GULDEFORD, a borough-town of Surry, ſituated on the river Wye, thirty miles ſouth-weſt of London. It ſends two members to parliament.

GUILLESTRE, a city of France, in the province of Dauphiny: E. long. 6° 20′, and N. lat. 44° 45′.

GUINEA, a large country of Africa, ſituated between 15° E. and 15° W. long. and between 4° and 10° N.

lat. The Britiſh, Dutch, French, and other nations, have forts and factories on this coaſt.

Guinea is alſo the name of a Britiſh gold goin, value 1 l. 1 s. Sterling.

Guinea-pig, in zoology. See Mus.

GUIPUSCOA, the north-eaſt diviſion of the province of Biſcay, in Spain, ſituated on the confines of Navarre in France.

GUIRA, or **Guara guainumbi**, in ornithology, the Braſilian name of the green iſpida, with a creſted head and very long tail.

GUISE, a town of France, in the province of Picardy, ſituated on the river Oyſe: E. long 3° 36′, and N. lat 49° 55′.

GUITAR, **Guitarra**, a muſical inſtrument of the ſtring kind, with five double rows of ſtrings, of which thoſe that are baſs are in the middle, unleſs it be for the burden, an octave lower than the fourth.

This inſtrument was firſt uſed in Spain, and by the Italians.

GULA, or **Gola**, in architecture, a wavy member, the contour of which reſembles the letter S, which the Greeks call cymatium, and our architects an ogee. See Architecture.

GULES, in heraldry ſignifies the colour red, which is expreſſed in engraving by perpendicular lines falling from the top of the eſchutcheon to the bottom. See Plate CI. fig. 6.

It is the firſt of all colours in armory, and was formerly prohibited to be worn by any perſon in his coat-armour, unleſs he were a prince, or had a permiſſion from him. This colour is a ſymbol of charity, valour, and generoſity, and repreſents blood colour, and true ſcarlet.

The Romans, according to Spelman, painted the bodies of their gods, and generals that triumphed, with vermilion; and under the conſuls, their ſoldiers were clad in red; hence called ruſſati. And we are told, that the Lacedemonians wore ſcarlet, to prevent ſeeing the blood iſſue from their wounds. Thoſe who bear this colour are obliged to relieve ſuch as are in danger of being oppreſſed by injuſtice.

GULL. See Larus.

GULPH, or **Gulf**, in geography, a part of the ſea, almoſt ſurrounded by lands, the gulph of Mexico, gulph of Venice, of Lyons, *&c.*

GUM, in pharmacy, a concreted vegetable juice, which tranſudes through the bark of certain trees, and hardens upon the ſurface.

Gum arabic. See *Gum* Arabic.

Gum Seneca, is a gum extremely reſembling gum arabic. It is brought to us from the country through which the river Senega runs, in looſe or ſingle drops, but theſe are much larger than thoſe of the gum arabic uſually are; ſometimes it is of the bigneſs of an egg, and ſometimes much larger: the ſurface is very rough, or wrinkled, and appears much leſs bright than the inner ſubſtance, where the maſſes are broken. It has no ſmell, and ſcarce any taſte. We are not acquainted with the tree which produces it. The virtues of it are the ſame with the gum arabic; but it is rarely uſed in medicine, unleſs as mixed with the gum arabic: the dyers and other artificers conſume the great quantities of it that are annually imported here. The negroes diſſolve it in milk, and in that ſtate make it a principal ingredient in many of their diſhes; and often feed on it thus alone.

Gum Tragacanth. See Tragacanth.

Gum manna. See Manna.

Other ſubſtances known by the name of gums, are as follow.

Gum aloes, a preparation of aloes, as ſet down in the London Diſpenſatory.

It is made thus: Take of ſuccotrine aloes, four ounces; of water, a quart: boil the aloes till it is diſſolved as much as may be; and ſet all by for a night: the reſin will be precipitated to the bottom of the veſſel; the liquor poured off and ſtrained, being evaporated, will have the gum. The intention of this ſeparation of the reſin, is to procure, in the gum, a medicine leſs purgative, but more agreeable to the ſtomach, than the crude aloes.

Gum ammoniac. See Ammoniac.

Gum elemi. See Elemi.

Gum guaiacum. See Guaiacum.

Gum lacca. See Lacca.

Gums, in anatomy, See Anatomy, p. 305.

GUN, a fire arm, or weapon of offence, which forcibly diſcharges a ball, ſhot, or other offenſive matter, thro' a cylindrical barrel, by means of gun-powder. See Gun-powder.

Gun is a general name, under which are included divers or even moſt ſpecies of fire-arms. They may be divided into great and ſmall.

Great guns, called alſo by the general name cannons, make what we alſo call ordinance, or artillery; under which come the ſeveral ſorts of cannons, as cannon-royal, demi-cannon, *&c.* Culverins, demi-culverins, ſakers, minions, falcons, *&c.* See Cannon.

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The author here quoted, has propoſed to change the fabric of all the pieces employed in the Britiſh navy, from the twenty four pounders downwards, ſo that they may have the ſame or leſs weight, but a larger bore. He thinks the thirty-two pounders in preſent uſe would be proper models for this purpoſe. Theſe being of fifty-two or fifty-three hundred weight, have ſomewhat leſs than a hundred and two thirds for each pound of bullet. And that this proportion would anſwer in ſmaller pieces, in point of ſtrength, ſeems clear from theſe conſiderations: 1. That the ſtrength of iron or any other metal, is in proportion to its ſubſtance. 2. That the leſſer quantity of powder fired in a ſpace it fills, has proportionably leſs force than a larger quantity; ſo that if two pieces, a large and a ſmall one, be made in the ſame proportion to their reſpective bullets, and fired with a proportionable quantity of powder, the larger piece will be more ſtrained, will heat more, and recoil more than the ſmaller.

On this ſcheme our preſent twenty-four pounders will be eaſed of ſix or eight hundred weight of uſeleſs metal; and ſome pieces of a leſs caliber, as nine and ſix pounders, would be ſometimes eaſed by fourteen hundred: hence much larger guns of the ſame weight might be borne. Thus, inſtead of ſix, nine, twelve, and eighteen pounders, our ſhips might carry twelve, eighteen, and twenty-four pounders: guns would be kept cooler and quieter, and would be of more ſervice, in many reſpects, if their uſual charge of powder were diminiſhed.

GUNELLUS, in ichthyology. See BLENNIUS.

GUNNER, an officer appointed for the ſervice of the cannon; or one ſkilled to fire the guns.

In the tower of London, and other garriſons, as well as in the field, this officer carries a field-ſtaff, and a large powder-horn in a ſtring over his left ſhoulder: he marches by the guns; and when there is any apprehenſion of danger, his field-ſtaff is armed with match: his buſineſs is to lay the gun to paſs, and to help to load and traverſe her.

Maſter GUNNER, a patent-officer of the ordnance, who is appointed to teach all ſuch as learn the art of gunnery, and to certify to the maſter general the ability of any perſon recommended to be one of the king's gunners. To every ſcholar he adminiſters an oath, not to ſerve, without leave, any other prince or ſtate; or teach any one the art of gunnery, but ſuch as have taken the ſaid oath.

GUNNERY, is the art of charging, directing, and exploding fire-arms, as cannons, mortars, muſkets, *&c.* to the beſt advantage.

To the ART of GUNNERY belongs the knowledge of the force and effects of gun-powder, (ſee GUN POWDER), the dimenſions of cannon, *&c.* and the proportion of the powder and ball they carry, with the method of ***managing***, ***charging***, ***pointing***, ***ſpunging***, &c.

A cannon is a military engine, or fire-arm, for throwing iron, lead, or ſtone bullets, by force of gun-powder, to a place exactly oppoſite to the axis of the cylinder whereof it conſiſts.

Cannons are made cylindrical, that the motion of the ball might not be retarded in its paſſage; and that the powder, when on fire, might not ſlip between the ball and the ſurface of the cannon, which would hinder its effect. With regard to the names, dimenſions, weight, *&c.* of cannons, ſee CANNON.

Each ſort of ordnance is more or leſs fortified; which fortification is reckoned by the thickneſs of the metal at the touch hole, at the trunnions, and at the muzzle, in proportion to the diameter of the bore.

There are three degrees uſed in fortifying each ſort of ordnance, both cannons and culverines: Firſt, ſuch as are ordinarily fortified, which are called legitimate pieces; ſecondly, ſuch whoſe fortifications are leſſened, which are called baſtard pieces; thirdly, double fortified pieces, or extraordinary pieces.

The cannons double fortified have full one diameter of their bore in thickneſs of metal at their touch-hole, and $\frac{11}{16}$ at their trunnions, and $\frac{7}{16}$ at their muzzle. The leſſened cannons have, at their touch-hole, but $\frac{3}{4}$ or $\frac{11}{16}$ of the diameter of their bore in thickneſs of metal, and $\frac{9}{6}$ at their trunnions, and $\frac{5}{16}$ at their muzzle. The ordinary fortified cannons, have $\frac{7}{8}$ at the touch hole, $\frac{5}{8}$ at the trunnions, and $\frac{3}{8}$ at the muzzle. All the double fortified culverines, and all leſſer pieces of that kind, have one diameter and $\frac{1}{8}$ at the touch-hole, $\frac{15}{16}$ at the trunnions, and $\frac{9}{16}$ at the muzzle. And all the ordinary fortified culverines, are fortified every way as the double fortified cannons; and the leſſened culverines, as the ordinary cannons in all points.

With regard to bullets, or balls, wherewith cannons are loaded, they are of various kinds, *viz.* 1. Red-hot bullets, intended to ſet fire to places, where combuſtible matters are found. The bullet is made red-hot, by digging a place in the earth, and lighting in it a great quantity of charcoal, or ſea coal, and placing over it a ſtrong iron grate. When the fire is well lighted, the bullets are placed on the grate, where, in a very ſhort time, they grow red-hot; they are taken out with tongs, or iron ladles for the purpoſe, and carried into the piece; having before put ſome clay over the powder the cannon is loaded with, leſt it ſhould be ſet on fire by the red hot bullet: then the piece is fired. Where-ever the bullet paſſes, and meets with combuſtible matters, it ſets them on fire. But when a trench is before the battery of red-hot bullets, hay is rammed over the powder; becauſe, if it was clay, the pieces of it would wound and kill the workmen.

Red-hot bullets are never fired but with eight or four pounders. For if they were of a ſtronger caliber, the bullets could not be ſerved eaſily.

2. Hollow bullets are ſhells made cylindrical, with an aperture and fuſee at one end, which giving fire to the inſide, when in the ground, it burſts, and has the ſame effect with a mine.

3. Chain-bullets conſiſt of two balls joined by a chain, three or four foot a-part.

4. Branch bullets are two balls joined by a bar of iron, five or ſix inches a-part.

5. Two-headed bullets, called alſo angels, being two halves of a bullet, joined by a bar or chain: theſe are chiefly uſed at ſea, for cutting of cords, cables, ſails, *&c.*

As bullets, as well as the pieces of ordnance, are of different caliber, which caliber, in a piece of ordnance, is the diameter of the mouth thereof; and in a bullet, its circumference; there are means found to proportion theſe two calibers to one another, *viz.* with an inſtrument called a caliber-rule, wherein a right line is ſo divided, as that the firſt part being equal to the diameter of an iron or leaden ball of one pound weight, the other parts are to the firſt, as the diameters of balls of two, three, four, *&c.* pounds, are to the diameter of one ball of one pound.

The caliber conſiſts of two thin pieces of braſs, ſix inches long, joined by a rivet, ſo as to move quite round each other: the head, or one end of the piece, is cut circular, and one half of its circumference divided into every ſecond degree. On the other half are diviſions from one to ten; each again ſubdivided into four: the uſe of which diviſions and ſubdiviſions, is when the diameter of a bullet, *&c.* not exceeding ten inches, is taken, the diameter of the ſemicircle will, among the diviſions, give the length of the diameter, taken between the points of the calibers, in inches and fourth parts.

The degrees on the head ſerve to take the quantity of an angle, the method of which is obvious. If the angle be inward, apply the outward edges to the planes that form the angle; the degree cut by the diameter of the ſemicircle, ſhews the quantity of the angle ſought. For an outward angle, open the branches till the points be outward, and applying the ſtreight edges to the planes that form the angle, the degrees cut by the diameter of the ſemicircle ſhew the angle required; reckoning from 180, towards the right hand.

On one branch of the calibers, on the ſame ſide, are, firſt, ſix inches; and each of theſe ſubdivided into ten parts. Secondly, a ſcale of unequal diviſions, beginning at two, and ending at ten, each ſubdivided into four parts. Thirdly, two other ſcales of lines, ſhewing, when the diameter of the bore of a piece is taken with the points of the calibers outwards, the name of the piece, whether of the iron or braſs, *i. e.* the weight of the bullet it carries, or that it is ſuch or ſuch a pounder, from one to forty-two pounds.

On the other branch of the calibers, on the ſame ſide, is a line of cords to about three inches radius; and a line of lines on both branches, as on the ſector; with a table of the names of the ſeveral pieces of ordnance. On the ſame face is a hand graved, and a right line drawn from the finger towards the centre of the rivet, ſhewing, by its cutting certain diviſions made on the circle, the weight of an iron ſhot, when the diameter is taken by the points of the calibers. Laſtly, on the circle or head, on the ſame ſide, are graved ſeveral geometrical figures, inſcribed in each other, with numbers; as a cube, whoſe ſide is ſuppoſed one foot; a pyramid on the ſame baſe or altitude, and the proportions of their weight, *&c.* a ſphere inſcribed in a cube; a cylinder, cone, circle, ſquare, *&c.*

The outſide of the caliber ſerves to take the diameter of the mouth of the piece; and the inſide, called the heel, that of the bullet.

There is another method of taking the caliber of the pieces, which is to have a rule very well divided, on which are graved the calibers both of the pieces and bullets. That rule muſt be applied on the mouth of the piece, and the caliber is preſently found.

Sometimes, in lieu of bullets, the pieces are charged with cartouches, which are caſes loaded with muſket-balls, nails, chains, and pieces of old iron; ſometimes, alſo, with ſmall cannon-balls. See Plate XCVIII.

There are cartouches made in form of grapes, which are muſket-balls joined together with pitch, and diſpoſed on a ſmall board, in a pyramidal form round a wooden ſtick, which ariſes from the middle of the board. (*ibid.*)

The cartouches made of tin are the beſt, becauſe they carry further.

There are alſo cartouches made in form of pine apples, whoſe figure is pyramidal. Their baſe is equal to the caliber of a bullet, propoſed for the piece they are to be fired with; their height is of a caliber and a half; they are dipped in tar, and afterwards rolled on muſket-balls, and when well covered with thoſe balls, dipped again in the ſame tar, after which they may be uſed, thruſting the biggeſt foremoſt into the piece. Theſe pine-apples are very good at ſea, becauſe, beſides that the muſket-balls flying about wound a great number of people, the bullet which is at the bottom of the cartouch does alſo much execution.

There are ſeveral ſorts of carriages for ordnance, *viz:* baſtard carriages, with low wheels, and high wheels. Sea-carriages, made in imitation of thoſe for ſhip-guns: and carriages for field-pieces, of which there are two kinds.

The carriages muſt be proportioned to the pieces mounted on them.—The ordinary proportion is, for the carriage to have 1½ of the length of the gun; the wheels to be half the length of the piece in height; four times the diameter or caliber, gives the depth of the planks the fore end, in the middle 3½.

The piece thus mounted on its carriage, ſeveral inſtruments are employed, ſome to prepare the piece to be loaded, ſome to load it, others to point it, and others to cleanſe it, *&c.* Thoſe inſtruments have each their proper name, which are as follows:

The lantern or ladle, (*ibid.*) which ſerves to carry the powder into the piece, and which conſiſts of two parts, *viz.* of a wooden box, appropriated to the caliber of the piece for which it is intended, and of a caliber and a half in length with its vent; and of a piece of copper nailed to the box, at the height of a half caliber.

This lantern muſt have three calibers and a half in length, and two calibers in breadth, being rounded at the end to load the ordinary pieces.

The rammer, (*ibid.*) which is a round piece of wood, commonly called a box, faſtened to a ſtick twelve foot long, for the pieces from twelve to thirty three pounders; and ten for the eight and four pounders; which ſerve to drive home the powder and ball to the breech.

The ſpunge, (*ibid.*) which is a long ſtaff or rammer, with a piece of ſheep or lamb ſkin wound about its end, to ſerve for ſcouring the cannon when diſcharged, before it be charged with freſh powder; to prevent any ſpark of fire from remaining in her, which would endanger the life of him who ſhould load her again.

Wad-ſcrew, (*ibid.*) which are two points of iron turned ſerpent-wiſe, to extract the wad out of the pieces, when one wants to unload them, or the dirt which had chanced to enter into it.

The botefeux, (*ibid*) which are ſticks two or three feet long, and an inch thick, ſplit at one end, to hold an end of the match twiſted round it, to fire the cannon.

The priming iron, (*ibid.*) which is a pointed iron rod, to clear the touch hole of the pieces of powder or dirt; and alſo to peirce the cartridge, that it may ſooner take fire.

The primer, (*ibid*) which muſt contain a pound of powder at leaſt, to prime the pieces.

The quoin of mire, which are pieces of wood with a notch on the ſide to put the fingers on, to draw them back or puſh them forward, when the gunner points his piece. They are placed on the ſole of the carriage.

Leaden plates, which are uſed to cover the touch-hole, when the piece is charged, leſt ſome dirt ſhould enter it and ſtop it.

Before you charge the piece, ſpunge it well, to clean it of all filth and dirt within ſide; then the proper weight of gunpowder, which powder drive in and ram down; taking care that the powder be not bruiſed in ramming, which weakens its effect; run over it a little quantity of paper, hay, or the like; and then throw in the ball.

To point, level, or direct the piece, ſo as to play againſt any certain point, is done by the help of a quadrant with a plummet; which quadrant conſiſts of two branches made of braſs or wood; one about a foot long, eight lines broad, and one line in thickneſs; the other four inches long, and the ſame thickneſs and breadth as the former. Between theſe branches is a quadrant, divided into 90 degrees, beginning from the ſhorter branch, and furniſhed with thread and plummet.

Place the longeſt branch of this inſtrument in the cannon's mouth, and elevate or lower it till the thread cuts the degree neceſſary to hit the propoſed object. Which done, prime the cannon, and then ſet fire to it.

To point a cannon well, ſo as to do the execution propoſed, we muſt know the path of a bullet, or the line it deſcribes, from the mouth of the piece to the point where it lodges, which path is commonly called range.

If the piece be laid in a line parallel to the horizon, it is called the right or level range; and if it be mounted to 45 degrees, the ball is ſaid to have the utmoſt range, and ſo proportionably; all others between 00 degrees and 45, being called intermediate ranges.

A ſhot made when the muzzle of a cannon its raiſed above the horizontal line, and is not deſigned to ſhoot directly or point blank, is called random-ſhot.

The utmoſt random of any piece is about ten times as far as the bullet will go point blank; and the bullet will go fartheſt when the piece is mounted to about 45 degrees above the level range.

Mr Norton obſerves, that

	Paces. Level.	Paces. Utmoſt Random.
A *Baſe* ſhoots ——	60	600
A *Rabinet*, —— —	70	700
A *Falconet*, — —	90	900
A *Falcon*, — —	130	1300
Minion ordinary —	120	1200
Minion largeſt, ——	125	1250
Sacker leaſt, — —	150	1500
Sacker ordinary, —	160	1600
Sacker old ſort, — —	163	1630
Demi-culverine leaſt,	174	1740
Demi-culverine ordinary,	175	1750
Demi-culverine old ſort,	178	1780
Culverine leaſt, ——	180	1800
Culverine ordinary, —	181	1810
Culverine largeſt, ——	183	1830
Demi-cannon leaſt, —	156	1560
Demi-cannon ordinary,	162	1620
Demi-cannon large, —	180	1800
Cannon-royal, ——	185	1850

A 24 pounder may very well fire 90 or 100 ſhots, every day in ſummer; at 60 or 75 in winter. In caſe of neceſſity, it may fire more And ſome French officers of artillery aſſure, that they have cauſed ſuch a piece to fire every day 150 ſhots in a ſiege.

A 16 and a 12 pounder fire a little more, becauſe they are eaſier ſerved. There have even been ſome occaſions, where 200 ſhots have been fired from theſe pieces, in the ſpace of nine hours, and 138 in the ſpace of five.

To range pieces in a battery, take care to reconoitre well the ground where it is to be placed, and the road to convey it, in the night time, the cannon and the munitions.

The pieces muſt be armed, each with two lanterns, or ladles, a rammer, a ſpunge, and two priming-irons. The battery muſt alſo be provided with carriages, and other implements, neceſſary to remount the pieces which the enemy ſhould chance to diſmount.

To ſerve expeditiouſly and ſafely a piece in battery, it is neceſſary to have to each a ſack of leather, large enough to contain about twenty pounds of powder to charge the lanterns or ladles, without carrying them to the magazine; and to avoid thereby making thoſe trains of powder in bringing back the lantern from the magazine, and the accidents which frequently happen thereby.

A battery of 3 pieces muſt have 30 gabions, becauſe ſix are employed on each of the two ſides or epaulments, which make twelve, and nine for each of the two merlons.

There ought to be two gunners and ſix ſoldiers to each piece, and four officers of artillery.

The gunner, poſted on the right of the piece, muſt take care to have always a pouch full of powder, and two priming-irons; his office is to prime the piece, and load it with powder. That on the left fetches the powder from the little magazine, and fills the lantern or ladle which his comrade holds; after which, he minds that the match be very well lighted, and ready to ſet fire to the piece at the firſt command of the officer.

There muſt be three ſoldiers on the right, and three on the left of the piece. The two firſt to take care to ram and ſpunge the piece, each on his ſide. The rammer and ſpunge muſt be placed on the left, and the lantern or ladle on the right. After having rammed well the wad put over the powder, and that put over the bullet, they then take each a handſpike, which they paſs between the foremoſt ſpokes of the wheel the ends whereof will paſs under the head of the carriage, to make the wheel turn round, leaning on the other end of the handſpike, towards the embraſure.

It is the office of the ſecond ſoldier on the right, to provide wad, and to put it into the piece, as well over the powder as over the bullet; and that of his comrade on the left, to provide 50 bullets, and every time the piece is to be charged, to fetch one of them and put it into the piece, after the powder has been rammed. Then they both take each an handſpike, which they paſs under the hind part of the wheel, to puſh it in battery.

The officer of artillery muſt take care to have the piece diligently ſerved.

In the night he muſt employ the gunners and ſoldiers, who ſhall relieve thoſe who have ſerved 24 hours to repair the embraſures.

If there be no water near the battery, care muſt be taken to have a caſk filled with it, to dip the ſpunges in it, and cool the pieces, every ten or twelve rounds.

The **Mortar** is a ſhort piece of ordnance, thick and wide, proper for throwing bombs, carcaſſes, ſhells, ſtones, *&c.*

There are chiefly two kinds of mortars: the one hung or mounted on a carriage with low wheels, after the manner of guns, called *pendent* or *hanging mortars*; the other fixed on an immoveable baſe, called *ſtanding mortars*. (*ibid.*)

At the head of the bore, or chaſe of the mortar, is the chamber for the charge of the powder. This is uſually made cylindrical, all but the baſe which they make hemiſpherical: though ſome of the later engineers prefer hemiſpherical chambers; as the ſurface of thoſe being leſs, under equal capacities, make leſs reſiſtance to the gun-powder.

The thickneſs of the mortar about the chamber, is to be much greater than about the chaſe, by reaſon the gun-powder makes a much greater effort about the chamber than elſewhere. The diameter of the chamber to be much leſs than that of the bore; by reaſon bombs, ſhells, *&c.* are much lighter than the bullets of equal diameters, and conſequently leſs powder ſuffices.

The firſt mortar-piece uſed for throwing ſtones, weighs commonly 1000 lb. and whoſe utmoſt random is 150 fathoms, loaded with two pounds of powder; it has 15 inches of diameter at its mouth, and 2 foot 7 inches in height.

The depth of its bore or chaſe is 1 foot 7 inches, and the depth of its chamber, without including the entrance where the tampion is placed, 8 inches. The tourillons have 5 inches of diameter,

The chamber muſt enter an inch into the tourillons; the thickneſs of the metal about the chamber, 3 inches; the thickneſs of the belly, 2 inches; and the length of the chaſe, 1 inch and $\frac{1}{2}$; about each ring, 1 inch and $\frac{3}{4}$.

Mortars, for throwing bombs, are of ſeveral kinds.

There are ſome in the ancient manner, of 6, 7, 8, 9, 10, 11, 12, and 18 inches diameter at their mouth, and which contain in their chambers 3, 4, 5, 6, and 12 pounds of powder.

The chamber where the powder is put is cylindrical, and a little rounded at bottom.

Thoſe of new invention have a concave chamber. And of theſe there are ſome which have 12 inches and $\frac{1}{2}$ at the mouth, and contain in their chambers 18 pounds of powder; others 12, and others 8.

The proportions of mortars are as follow: The mortar which throws a bomb of 17 inches 10 lines of diameter, has the bore $27\frac{1}{2}$ inches long, and 18 inches 4 lines of diameter: it has in thickneſs between the bourelet, and its ſmall reinforced ring, $3\frac{1}{2}$ inches; its ſmall reinforced ring, is $3\frac{1}{4}$ inches thick; its great one, 4 inches; the entrance of its chamber has $5\frac{1}{2}$ inches of diameter; the chamber, in form of a pear, is 13 inches long, and $7\frac{1}{2}$ inches of diameter at its greateſt breadth; and alſo $7\frac{1}{2}$ thick, and contains 12 pounds of powder.

The tourillons of the mortar have 32 inches in length from one end to the other, and 9 of diameter. The mortar has in height 4 foot 4 inches.

The bomb has 17 inches 10 lines of diameter, is 2 inches thick every where, except the bottom, which has 2 inches 10 lines. The aperture of the touch-hole is of 20 lines within and without.

The bomb contains 48 lb. of powder, and weighs 490 lb. and a little more.

The bore of the concave mortar, whoſe chamber contains 18 pounds of powder, has $12\frac{1}{2}$ inches of diameter, and is $18\frac{1}{2}$ inches long. It has in thickneſs between the bourelet, and its reinforced ring, $3\frac{1}{2}$ inches; and its reinforced ring is $4\frac{1}{2}$ inches thick. Its chamber has 9 inches 7 lines of diameter at its greateſt width: the higher part thereof has 6 inches of diameter, and 4 inches in height; and its lower part $2\frac{1}{2}$ inches. The thickneſs of the metal round the chamber is of 26 inches 9 lines. The tourillons have, from one end to the other, 8 inches of diameter. The mortar has in height 3 feet 5 inches 4 lines. It throws a bomb of 11 inches 8 lines diameter, which is 1 inch 4 lines thick every where, except at its cullot, which has 1 inch 8 lines. The aperture of its touch hole is 16 lines inſide and outſide. The bomb contains 15 pounds of powder, and weighs 130 pounds, or thereabout.

The bore or chaſe of the concave mortar, whoſe chamber contains 12 pounds of powder, has 12 inches 6 lines of diameter, and 17 inches 6 lines in length. Its thickneſs between the bourelet and its reinforced ring, is of $2\frac{1}{2}$ inches. Its reinforced ring is 3 inches thick. Its chamber has of diameter, at its greateſt width, 9 inches 6 lines. The portion of that chamber a-top has 5 inches 4 lines of diameter, and 2 inches at bottom. The thickneſs of the metal round the chamber is 6 inches. The tourillons are, from one end to the other, 30 inches long, and 7 inches of diameter; and the mortar is in all 3 foot 2 inches high.

It throws a bomb 11 inches 8 lines of diameter, which is 1 inch 4 lines thick every where, except at its cullot, which has 1 inch 8 lines.

The aperture of its touch-hole outſide and inſide, is 16 lines.

The bomb contains 15 pounds of powder, and weighs 130.

The mortar, which has a concave chamber containing 8 pounds of powder, muſt throw a bomb of 11 inches 8 lines. Its diameter is of 12½ inches; its bore 18 inches long; its thickneſs at the chaſe 2½ inches; its reinforced ring 6 inches long, and 3 inches thick; its concave chamber 8 inches 8 lines long, and 7 inches in diameter; the thickneſs of the metal round it 5 inches; its tourillons 3 inches long from one end to the other, and 7 inches in diameter. The concave, chamber contains 8 pounds of powder, and throws a bomb as above.

The ordinary mortar, which throws a bomb of 11 inches 8 lines, has a bore of 12 inches diameter, and 18 long; its thickneſs at the neck 2 inches; at its reinforced ring 2½ inches; its chamber 9½ inches in length, its diameter of 5¼ inches, the thickneſs of the metal round the chamber 7 inches, which chamber contains 6 pounds of powder; the tourillons have in length, from one end to the other, 28 inches, and 8 inches of diameter.

The mortar, which throws a bomb of 8 inches, has the bore 12 inches long, and 8 inches 4 lines in diameter; its thickneſs 1 inch 4 lines at the chaſe; its reinforced rings 4 inches 8 lines long, and 1 inch 8 lines thick; its chamber 6 inches long, and 2 inches 8 lines of diameter; its tourillons 18 inches 8 lines in length, and 4 inches 8 lines of diameter. The bomb of 8 inches of diameter is 10 lines thick every where, except at the cullot, which is 13, and its touch-hole 1 inch of diameter inſide and outſide. The chamber contains 4 pounds of powder, and the bomb weighs 40 pounds.

The bore of the mortar, which is to throw a bomb of 6 inches, is of 6¼ inches of diameter, and 9 inches long; its thickneſs at the chaſe 1 inch; its reinforced ring 1¼ inch thick, and 3½ inches long; its chamber 4½ inches long, and 2 inches of diameter; the thickneſs of the metal 2 inches, and from the bottom of the chamber to behind the recoil of the mortar 4 inches thick.

Common mortars are very good for the bombardment of a place, when they can be carried near the place; throwing the bomb to 45 degrees of elevation, and to 700 fathoms diſtance: the chamber is charged with 5 or 6 pounds of powder, which is the greateſt charge, and carries farther: the nearer a place a mortar is mounted, the leſs powder is wanted for its charge. The mortars, with a concave chamber of the ſame diameter, *i. e.* of 12 and 12½ inches, pointed at 45 degrees, are proper to bombard places afar off; they carry their bombs from 1200 to 1800 fathoms. Thoſe whoſe chamber contains 8 pounds of powder, throw the bomb to 1200 fathoms, and weigh 2000 lb. Thoſe of 12 pounds of powder will carry their bombs to 1400 fathoms, and weigh 2500lb. Thoſe of 18 pounds of powder will carry to 1800 fathoms, and weigh 5000 lb.

The carriage for a mortar of 12 inches of diameter muſt be 6 foot long, the flaſks 12 inches long and 10 thick. The trunnions are placed in the middle of the carriage.

The carriage of 18 muſt be 4 foot long; and the flaſks 11 inches high, and 6 thick.

To mount the mortars of new invention, they uſe carriages of caſt iron.

In Germany, to mount mortars from 8 to 9 inches, and carry them into the field, and execute them horizontally as a piece of cannon, they make uſe of a piece of wood 8 feet 2 inches long, with a hole in the middle to lodge the body of the mortar and its trunnions as far as their half diameter, and mounted on two wheels four feet high, to which they join a vantrain proportioned to it, and made like thoſe which ſerve to the carriages of cannons.

Having mounted the mortar on its carriage, the next thing is to caliber the bomb, by means of a great caliber, the two branches whereof embrace the whole circumference of the bomb: theſe two branches are brought on a rule where the different calibers are marked, among which that of the bomb is found.

A bomb is a hollow iron ball, or ſhell, filled with gun-powder, and furniſhed with a vent for a fuſee or wooden tube filled with combuſtible matter to be thrown out from a mortar. The method of preparing a bomb is as follows: A hollow iron globe is caſt pretty thick, having a round aperture by which it may be filled and lighted; and circular anſæ for the commodiouſly putting it into the mortar. To prove whether it be ſtaunch, after heating it red hot on the coals, it is expoſed to the air ſo as it may cool gently; for, ſince fire dilates iron, if there be any hidden chinks or perforations, they will thus be opened and enlarged, and the rather becauſe of the ſpring of the included air continually acting from within. This done, the cavity of the globe is filled with hot water, and the aperture well ſtopped, and the outer ſurface waſhed with cold water and ſoap; ſo that if there be the ſmalleſt leak, the air, rarified by the heat, will now perſpire and form bubbles on the ſurface.

If no defect be found in the bomb, its cavity is filled, by means of a funnel, with whole gun-powder; a little ſpace or liberty is left, that when a fuſee or wooden tube, of the figure of a truncated cone, is driven through the aperture, (with a wooden mallet, not an iron one, for fear of accident), and faſtened with a cement made of quick-lime, aſhes, brick-duſt, and ſteel-filings worked together in a glutinous water, or of four parts of pitch, two of colophony, one of turpentine, and one of wax; the powder may not be bruiſed. This tube is filled with a combuſtible matter, made of two ounces of nitre, one of ſulphur, and three of gun-powder-duſt well rammed.

This fuſee ſet on fire, burns ſlowly till it reaches the gun-powder, which goes off at once, burſting the ſhell to pieces with incredible violence. Special care, however, muſt be taken, that the fuſee be ſo proportioned, as that the gun-powder do not take fire ere the ſhell arrives at the deſtined place; to prevent which, the fuſee is frequently wound round with a wet clammy thread.

The mortar mounted on its carriage, and the bomb ready, let us place our piece in battery, which battery muſt conſiſt,—1. Of an epaulment to ſhelter the mortars from the fire of the enemy. 2. Of platforms on which the mortars are placed. 3. Of ſmall magazines of powder. 4. Of a boyau which leads to the great magazine. 5. Of ways which lead from the battery to the magazine of bombs. 6. Of a great ditch before the epaulment. 7. Of a berm or retraite.

The platforms for mortars of 12 inches muſt have 9 feet in length, and 6 in breadth.—The lambourds for common mortars muſt be four inches thick; thoſe of a concave chamber of 8 lb. of powder, 5 inches; thoſe of 12 lb. 6 inches; thoſe of 18 lb. 7 inches, or thereabouts. Their length is at diſcretion, provided there be enough to make the platforms 9 feet long.—The fore-part of the platform will be ſituated at two foot diſtance from the epaulment of the battery.—The bombardiers, to ſhelter themſelves in their battery, and not be ſeen from the town beſieged, raiſed an epaulment of 7 foot or more high, which epaulment has no embraſures.

To ſerve expeditiouſly a mortar in battery are required, —five ſtrong handſpikes; a dame or rammer, of the caliber of the conic chamber, to ram the wad and the earth; a wooden knife a foot long, to place the earth round the bomb; an iron ſcraper two foot long, one end whereof muſt be 4 inches broad and roundwiſe, to clean the bore and the chamber of the mortar, and the other end made in form of a ſpoon to clean the little chamber; a kind of brancard to carry the bomb, a ſhovel, and pick ax.

The officer who is to mind the ſervice of the mortar muſt have a quadrant to give the degrees of elevation.

Five bombardiers, or others, are employed in that ſervice; the firſt muſt take care to fetch the powder to charge the chamber of the mortar, putting his priming-iron in the touch-hole before he charges the chamber; and never going to fetch the powder before he has aſked his officer at what quantity of powder he deſigns to charge, becauſe more or leſs powder is wanted, according to the diſtance where it is fired; the ſame will take care to ram the wad and earth, which another ſoldier ſhall put in the chamber.

That on the right will put again two ſhovels full of earth in the bottom of the bore, which ſhould be likewiſe very well rammed down.

This done, the rammer or dame is returned into its place, againſt the epaulment on the right of the mortar: he takes an handſpike in the ſame place to poſt himſelf behind the carriage of the mortar, in order to help to puſh it into battery: having laid down his handſpike, he takes out his priming-iron, and primes the touch-hole with fine powder.

The ſecond ſoldier on the right and left, will have by that time brought the bomb ready loaded, to be placed in the mortar, which muſt be received in the mortar by the firſt ſoldier, and placed very ſtrait in the bore or chaſe of the mortar.

The firſt, on the right, ſhall furniſh him with earth to put round the bomb, which he muſt take care to ram cloſe with the knife given him by the ſecond on the left.

This done, each ſhall take a handſpike, which the two firſt, on the right and left, ſhall put under the pegs of retreat of the fore part, and the two behind under thoſe of the hind-part; and they together ſhall puſh the mortar in battery.

Afterwards the officer ſhall point or direct the mortar.

During that time the firſt ſoldier ſhall take care to prime the touch-hole of the mortar, without ramming the powder; and the laſt on the right, ſhall have the match ready to ſet fire on the fuſee of the bomb on the right, while the firſt ſhall be ready with his on the left, to ſet fire to the touch-hole of the mortar; which he ought not to do till he ſees the fuſee well lighted.

The foremoſt ſoldiers will have their handſpikes ready to raiſe the mortar upright, as ſoon as it has diſcharged; while the hindmoſt on the left ſhall, with the ſcraper, clean the bore and chamber of the mortar.

The magazine of powder for the ſervice of the battery, ſhall be ſituated 15 or 20 paces behind, and covered with boards, and earth over it.—The loaded bombs are on the ſide of the ſaid magazine, at five or ſix paces diſtance.

The officer who commands the ſervice of the mortar, muſt take care to diſcover, as much as poſſible, with the eye, the diſtance of the place where he intends to throw his bomb, giving the mortar the degrees of elevation, according to the judgment he has formed of the diſtance. Having thrown the firſt bomb, he muſt diminiſh or increaſe the degrees of elevation, according to the place upon which it ſhall fall. Several make uſe of tables to diſcover the different diſtances according to the differences of the elevations of the mortar, eſpecially the degrees of the quadrant from 1 to 45.

M. Blondel has wrote a large treatiſe on that ſubject, where he pretends to give a demonſtration to throw bombs with great exactneſs.

They ſay then, (ſays M. Blondel, ſpeaking of bombardiers), that the mortar chaſes more or leſs, according as it is more or leſs charged with powder; and that a mortar, for example, of 12 inches caliber, charged in its chamber with 2 lb. of powder, gives every degree 48 feet difference in the random, and for the greateſt extent under the elevation of 45 degrees, 2160 feet.

The ſame mortar will give every degree 50 foot difference, if it be charged with $2\frac{1}{2}$ of the ſame goodneſs, and 2700 foot for the greateſt random.

Laſtly, it will give 72 foot difference every degree, if the charge be of 3 lb. of the ſame powder; and at the elevation of 45 degrees, which, they ſay, is the greateſt random, it will throw the bomb at the diſtance of 3240 feet.

On this foundation they have made the following tables.

TABLES for Mortars of 12 *inches* of Caliber.

Firſt Table at *two pounds* of *powder.*

Degrees	*Randoms*	*Degrees*	*Randoms*
5	240 *Feet*	28	1344 *Feet*
10	480	29	1392
11	528	30	1440
12	576	31	1488
13	624	32	1536
14	672	33	1584
15	720	34	1632
16	768	35	1680
17	816	36	1728
18	864	37	1776
19	912	38	1824
20	960	39	1872
21	1008	40	1920
22	1056	41	1968
23	1104	42	2016
24	1152	43	2064
25	1200	44	2112
26	1248	45	2160
27	1296		

Note, That the difference is of 48 feet every degree.

Second Table at *two pounds* and *half* of *powder.*

Degrees	*Randoms*	*Degrees*	*Randoms*
36	2160 *Feet*	41	2460 *Feet*
37	2200	42	2520
38	2280	43	2580
39	2340	44	2640
40	2400	45	2700

Note, That the difference is of 60.

Third Table at *three pounds* of *powder.*

Degrees	*Randoms*	*Degrees*	*Randoms*
37	2664 *Feet*	42	3024 *Feet*
38	2736	43	3096
39	2808	44	3168
40	2880	45	3240
41	2952		

The difference is of 72.

TABLES for Mortars of 8 *inches* Caliber.

Firſt Table at *half pound* of *powder.*

Degrees	*Randoms*	*Degrees*	*Randoms*
5	210 *Feet*	28	1176 *Feet*
10	420	29	1218
11	460	30	1260
12	504	31	1302
13	546	32	1344
14	588	33	1386
15	630	34	1428
16	672	35	1470
17	714	36	1512
18	756	37	1554
19	798	38	1596
20	840	39	1638
21	882	40	1680
22	924	41	1722
23	966	42	1764
24	1008	43	1806
25	1050	44	1848
26	1092	45	1890
27	1134		

The difference is of 42 feet every degree.

Second Table at *three quarters* of a *pound* of *powder.*

Degrees	*Randoms*	*Degrees*	*Randoms*
31	1922 *Feet*	39	2418 *Feet*
32	1984	40	2480
33	2046	41	2542
34	2108	42	2604
35	2170	43	2666
36	2232	44	2728
37	2294	45	2790
38	2356		

The difference is of 62.

Third Table at *one pound* of *powder.*

Degrees	*Randoms*	*Degrees*	*Randoms*
35	2870 *Feet*	41	3362 *Feet*
36	2952	42	3444
37	3034	43	3526
38	3116	44	3608
39	3198	45	3690
40	3280		

Granadoes are charged like the bombs, and are very much like them, except that they have no *anſæ*.

A granado is a hollow ball, or ſhell of iron, braſs, or even glaſs, or potters earth, filled with gun powder, and fitted with a fuſee to give it fire. (*ibid.*)

Of theſe there are two kinds; the one large for ditches, or foſſees, called ſometimes bombs, whoſe caliber is the ſame with that of the bullets of 33 lb. and which weigh 16 lb. of 24, and which weigh 12 lb. of 16, which weigh 8 lb.

Theſe granadoes are rolled from the ramparts, or other works, into the ditch, or on a breach, and do much execution.

The other are hand-granadoes, of the bigneſs or caliber of a bullet of 4 lb. and weigh only 2 lb. containing 4 or 5 ounces of powder, or thereabout.

Theſe ſerve to throw with the hand into the trenches, or retrenchments, in the middle of a troop or company, and they infallibly lame or kill.

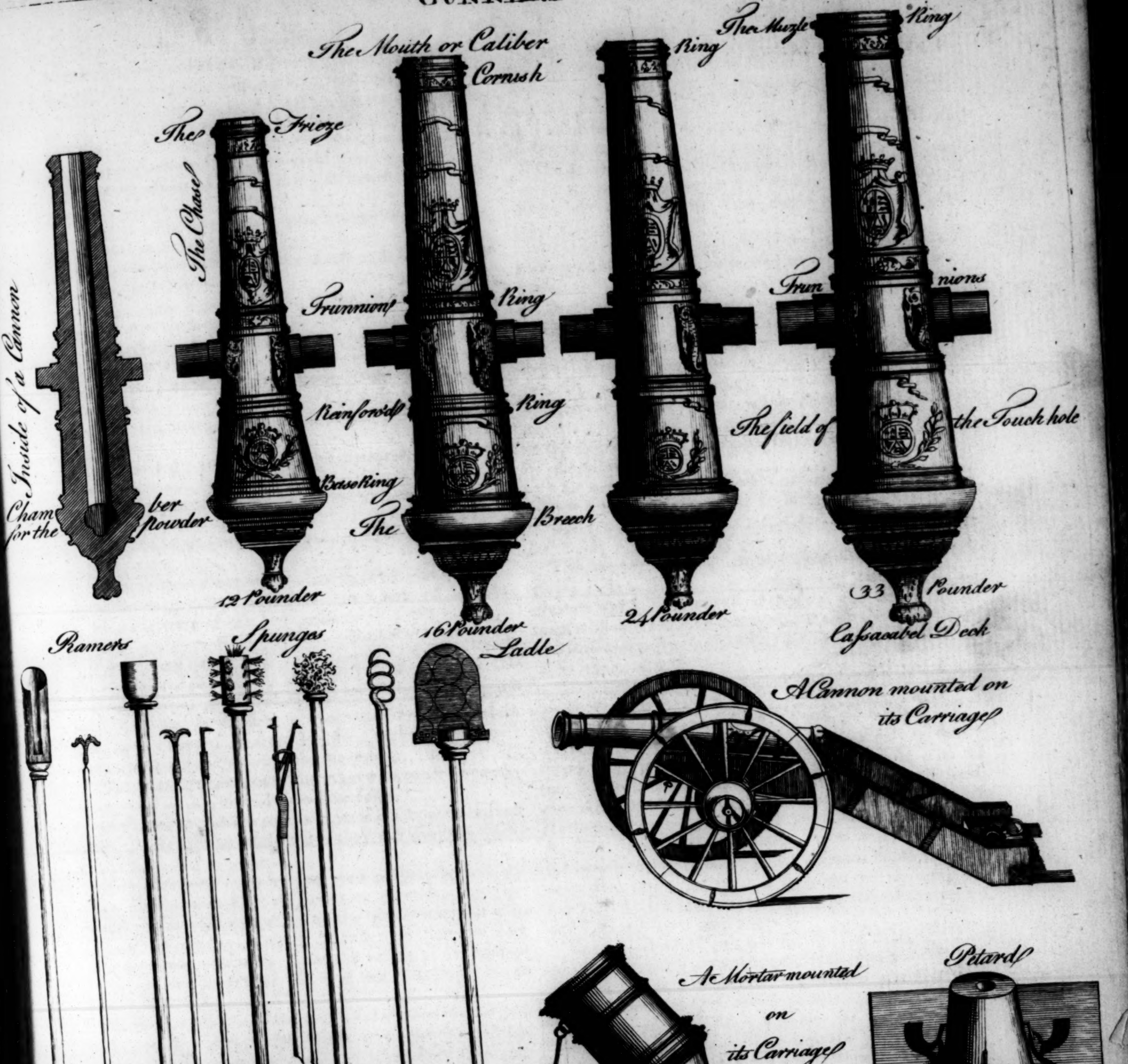
Care is taken, as much as poſſible, that they be well emptied, ſhaved, and of brittle iron. Their aperture or orifice muſt have ſix lines, or thereabout.

Small lanterns or ladles of copper, and ſmall rammers, are uſed to charge the granadoes.

As to the proportions of granadoes, thoſe of the caliber of

GUNNERY

Plate XCVIII.


Inside of a Cannon
Cham
ber
for the
powder
The
Frieze
The Chase
The Mouth or Caliber
Cornish
Trunnions
Ring
Reinforcés
Ring
Base Ring
The
Breech
12 Pounder
16 Pounder
Ladle
The Muzle
Ring
Ring
24 Pounder
Trun
nions
The field of
the Touch hole
33 Pounder
Caſsacabel Deck
Ramers
Spunges
A Cannon mounted on its Carriage
A Mortar mounted on its Carriage
Petard
Cartouches
Cartridge
Angels
Shot in the form of Pine Aples
Bomb
inside
Chain Shote

A Bell Sculp.ᵗ

4 AP 54

of a bullet of 33, have 6 inches of diameter, and ſomething more; they are 8 lines thick, and weigh 16 lb.

Thoſe of the caliber of 24 have 5 inches 5 lines diameter, are 6 lines thick, and weigh 12 lb.

Thoſe of the caliber of 16 have 4 inches 9 lines of diameter, are 5 lines thick, and weigh 8 lb.

Thoſe which weigh 6 lb. have 3 inches 5 lines diameter, and 5 lines in thickneſs.

Thoſe of 5 lb. weight have 3 inches $2\frac{1}{4}$ lines diameter, and 5 lines in thickneſs.

Thoſe which weigh 3 lb. have 2 inches 8 lines diameter, and are $4\frac{1}{2}$ lines thick.

Thoſe of 2 lb. weight, have 2 inches 4 lines diameter, and 4 lines in thickneſs.

Thoſe of 1 lb. weight have 1 inch 10 lines diameter, and are 3 lines thick.

Thoſe of $\frac{1}{4}$ have 1 inch 8 lines diameter, and are 3 lines thick.

Thoſe of $\frac{1}{2}$ have 1 inch 6 lines diameter. and are 3 lines thick.

Thoſe of a $\frac{1}{4}$ have 1 inch 2 lines diameter, and are $2\frac{1}{2}$ lines thick.

All theſe granadoes muſt be thicker at bottom than any where elſe.

Theſe different ſorts of granadoes have alſo different ſorts of fuſees.

Thoſe of the caliber of	33	24	16	12	8	4
are at the biggeſt end, of	12 *lin.*	11	$10\frac{1}{2}$	10	$9\frac{1}{2}$	$8\frac{1}{2}$
The diameter of the orifices,	4	4	3	3	3	2
The fuſees are in length, in all, of	$5\frac{1}{2}$ *inch.*	5	4	4	$3\frac{1}{2}$	$2\frac{1}{2}$

And as the large granadoes, which are made to throw into the foſſes, or ditches, or with ſmall mortars, they muſt have fuſees of different lengths; theſe are for ſmall mortars; thoſe for ditches muſt be ſhorter.

The Germans cover over the fuſee with paper or parchment, tied with a thread round the fuſee.

In France they uſe a compoſition of black pitch, mixed with a little tallow, with which they rub over the fuſee, when fixed to the granado.

The fuſee muſt burn ſo long, and no longer, as is the time of the motion of the bomb or granado, from the mouth of the mortar, *&c.* to the place where it is to fall, which time is about 27 ſeconds; ſo that the fuſee muſt be contrived, either from the nature of the compoſition, or the length of the pipe which contains it, to burn juſt that time.

At Paris they charge the fuſees for the bombs and granadoes with a compoſition made with powder-duſt and charcoal, very well pounded, and ſifted very fine, putting two ounces of charcoal on each pound of powder, and make ſeveral proofs, to know if the compoſition be not too quick.

There are ſeveral other compoſitions to charge the fuſees for bombs or granadoes.

The firſt is of 4 lb. of powder, 2 lb. of ſaltpetre, and 1 lb. of ſulphur.

The ſecond is of 5 lb. of powder, 2 lb. of ſaltpetre, and 1 pound of ſulphur.

The third, which is the beſt, is of 3 lb. of powder, 2 lb. of ſaltpetre, and 1 lb. of ſulphur.

The fourth is of 3 lb. of powder, 2 lb. of ſaltpetre, and $\frac{1}{4}$ lb. of ſulphur.

The fuſees muſt be charged even, *i. e.* they muſt burn without ſpitting.

The fuſee of the hand-granado, which is of the caliber of 4, muſt be 2 inches 2 lines long, 9 lines of diameter, and 6 lines at the ſmall end: the orifice of the fuſee $2\frac{1}{2}$ lines.

As ſoon as the fuſee is placed to the granado, the head thereof muſt be ſauced in melted pitch, and afterwards dipped in water, which hinders the compoſition from ſpoiling, and the wood from rotting.

The PETARD, (*ibid.*) is the next piece of artillery which deſerves our attention, and is a kind of engine of metal, ſomewhat in ſhape of a high-crowned hat, ſerving to break down gates, barricades, drawbridges, or the like works; which are intended to be ſurprized. It is very ſhort, narrow at the breach, and wide at the muzzle, made of copper mixed with a little braſs, or of lead with tin.

The petards are not always of the ſame height and bigneſs: they are commonly 10 inches high, 7 inches of diameter a-top, and 10 inches at bottom. They weigh commonly 40, 45, and 50 pounds.

The madrier, on which the petard is placed, and where it is tied with iron circles, is of two feet for its greateſt width, and of 18 inches on the ſides, and no thicker than a common madrier. Under the madrier are two iron bars paſſed croſs-ways, with a hook, which ſerves to fix the petard.

To charge a petard 15 inches high, and 6 or 7 inches of caliber or diameter at the bore, the inſide muſt be firſt very well cleaned and heated, ſo that the hand may bear the heat; then take the beſt powder that may be found, throw over it ſome ſpirit of wine, and expoſe it to the ſun, or put it in a frying-pan; and when it is well dried, 5 or 6 lb. of this powder is put into the petard, which reaches within three fingers of the mouth: the vacancies are filled with tow, and ſtopped with a wooden tampion; the mouth being ſtrongly bound up with cloth tied very tight with ropes; then it is fixed on the madrier, that has a cavity cut in it to receive the mouth of the petard, and faſtened down with ropes.

Some, inſtead of gun powder for the charge, uſe one of the following compoſitions, *viz.* gun-powder ſeven pounds, mercury ſublimate one ounce, camphor eight ounces; or gun-powder ſix pounds, mercury ſublimate three ounces, and ſulphur three; or gun-powder ſix, beaten glaſs $\frac{1}{2}$ an ounce, and camphor $\frac{3}{4}$.

Before any of theſe pieces are appropriated for ſervice, it is neceſſary to have each undergo a particular trial of its ſoundneſs, which is called a proof, to be made by or before one authoriſed for the purpoſe, called the *proof-maſter*.

To make a proof of the piece, a proper place is choſen, which is to be terminated by a mount of earth very thick to receive the bullets fired againſt it, that none of them may run through it. The piece is laid on the ground, ſupported only in the middle by a block of wood. It is fired three times: the firſt with powder of the weight of the bullet, and the two others with $\frac{1}{4}$ of the weight; after which a little more powder is put in to ſinge the piece; and after this water, which is impreſſed with a ſpunge, putting the finger on the touch-hole, to diſcover if there be any cracks; which done, they are examined with the cat, which is a piece of iron with three graſps, diſpoſed in the form of a triangle, and of the caliber of the piece; then it is viſited with a wax candle, but it is of very little ſervice in the ſmall pieces, becauſe if they be a little long, the ſmoke extinguiſhes it immediately.

The proof of mortars is made in this manner: Where there are carriages of caſt iron, the mortar is placed on one of thoſe carriages. Under that carriage is made a platform of madriers 5 or 6 inches thick; the mortar is charged with the beſt powder, and with as much of it as its chamber can contain, obſerving to leave no vacuity at the neck of the mortar, but what is neceſſary to put a little wad over the powder, and which is rammed with the end of an handſpike, to keep the powder together as much as poſſible. A large green turf, with earth two fingers deep, is put over the wad, which muſt have width enough to fill up the bottom of the mortar. This turf and earth are very well rammed down, then the bomb is placed over it as upright as poſſible, leaving a ſmall place round it, which is to be filled with clay as tight as poſſible, preſſing it between the mortar and the bomb with a pointed ſtick; and as it is not neceſſary to ſpend much powder in theſe ſort of proofs, the bomb muſt be filled with as much earth as it would contain powder.

For want of carriages of caſt iron, holes are dug in the earth where the mortars are buried as far as the touch-hole; and in order that the mortars thus buried may find more reſiſtance, and make a greater effort, large pieces of wood in form of joiſts are put under the mortar, chuſing always the hardeſt ground, to reſiſt better the recoil of the mortar.

A fuſee for granadoes is put on the touch-hole of each mortar, that the gunner may have time to retire, in caſe the mortar was to burſt in the proof; which is alſo practiſed in the proof of the pieces.

This proof is made three times, without increaſing or diminiſhing any thing.

Beſides the large pieces mentioned throughout this treatiſe, invented for the deſtruction of mankind, there are others called ſmall guns, *viz.* muſkets of ramparts, common muſkets, fuſils, carabines, muſketoons, and piſtols.

A muſket, or muſquet, is a fire-arm borne on the ſhoulder, and uſed in war, formerly fired by the application of a lighted match, but at preſent with a flint and lock.

The common muſkets are of the caliber of 20 leaden balls to the pound, and receive balls from 22 to 24: its length is fixed to 3 feet 8 inches from the muzzle to the touch-pan.

A fuſil, or fire-lock, has the ſame length and caliber; and ſerves at preſent inſtead of a muſket.

A carabine is a ſmall ſort of fire-arm, ſhorter than a fuſil, and carrying a ball of 24 in the pound, borne by the light-horſe, hanging at a belt over the left ſhoulder.

The carabine is a kind of medium between the piſtol and the muſket; and bears a near affinity to the arquebuſs, only that its bore is ſmaller. It was formerly made with a match-lock, but of late only with a flint-lock.

The muſquetoon is of the ſame length of the carabine, the barrel poliſhed, and clean within.

The muſquetoon carries five ounces of iron, or ſeven and a half of lead, with an equal quantity of powder.

The barrel of a piſtol is generally 14 inches long.

As to the invention of cannon and gun powder, we are certain that they are diſcoveries of a modern date: but there is no depending upon the various accounts given of them by authors. All that can be ſaid with certain y is, that there is mention made of gun-powder in the regiſter of the chamber of accounts in France, in the year of Chriſt 1338; that Alphonſus XI. king of Caſtile, beſieged the Moors with iron mortars, in the year of Chriſt 1343; and that our King Edward, in 1346, firſt carried thoſe thundering machines of war and death into France, where he availed himſelf of five or ſix pieces of cannon at the battle of Creſſy.

Before the invention of theſe inſtruments of war, the ancients made uſe of the aries, or battering-ram, the catapultæ, the balliſta, ſcorpion, and teſtudo. See Ram, *&c.*

For the mathematical principles of Gunnery, see Projectiles.

GUN-POWDER, a compoſition of ſaltpetre, ſulphur, and charcoal, mixed together, and uſually granulated; which eaſily takes fire, and, when fired, rarifies, or expands, with great vehemence, by means of its elaſtic force.

It is to this powder we owe all the action and effect of guns, ordnance, *&c.* ſo that the modern military art, fortification, *&c.* in a great meaſure depend thereon.

Method of making Gun powder. Dr Shaw's recipe for this purpoſe is as follows. Take four ounces of refined ſaltpetre, an ounce of brimſtone, and ſix drams of ſmall coal: reduce theſe to a fine powder, and continue beating them for ſome time in a ſtone mortar, with a wooden peſtle, wetting the mixture between whiles with water, ſo as to form the whole into an uniform paſte, which is reduced to grains, by paſſing it through a wire ſieve fit for the purpoſe; and in this form being carefully dried, it becomes the common gun-powder.

For greater quantities, mills are uſually provided, by means of which more work may be performed in one day, than a man can do in a hundred.

The nitre or ſaltpetre is refined thus: diſſolve four pounds of rough nitre as it comes to us from the Indies, by boiling it in as much water as will commodiouſly ſuffice for that purpoſe: then let it ſhoot for two or three days in a covered veſſel of earth, with ſticks laid acroſs for the cryſtals to adhere to. Theſe cryſtals being taken out, are drained and dried in the open air.

In order to reduce this ſalt to powder, they diſſolve a large quantity of it in as ſmall a proportion of water as poſſible; then keep it conſtantly ſtirring over the fire, till the water exhales, and a white dry powder is left behind.

In order to purify the brimſtone employed, they diſſolve it with a very gentle heat; then ſcum and paſs it through a double ſtrainer. If the brimſtone ſhould happen to take fire in the melting, they have an iron cover that fits on cloſe to the melting veſſel, and damps the flame. The brimſtone is judged to be ſufficiently refined if it melts, without yielding any fetid odour, between two hot iron plates, into a kind of red ſubſtance.

The coal for the making of gun powder is either that of willow, or hazel, well charred in the uſual manner, and reduced to powder. And thus the ingredients are prepared for making this commodity: but as theſe ingredients require to be intimately mixed, and as there would be danger of their firing if beat in a dry form, the method is to keep them continually moiſt, either with water, urine, or a ſolution of ſal ammoniac: they continue thus ſtamping them together for twenty four hours, after which the maſs is fit for corning and drying in the ſun, or otherwiſe, ſo as ſedulouſly to prevent its firing.

Rationale of GUN-POWDER. The exploſive force of gun-powder is now a thing commonly known, but the phyſical reaſon thereof may not perhaps be hitherto ſufficiently underſtood. In order to explain it, Dr Shaw propoſes the following obſervations: 1. That ſaltpetre of itſelf is not inflammable; and though it melts in the fire, and grows red hot, yet does not explode, unleſs it comes in contact with the coals. 2. That brimſtone eaſily melts at the fire, and eaſily catches flame. 3. That powdered charcoal readily takes fire, even from the ſparks yielded by a flint and ſteel. 4. That if nitre be mixed with powdered charcoal, and brought in contact with the fire, it burns and flames. 5. That if ſulphur be mixed with powdered charcoal, and applied to the fire, part of the ſulphur burns ſlowly away, but not much of the charcoal; and, 6. That if a lighted coal be applied to a mixture of nitre and ſulphur, the ſulphur preſently takes fire with ſome degree of exploſion; leaving part of the nitre behind, as we ſee in making the ſal prunellæ, and ſal polychreſtum.

Theſe experiments duly conſidered, adds the doctor, may give us the chemical cauſe of the ſtrange exploſive force of gun-powder. For each grain of this powder conſiſting of a certain proportion of ſulphur, nitre, and coal, the coal preſently takes fire, upon contact of the ſmalleſt ſpark: at which time both the ſulphur and the nitre immediately melt, and by means of the coal interpoſed between them, burſt into flame; which, ſpreading from grain to grain, propagates the ſame effect almoſt inſtantaneouſly: whence the whole maſs of powder comes to be fired: and as nitre contains both a large proportion of air and water, which are now violently rarified by the heat, a kind of fiery exploſive blaſt is thus produced, wherein the nitre ſeems, by its aqueous and aerial parts, to act as bellows to the other inflammable bodies, ſulphur and coal, to blow them into a flame, and carry off their whole ſubſtance in ſmoke and vapour.

Different kinds of GUN-POWDER. The three ingredients of gun powder are mixed in various proportions according as the powder is intended for muſkets, great guns, or mortars; though theſe proportions ſeem not to be perfectly adjuſted or ſettled by competent experience.

Semienowitz, for mortars, directs an hundred pounds of ſaltpetre, twenty-five of ſulphur, and as many of charcoal; for great guns, an hundred pounds of ſaltpetre, fifteen pound of ſulphur, and eighteen pound of charcoal; for muſkets and piſtols, an hundred pound of ſaltpetre, eight pound of ſulphur, and ten pound of charcoal. Miethius extols the proportion of one pound of ſaltpetre to three ounces of charcoal, and two, or two and a quarter of ſulphur; than which, he affirms, no gun-powder can poſſibly be ſtronger. He adds, that the uſual practice of making the gun-powder weaker for mortars than guns, is without any foundation, and renders the expence needleſly much greater: for whereas to load a large mortar, twenty-four pound of common powder is required, and conſequently, to load it ten times, two hundred and forty pound, he ſhews, by calculation, that the ſame effect would be had by one hundred and fifty pound of the ſtrong powder.

To increaſe the ſtrength of powder, Dr Shaw thinks it proper to make the grains conſiderably large, and to have it well ſifted from the ſmall duſt. We ſee that gun-powder, reduced to duſt, has little exploſive force; but when the grains are large, the flame of one grain has a ready paſſage to another, ſo that the whole parcel may thus take fire nearly at the ſame time, otherwiſe much force may be loſt, or many of the grains go away as ſhot unfired.

It ſhould alſo ſeem that there are other ways of increaſing the ſtrength of powder, particularly by the mixture of ſalt of tartar; but perhaps, adds the laſt-mentioned author, it were improper to divulge any thing of this kind, as gun-powder ſeems already ſufficiently deſtructive.

Method of trying and examining GUN-POWDER. There are two general methods of examining gun-powder; one with regard to its purity, the other with regard to its ſtrength. Its purity is known by laying two or three little heaps near each other upon white paper, and firing one of them: for if this takes fire readily, and the ſmoke riſes upright, without leaving any droſs or feculent matter behind, and without burning the paper, or firing the other heaps, it is eſteemed a ſign that the ſulphur and nitre were well purified, that the coal was good, and that the three ingredients were thoroughly incorporated together: but if the other heaps alſo take fire at the ſame time, it is preſumed, that either common ſalt was mixed with the nitre, or that the coal was not well ground, or the whole maſs not well beat, and mixed together; and if either the nitre or ſulphur be not well purified, the paper will be black or ſpotted.

In order to try the ſtrength of gun-powder, there are two kinds of inſtruments in uſe; but neither of them appear more exact than the common method of trying to what diſtance a certain weight of powder will throw a ball from a muſket.

There has been much talk of a white powder, which, if it anſwered the character given it, might be a dangerous compoſition; for they pretend that this white powder will throw a ball as far as the black, yet without making a report; but none of the white powder we have ſeen, ſays Dr Shaw, anſwers to this character; being, as we apprehend, commonly made either with touchwood or camphor, inſtead of coal.

Obſervations on the force of GUN-POWDER. Gun-powder, fired either in vacuum, or in air, produces, by its exploſion, a permanent elaſtic fluid. For if a red-hot iron be included in a receiver, after being exhauſted, and gun powder be let fall on the iron, the powder will take fire, and the mercurial gage will ſuddenly deſcend upon the exploſion; and though it immediately aſcends again, yet it will never riſe to the height it firſt ſtood at, but will continue depreſſed by a ſpace proportioned to the quantity of gun powder which was let fall on the iron.

The ſame production likewiſe takes place, when gun powder is fired in the air: for if a ſmall quantity of powder be placed in the upper part of a glaſs tube, and the lower part of the tube be immerged in water, and the water be made to riſe ſo near the top, that only a ſmall portion of air is left in that part where the gun-powder is placed; if in this ſituation the communication of the upper part of the tube with the external air be cloſed, and the powder be fired, which will eaſily be done by a burning-glaſs, the water will in this experiment deſcend upon the exploſion as the quickſilver did in the laſt; and will always continue depreſſed below the place at which it ſtood before the exploſion; and the quantity of this depreſſion will be greater, if the quantity of powder be increaſed, or the diameter of the tube be diminiſhed. From whence it is proved, that as well in air as in a vacuum, the exploſion of fired powder produces a permanent elaſtic fluid. It alſo appears from experiment, that the elaſticity or preſſure of the fluid produced by the firing of gun powder, is, *cæteris paribus*, directly as its denſity. This follows from hence, that if in the ſame receiver a double quantity of powder be let fall, the mercury will ſubſide twice as much as in the firing of a ſingle quantity.

To determine the elaſticity and quantity of this elaſtic fluid, produced from the exploſion of a given quantity of gun powder, Mr Robins premiſes, that the elaſticity of this fluid increaſes by heat, and diminiſhes by cold, in the ſame manner as that of the air; and that the denſity of this fluid, and conſequently its weight, is the ſame with the weight of an equal bulk of air having the ſame elaſticity, and the ſame temperature.

From theſe principles, and from his experiments, (for a detail of which we muſt refer the reader to his New Principles of Gunnery, in Scholium to prop. II.) he concludes, that the fluid produced by the firing of gun-powder will be $\frac{3}{10}$ of the weight of the gun powder, and the ratio of the reſpective bulks of the powder, and the fluid produced from it, will be in round numbers 1 to 244.

Hence we are certain, that any quantity of powder fired in any confined ſpace, which it adequately fills, exerts, at the inſtant of its exploſion, againſt the ſides of the veſſels containing it, and the bodies it impels before it, a force at leaſt 244 times greater than the elaſticity of common air; or, which is the ſame thing, than the preſſure of the atmoſphere; and this without conſidering the great addition which this force will receive from the violent degree of heat with which it is endued at that time, the quantity of which augmentation is the next head of Mr Robin's enquiry. He determines that the elaſticity of the air is augmented when heated to the extremeſt heat of red hot iron, in the proportion of 796 to $194\frac{1}{3}$; and ſuppoſing that the flame of fired gun-powder is not leſs hot than red hot iron, and the elaſticity of the air, and conſequently of the fluid, generated by the exploſion, being augmented by the extremity of this heat in the ratio of 796 to $194\frac{1}{3}$, it follows, that if 244 be augmented in this ratio, the reſulting number, which is $999\frac{1}{3}$, will determine how many times the elaſticity of the flame of fired powder exceeds the elaſticity of common air, ſuppoſing it to be confined in the ſame ſpace which the powder filled before it was fired.

Hence then, the abſolute quantity of the preſſure exerted by gun-powder at the moment of its exploſion may be aſſigned: for ſince the fluid then generated has an elaſticity of $999\frac{1}{3}$, or, in round numbers, 1000 times greater than common air; and ſince common air, by its elaſticity, exerts a preſſure on any given ſurface equal to the weight of the incumbent atmoſphere with which it is in *equilibrio*, the preſſure exerted by fired powder, before it has dilated itſelf, is 1000 times greater than the preſſure of the atmoſphere; and conſequently the quantity of this force on a ſurface of an inch ſquare amounts to above ſix tun weight, which force however diminiſhes as the fluid dilates itſelf. The variations of the denſity of the atmoſphere does not any way alter the action of powder by any experiment that can be made. But the moiſture of the air has a very great influence on the force of it: for that quantity which in a dry ſeaſon would communicate to a bullet a velocity of 1700 feet in one ſecond, will not in damp weather communicate a velocity of more than 12 or 1300 feet in a ſecond, or even leſs, if the powder be bad and negligently kept.

The velocity of expanſion of the flame of gun-powder, when fired in a piece of artillery, without either bullet, or any other body before it, is prodigious. By the experiments of Mr Robins, it ſeems this velocity cannot be much leſs than 7000 feet in a ſecond. This, however, muſt be underſtood of the moſt active part of the flame. For, as was obſerved before, the elaſtic fluid, in which the activity of gun-powder conſiſts, is only $\frac{3}{10}$ of the ſubſtance of the powder, the remaining $\frac{7}{10}$ will in the exploſion be mixed with the elaſtic part, and will by its weight retard the activity of the exploſion; and yet they will be ſo completely united, as to move with uncommon motion; but the unelaſtic part will be leſs accelerated than the reſt, and ſome of it will not even be carried out of the barrel, as appears by the conſiderable quantity of unctuous matter, which adheres to the inſide of all fire-arms, after they have been uſed. Theſe inequalities in the expanſive motion of the flame render it impracticable to determine its velocity, otherwiſe than from experiments.

To recover damaged **Gun powder.** The method of the powder-merchants is, to put part of the powder on a ſail-cloth, to which they add an equal weight of what is really good; and with a ſhovel mingle it well together, dry it in the ſun, and barrel it up, keeping it in a dry and proper place. Others again, if it be very bad, reſtore it by moiſtening it with vinegar, water, urine, or brandy: then they beat it fine, ſearce it, and to every pound of powder add an ounce, an ounce and a half, or two ounces, according as it is decayed, of melted ſalt petre. Afterwards, theſe ingredients are to be moiſtened and mixed well, ſo that nothing can be diſcerned in the compoſition, which may be known by cutting the maſs; and then they granulate it as aforeſaid. In caſe the powder be in a manner quite ſpoiled, the only way is to extract the ſaltpetre with water, according to the uſual manner, by boiling, filtrating, evaporating, and cryſtallizing; and then with freſh ſulphur and charcoal to make it up a-new again. In regard to the medical virtues of gun-powder, Boerhaave informs us, that the flame of it affords a very healthy fume in the height of the plague: becauſe the exploſive acid vapour of nitre and ſulphur corrects the air; and that the ſame vapour, if received in a ſmall cloſe pent up place, kills inſects.

It is enacted by 5 and 11 of Geo. I. and 5 Geo. II. *c.* 20. that gun-powder be carried to any place in a covered carriage; the barrels being cloſe jointed; or in caſes and bags of leather, *&c.* And perſons keeping more than 200 pounds weight of gun-powder at one time, within the cities of London and Weſtminſter, or the ſuburbs, *&c.* are liable to forfeitures if it be not removed; and juſtices of peace may iſſue warrants to ſearch for, ſeize, and remove the ſame.

The invention of gun powder is aſcribed by Polydore Virgil to a chemiſt, who having accidentally put ſome of the ingredients in this compoſition in a mortar, and covered it over with a ſtone, it happened to take fire, and blew up the ſtone. Thevet ſays, the perſon here ſpoken of was a monk of Friburg, named Conſtantine Anelzen; but Belleforet and others hold it to be Bartholdus Schwartz, or the black; at leaſt it is affirmed, that he firſt taught the uſe of it to the Venetians, in the year 1380, during the war with the Genoeſe. But what contradicts this account, and ſhews gun-powder to be of an older date, is, that Peter Mexia, in his Variæ Lectiones, relates, that Alphonſus XI. king of Caſtile, uſed mortars againſt the Moors in a ſiege in 1343. Ducange adds, that there is mention made of this powder in the regiſters of the chambers of accounts in France, as early as the year 1338; and frier Bacon, our countryman, mentions the compoſition in expreſs terms, in his treatiſe De nullitate magiæ, publiſhed at Oxford, in the year 1216.

Gun-shot-wounds. See **Surgery.**

GUNTSBERG, a town of Germany in the circle of Swabia, ſituated on the eaſt ſide of the Danube: E. long. 10° 15′, N. lat. 48° 35′.

GUNTER's line, a logarithmic line, uſually graduated upon ſcales, ſectors, *&c.*

It is alſo called the line of lines, and line of numbers; being only the logarithms graduated upon a ruler, which therefore ſerves to ſolve problems inſtrumentally in the ſame manner as logarithms do arithmetically. It is uſually divided into an hundred parts, every tenth whereof is numbered, beginning with 1, and ending with 10; ſo that, if the firſt great diviſion, marked 1, ſtand for one tenth of any integer, the next diviſion, marked 2, will ſtand for two tenths; 3, three tenths, and ſo on; and the intermediate diviſions will, in like manner, repreſent 100dth parts of the ſame integer. If each of the great diviſions repreſent 10 integers, then will the leſſer diviſions ſtand for integers; and if the greater diviſions be ſuppoſed each 100, the ſubdiviſions will be each 10.

Uſe of **Gunter's line.** 1. *To find the product of two numbers.* From 1 extend the compaſſes to the multiplier; and the ſame extent, applied the ſame way from the multiplicand, will reach to the product. Thus if the product of 4 and 8 be required, extend the compaſſes from 1 to 4, and that extent laid from 8 the ſame way, will reach to 32, their product. 2. *To divide one number by another.* The extent from the diviſor to unity, will reach from the dividend to the quotient: thus, to divide 36 by 4, extend the compaſſes from 4 to 1, and the ſame extent will reach from 36 to 9, the quotient ſought. 3. *To three given numbers, to find a fourth proportional.* Suppoſe the numbers 6, 8, 9; extend the compaſſes from 6 to 8, and this extent, laid from 9 the ſame way, will reach to 12, the fourth proportional required. 4. *To find a mean proportional between any two given numbers.* Suppoſe 8 and 32; extend the compaſſes from 8, in the left hand part of the line, to 32 in the right; then biſſecting this diſtance, its half will reach from 8 forward, or from 32 backward, to 16, the mean proportional ſought. 5. *To extract the ſquare root of any number.* Suppoſe 25; biſſect the diſtance between 1 on the ſcale and the point repreſenting 25; then the half of this diſtance, ſet off from 1, will give the point repreſenting the root 5. In the ſame manner, the cube root, or that of any higher power, may be found by dividing the diſtance on the line, between 1 and the given number, into as many equal parts as the index of the power expreſſes; then one of thoſe parts, ſet from 1, will find the point repreſenting the root required.

Gunter's quadrant, one made of wood, braſs, *&c.* containing a kind of ſtereographic projection of the ſphere, on the plane of the equinoctial; the eye being ſuppoſed placed in one of the poles.

GUNTER'S SCALE, called by navigators ſimply the gunter, is a large plain ſcale, generally two foot long, and about an inch and a half broad, with artificial lines delineated on it, of great uſe in ſolving queſtions in trigonometry, navigation, *&c.*

GUN-WALE, or **GUNNEL**, is the uppermoſt wale of a ſhip, or that piece of timber which reaches on either ſide from the quarter-deck to the forecaſtle, being the uppermoſt bend which finiſhes the upper works of the hull, in that part in which are put the ſtanchions which ſupport the waſte-trees.

GURIEL, a ſubdiviſion of Georgia in Aſia, ſituated on the eaſtern coaſt of the Euxine ſea.

GURK, a city of Carinthia, in Germany: E. long. 14°, N. lat. 47° 20′.

GURNARD, in ichthyology. See TRIGLA.

GUSSET, in heraldry, is formed by a line drawn from the dexter or ſiniſter chief points, and falling down perpendicularly to the extreme baſe. See Plate XCVII. fig. 8.

The guſſet is an abatement of honour, denoting an effeminate perſon.

GUSTROW, a town of Germany, in the dutchy of Mecklenburg: E. long. 12° 15′, N. lat. 54°.

GUTS. See ANATOMY, p. 257.

GUTSKROW, a city of Germany in the circle of Upper Saxony, and province of Swediſh Pomerania: E. long. 13° 40′, N. lat. 54°.

GUTTÆ, in architecture, are ornaments in the form of little cones, uſed in the plafond of the Doric corniche, or on the architrave underneath the triglyphs, repreſenting a ſort of drops or bells. See ARCHITECTURE.

GUTTA SERENA, a diſeaſe in which the patient, without any apparent fault in the eye, is entirely deprived of ſight. See MEDICINE.

GUTTERS, in architecture, a kind of canals in the roofs of houſes, ſerving to receive and carry off the rain.

GUTTURAL, a term applied to letters or ſounds pronounced or formed as it were in the throat.

GUTTY, in heraldry, a term uſed when any thing is charged or ſprinkled with drops. In blazoning, the colour of the drops is to be named; as, gutty of ſable, of gules, *&c.*

GUY, in a ſhip, is any rope uſed for keeping off things from bearing or falling againſt the ſhip's ſide when they are hoiſting in.

That rope which at one end is made faſt to the foremaſt, and ſeized to a ſingle block at the pendant of the garnet, is called the guy of the garnet.

GUZES, in heraldry, roundles of a ſanguine or murry colour. Theſe, from their bloody hue, are by ſome ſuppoſed to repreſent wounds.

GYMNASIARCH, in antiquity, the director of the gymnaſium. He had two deputies under him; the one called xyſtarch, who preſided over the athletæ, and had the overſight of the wreſtling; the other gymnaſtes, who had the direction of all the other exerciſes.

GYMNASIUM, in Grecian antiquity, a place fitted for performing exerciſes.

Gymnaſia, according to Potter, were firſt uſed at Lacedæmon, but were afterwards very common in all the parts of Greece, and imitated, very much augmented, and improved at Rome. They were not ſingle edifices, but a knot of buildings united, being ſo capacious as to hold many thouſands of people at once; and having room enough for philoſophers, rhetoricians, and the profeſſors of all other ſciences, to read their lectures; and wreſtlers, dancers, and all others who would, to exerciſe at the ſame time without the leaſt diſturbance or interruption. They conſiſted of a great many parts, the chief of which were, the porticos, elæotheſium, palæſtra, coniſterium, *&c.*

Athens had ſeveral gymnaſia, of which the lyceum, academia, and cynoſurges, were thoſe of moſt note.

The lyceum was ſituated on the banks of the river Iliſſus, and received its name from Apollo, to whom it was dedicated.

The lyceum was the place where Ariſtotle taught philoſophy, walking there every day till the hour of anointing; whence he and his followers got the name of peripatetics.

The academy was part of the ceramicus without the city, where Plato lectured. See ACADEMY.

GYMNASTICS, the art of performing the ſeveral bodily exerciſes, as wreſtling, running, fencing, dancing, *&c.*

GYMNOPYRUS, in natural hiſtory, a name given by Dr Hill to the pyritæ of a ſimple internal ſtructure, and not covered with a cruſt.

Of theſe there are only two ſpecies: 1. A green variouſly ſhaped kind. 2. A botryoide kind.

The firſt ſpecies is the moſt common of all the pyritæ, and appears under a great diverſity of ſhapes. It is very hard and heavy, very readily gives fire with ſteel, but will not at all ferment with aquafortis. The ſecond ſpecies is very elegant and beautiful, and its uſual colour is a very agreeable pale green; but what moſt diſtinguiſhes it from all other pyritæ is, that its ſurface is always beatifully elevated into tubercles of various ſizes, reſembling a cluſter of grapes.

GYMNOSOPHISTS, a ſect of philoſophers who clothed themſelves no farther than modeſty required. There was ſome of theſe ſages in Africa; but the moſt celebrated clan of them was in India. The African gymnoſophiſts dwelt upon a mountain in Ethiopia, near the Nile, without the accommodation either of houſe or cell. They did not form themſelves into ſocieties like thoſe of India, but each had his private retirement, where he ſtudied and performed his devotions by himſelf. If any perſon had killed another by chance, he applied to theſe ſages for abſolution, and ſubmitted to whatever penances they enjoined. They obſerved an extraordinary frugality, and lived only upon the fruits of the earth. Lucan aſcribes to theſe gymnoſophiſts ſeveral new diſcoveries in aſtronomy.

As to the Indian gymnoſophiſts, they dwelt in the woods, where they lived upon the wild products of the earth, and never drank wine, nor married. Some of them practiſed phyſic, and travelled from one place to another: theſe were particularly famous for their remedies againſt barrenneſs. Some of them, likewiſe, pretended to practiſe magic, and to foretell future events.

In general, the gymnoſophiſts were wiſe and learned men: their maxims and diſcourſes, recorded by hiſtorians, do not in the leaſt ſavour of a barbarous education, but are plainly the reſult of great ſenſe and deep thought. They keep up the dignity of their character to ſo high a degree, that it was never their cuſtom to wait upon any body, not even upon princes themſelves; for which reaſon Alexander, who would not condeſcend to viſit them in perſon, ſent ſome of his courtiers to them in order to ſatisfy his curioſity. Their way of educating their diſciples is very remarkable: every day, at dinner, they examined them how they had ſpent the morning; and every one was obliged to ſhew, that he had diſcharged ſome good office, practiſed ſome virtue, or improved in ſome part of learning: if nothing of this appeared, he was ſent back without his dinner. They held a tranſmigration of ſouls; and it is probable that Pythagoras borrowed his doctrine from them.

GYMNOSPERMIA, in botany. See BOTANY, p. 636.

GYMNOTUS, in ichthyology, a genus of fiſhes belonging to the order of apodes. They have two tentacula at the upper lip; the eyes are covered with the common ſkin; there are five rays in the membrane of the gills; the body is compreſſed, and carinated on the belly with a fin. There are five ſpecies.

GYNÆCEUM, among the ancients, the apartment of the women, a ſeparate room in the inner part of the houſe, where they employed themſelves in ſpinning, weaving, and needle-work.

GYNÆCOCRACY, denotes the government of women, or a ſtate where women are capable of the ſupreme command. Such are Britain and Spain.

GYNANDRIA, in botany. See BOTANY, p. 635.

GYPSIES. See EGYPTIANS.

GYPSUM, or PLASTER-STONE, in natural hiſtory, a genus of foſſils, naturally and eſſentially ſimple, not inflammable nor ſoluble in water, and compoſed of flat ſmall particles, which form bright, gloſſy, and in ſome degree tranſparent maſſes, not flexible or elaſtic, not giving fire with ſteel, nor fermenting with, or being ſoluble in, acid menſtrua, and very eaſily calcined in the fire.

Of theſe gypſums, ſome are harder, others ſofter, and are of ſeveral colours; as, white, grey, red, green, *&c.* ſometimes diſtinct, and ſometimes variouſly blended together.

The texture of all the gypſums being ultimately the ſame, it may be ſufficient to obſerve, that their origin is plainly from particles of a determinate nature and ſubſtance, and of a certain and invariable figure, an oblong, flat, and irregularly angular one. Theſe we ſometimes ſee, as indeed is moſt natural to them, diſpoſed without order or regularity, into looſe, complex, friable maſſes; at others, they are getting out of their native order, and emulating the ſtructure of other claſſes of bodies, of which they are indeed properly the baſis, and appearing ſomewhat in the figure of the fibrariæ; and at other times, of the foliaceous compoſite flakes of the ſelenitæ: the ſpecies which have theſe ſtructures, are truly varying from the gypſums into thoſe bodies they emulate; for the fibrariæ are only a peculiar arrangement of theſe very particles, and the ſelenitæ only more broad flakes of the ſame, like thoſe of the foliaceous talcs.

The gypſums are much uſed in plaſter, for ſtuccoing rooms, and caſting buſts and ſtatues.

GYRFALCON. See FALCO.

GYSHORN, a town of germany, in the dutchy of Lunenburg, ſituated on the river Aller, forty-five miles north-eaſt of Hanover: E. long. 10° 45′, and N. lat. 52° 50′.

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H

HABAT, the north-weſt province of the empire of Morocco, ſituated on the ſtreights of Gibraltar.

HABAKKUK, or the prophecy of Habakkuk, a canonical book of the Old Teſtament.

There is no mention made in ſcripture, either of the time when this prophet lived, or of the parents from whom he was deſcended; but according to the authors of the lives of the prophets, he was of the tribe of Simeon, and a native of Bethzacar.

HABEAS CORPUS, in law, is a writ of two kinds; the one being the great writ of the Engliſh liberty, which lies where a perſon is indicted for any crime or treſpaſs before juſtices of the peace, or in a court of any franchiſe, and on being impriſoned has offered ſufficient bale, which has been refuſed, though the caſe be bailable; in which caſe he may have this writ out of the king's bench, in order to remove himſelf thither, to anſwer the cauſe at the bar of that court.

The practice in this caſe is, firſt to procure a certiorari out of the court of chancery, directed to all the juſtices for removing the indictment into the king's bench; and upon that to obtain this writ, directed to the ſheriff, for cauſing the body of the party to be brought at a certain day.

The other kind of habeas corpus is uſed for bringing the body of a perſon into court, who is committed to any goal or priſon, either in civil or criminal cauſes; which writ will remove the perſon and cauſe from one court and priſon to another.

No habeas corpus, or other writ, to remove a cauſe from out of an inferior court, can be allowed, if the ſame be not delivered to the judge of the court, before the jury who are to try the cauſe have appeared, and before any of them are ſworn, 43 Eliz. c. 5.

The habeas corpus act, 31 Car. II. c. 2. has ordained, that a perſon may have a habeas corpus from any judge, on complaint made and view of the warrant of commitment, (except ſuch perſon is committed for treaſon or felony expreſſed in the warrant, or ſome other offence that is not bailable) which habeas corpus muſt be made returnable immediately; and on producing a certificate of the cauſe of commitment, the priſoner is to be diſcharged on bail given to appear in the court of king's bench the next term, or next aſſizes, *&c.* Perſons committed, for either treaſon or felony, expreſsly mentioned in the warrant, upon a motion made in open court, in the firſt week of the term, or day of ſeſſions, *&c.* after commitment, are to be brought to trial; and if they are not indicted the next term or ſeſſions after commitment, on a motion made the laſt day of that term, they ſhall be let out upon bail, except it appear on oath, that the king's witneſſes are not ready; and in caſe they are not indicted or tried the ſecond term after commitment, they ſhall be diſcharged.

Judges denying a habeas corpus, ſhall forfeit 500 l. and if an officer refuſe to obey it, or to deliver a true copy of the commitment-warrant, he forfeits 100 l. for the firſt offence.

HABIT, in philoſophy, an aptitude or diſpoſition either of mind or body, acquired by a frequent repetition of the ſame act.

Habit, in medicine, denotes the ſettled conſtitution of the body, or the habitude of any thing elſe, as the ſtructure or compoſition of a body, or the parts thereof.

Habit is alſo uſed for a dreſs or garb, or the compoſition of garments, wherewith a perſon is covered; in which ſenſe we ſay, the habit of an eccleſiaſtic, of a religious, *&c.* a military habit, *&c.*

HABITE AND REPUTE, in Scots law, the common opinion of the people, among whom a perſon lives, with reſpect to any circumſtance relating to him.

HABITUAL, ſomething grown to a habit by long uſe. See Habit.

HABITUDE, among ſchoolmen, the reſpect or relation one thing bears to another. See Relation.

HACHA, a town of terra firma, in South America, ſituated on the north ſea, at the mouth of the river Hacha. in W. long. 72°, N lat. 11° 0′.

HACKNEY, a village on the north-eaſt ſide of London, with a handſome church, three meeting-houſes, and ſeventeen alms-houſes.

HADDINGTON, a parliament-town in Scotland, about eighteen miles eaſt of Edinburgh.

HADDOCK, the Engliſh name of a well known fiſh of the gadus kind. See Gadus.

HADRAMUT, a city of Arabia Felix, the capital of the province of Hadramut, ſituated in E. long. 50° 30′, N. lat. 16°, three hundred and ſixty miles north-eaſt of Mocho.

HÆMAGOGOS, among phyſicians, a compound medicine conſiſting of fetid and aromatic ſimples, mixed with black hellebore; and preſcribed in order to promote the menſtrual and hæmorrhoidal fluxes, as alſo to bring away the lochia.

HÆMANTHUS, in botany, a genus of the hexandria monogynia claſs. The involucrum is large, and conſiſts of ſix leaves; the corolla is above the fruit, and divided into ſix parts; and the berry has three cells. There are four ſpecies, none of them natives of Britain.

HÆMATITES, or blood-stone, in natural hiſtory, an extremely rich and fine iron.

It is very ponderous, and is either of a pale red, a deeper red, or a bluiſh colour; uſually of a very gloſſy ſurface; and when broken, of a fine and regularly ſtriated texture; the ſtriæ converging toward the centre of the body; and the maſſes thereof naturally breaking into fragments of a broad baſe and pointed end; appearing ſomething pyramidal. The hæmatites is various in its degrees of purity and hardneſs, as well as in its figure: the fineſt and moſt pure is of a botryoide ſurface; the whole ſuperficies riſing into larger or ſmaller roundiſh tubercles: ſometimes the hæmatites is of a coarſe texture, and a laxer ſtructure, in which ſtate it is known to many by the name ſchiſtus.

HÆMATOPUS, the sea-pye, in ornithology, a genus belonging to the order of grallæ. The beak is compreſſed with an equal wedge-ſhaped point; the noſtrils are linear; and the feet have three toes without nails. There is but one ſpecies, *viz.* the aſtralegus, a native of Europe and America. It feeds upon ſhell-fiſh near the ſea ſhores.

HÆMATOXYLUM, campeche-wood, in botany, a genus of the decandria monogynia claſs. The calix is divided into five parts; the petals are five; the capſule is lanceolated, and contains one cell with two boat-ſhaped valves. There is but one ſpecies, *viz.* the campechianum, campechy or logwood, a native of America, near Carthagena. It is uſually brought home in large logs, very hard, of a red colour, and an aſtringent ſweet taſte. It has been long uſed by the dyers, but not till very late as a medicine: an extracted decoction of it are ſaid to be ſerviceable in diarrhœas.

HÆMOPTOSIS, Hæmaptysis, or Hæmoptoe, in medicine, a ſpitting of blood. See Medicine.

HÆMORRHAGE, in medicine, a flux of blood from any part of the body. See Medicine.

HÆMORRHOIDAL, an appellation given by anatomiſts to the arteries and veins going to the inteſtinum rectum. See Anatomy, Part III. and IV.

HÆMORRHOIDS, or Piles, in medicine, an hæmorrhage, or flux of blood from the hæmorrhoidal veſſels. See Medicine.

HAERLEM, a populous city of the United Provinces, in the province of Holland, ſituated near the lake which from this town is called Haerlem-Meer; four miles eaſt of the ocean, and twelve weſt of Amſterdam: E. long. 4° 20′. N. lat. 52° 30′.

HAGAI, a canonical book of the Old Teſtament, ſo called from the prophet of that name, who, in all probability was born at Babylon, from whence he returned with Zerubbabel.

HAGENAU, a fortified town of Germany, in the Landgraviate of Alſace: E. long. 7° 40′, N. lat. 48° 45′.

HAGUE, a town of the United Provinces, in the province of Holland, ſituated two miles eaſt of the ſea, and fourteen north-weſt of Rotterdam. This is one of the fineſt towns in Europe; but though it enjoys all the privileges of a city of Holland, except that of ſending repreſentatives to the ſtate, yet, as it has no walls, it is only eſteemed a village. Here every city of the United provinces has a houſe for their reſpective deputies, and here the ſtates of the province of Holland aſſemble, and all public affairs are tranſacted.

HAIL, in phyſiology, an aqueous concretion, in form of white or pellucid ſpherules, deſcending out of the atmoſphere.

Hail is evidently no other than drops of rain congealed into ice. This happens when in their paſſage thro' the inferior air, they meet with nitrous particles, which are known to contribute greatly to freezing. Their magnitude is owing to a freſh acceſſion of matter as they paſs along. Hence we ſee the reaſon why hail is ſo frequent in ſummer, becauſe at that time greater quantities of nitre are exhaled from the earth, and float up and down the air. See RAIN and FROST.

HAIMSUCKEN, in Scots law, the aſſaulting or beating a man in his own houſe. See SCOTS LAW, title 33.

HAIR, ſlender, oblong, and flexible filaments, growing out of the pores of animals, and ſerving moſt of them as a covering. See ANATOMY, p. 256.

HAKE, in ichthyology. See GADUS.

HALBERSTAT, a city of Germany, in the circle of Upper Saxony, the capital of the duchy of the ſame name; ſubject to the king of Pruſſia, E. long. 11° 6′, N. lat. 51° 55′.

HALCRYPTIUM, a name given by Dr Hill to the ſalt ſuſpended in a fluid form, and in very ſmall quantities in mineral waters, ſcarce diſcernable by the taſte, and with much difficulty ſeparable from them.

HALCYON, in ornithology, a name given by the ancients to the alcedo, or kings-fiſher. See ALCEDO.

HALCYON DAYS, in antiquity, a name given to ſeven days before and as many after the winter ſolſtice; by reaſon the halycon, invited by the calmneſs of the weather, laid its eggs in neſts build in the rocks, cloſe by the brink of the ſea, at this ſeaſon.

HALE, in the ſea-language, ſignifies pull; as, to hale up, is to pull up; to hale in or out, is to pull in or out. To over-hale a rope, is to hale it too ſtiff, or to hale it the contrary way.

Keel-HALE. See DUCKING.

HALEM, a town of the Auſtrian Netherlands, in the province of Brabant, twenty-five miles weſt of Maeſtricht: E long. 5° 5′, N. lat. 51° 5′.

HALESWORTH, a market town of Suffolk, thirty-five miles eaſt of Bury: E. long. 1° 40′, N. lat. 52° 30′.

HALF-BLOOD, in law, is where a man marries a ſecond wife, the firſt being dead, and by the firſt venter has a ſon, and by his ſecond venter has likewiſe a ſon, the two brothers, in this caſe, are but of half blood.

HALF-MERK, a noble, or 6 s. 8 d.

HALF-MOON, in fortification, an outwork compoſed of two faces, forming a ſaliant angle, whoſe gorge is in form of a creſcent, or half moon; whence the name. See FORTIFICATION.

HALIÆTUS, in ornithology. See FALCO.

HALIOTIS, the EAR-SHELL, a genus of inſects belonging to the order of Vermes teſtacea. This is an animal of the ſnail-kind, with an open ſhell reſembling an ear. There are ſeven ſpecies, diſtinguiſhed by the figure of their ſhells.

HALL, in geography, a town of Germany, in the circle of Auſtria, and county of Tyrol, ſituated ſix miles north eaſt of Inſpruck: E. long. 11° 28′, N. lat. 47° 15′.

HALL is alſo a town of the Auſtrian Netherlands in the province of Brabant, ſeven miles ſouth of Bruſſels: E. long. 4° 10′, N. lat. 50° 50′.

HALL is alſo a city of Germany, in the circle of Upper Saxony, in the capity of a duchy ſituated on the river Sala, ſubject to the king of Pruſſia: E. long. 12° 5′, N. lat. 51° 35′.

HALL is alſo a town of Germany, in the circle of Swabia, twenty miles eaſt of Hailbron; being an imperial city, or ſovereign ſtate: E. long. 9° 45′, N. lat. 49° 20′.

HALLAGE, a fee or toll paid for cloth brought to be ſold in Blackwell-hall, London.

HALLAMASS. See ALL-SAINTS.

HALLELUJA, a word ſignifying, praiſe the Lord.

The ſinging halleluja was a ſort of invitatory, or call to each other, to praiſe the Lord.

St Auſtin ſays, that in ſome churches, it was ſung only on Eaſter-day, and the fifty days of Pentecoſt; but that even in thoſe churches where it was moſt in uſe, it was never uſed in the time of lent.

HALLEN, a town of the Auſtrian Netherlands, in the province of Brabant: E. long. 5°, N. lat. 50° 55′.

HALLEIN, a town of Germany, in the archbiſhopric of Saltzburg: E. long. 13° 6′, N. lat. 47° 36′.

HALLER, a town in the Netherlands, in the province of Brabant: E. long. 5°, N. lat. 50° 40′.

HALLERIA, in botany a genus of the didynamia angioſpermia claſs. The calix has three ſegments, and the corolla four, the filaments are longer than the corolla; and the berry has two cells. There is but one ſpecies, a native of Æthiopia.

HALLIFAX, a large market town in the weſt riding of of Yorkſhire, thirty-four miles ſouth-weſt of York: W. long. 1° 40′, N. lat. 53° 45′.

HALMSTAT, a port-town of Gothland in Sweden, eighty miles ſouth of Gottenberg: E. long. 13° 5′, N. lat. 56° 45′.

HALO, a meteor in the form of a luminous ring or circle, of various colours, appearing round the bodies of the ſun, moon, or ſtars.

Concerning the production of halos, Sir Iſaac Newton intimates, that they are formed by the light which comes through the drops of rain, by two refractions, without any reflection; but how this may be, is not eaſy to conceive.

HALTWESEL, a market-town of Northumberland, thirty-two miles weſt of Newcaſtle: W. long. 2°, N. lat. 55°. ′

HAM, in anatomy, the part behind the knee.

Ham, in geography, a city in Germany, in the circle of Weſtphalia, and the capital of the county of Mark, ſubject to Pruſſia: E. long. 7° 15, N. lat. 51° 35′.

HAMA, or Apamea. See Apamea.

HAMADAN, a city of Perſia, in the province of Eyrac Agem, 200 miles north-weſt of Iſpahan; E. long. 47° 35′, N. lat 35°.

HAMADRYADS, in heathen theology, certain rural deities; being nymphs of the woods, whoſe fate depended upon certain trees, together with which they were ſuppoſed both to be born and to die.

HAMAMELIS, in botany, a genus of the tetrandria digynia claſs. The involucrum conſiſts of three leaves, and the proper calix of four; the petals are four; and the nut has two cells. There is but one ſpecies, a native of Virginia.

HAMAXOBIANS, *hamaxobii*, an ancient people of Europian Sarmatia, ſo called from their living together in chariots or waggons, for the conveniency of ſhifting the place of their abode at pleaſure.

HAMBURGH, a large city and well fortified port town of Germany, in the circle of Lower Saxony, and duchy of Holſtein, ſituated on the north ſide of the river Elb, partly on iſlands, and partly on the continent. It is an imperial city, or ſovereign ſtate, governed by its own magiſtrates, and ſubject only to the general laws of the empire. Merchants from all parts of Europe reſort to it, from whence their goods are ſent into the heart of the empire: E. long. 9° 40′, N. lat. 54°.

HAMCHEU, the capital of the province of Chekiam, in China, ſituated on the river Cienton, 160 miles ſouth-eaſt of Nanking: E. long. 120°, N. lat. 30°.

HAMELIN, a town of Germany, in the circle of lower Saxony, and duchy of Brunſwic, ſubject to the elector of Hanover: E. long. 9° 12′, N. lat. 52° 15′.

HAMILTON, a town of Scotland, in the county of Clydeſdale, ſituated on the river Clyde, eleven miles ſouth-eaſt of Glaſgow: W. long. 3° 50′, N. lat. 55° 40′

HAMLE, the name of the eleventh month of the Ethiopian year, beginning on the 25th of June, old ſtyle.

HAMMONT, a town of Germany, in the circle of Weſtphalia, and biſhopric of Liege, ſituated near the confines of Brabant: E. long. 5° 32′, N. lat. 51° 20′.

HAMPSHIRE, an Engliſh country, bounded by Berkſhire, on the north; by Surry and Suſſex, on the eaſt; by the Engliſh channel, on the ſouth; and by Wiltſhire and Dorſetſhire, on the weſt. It comprehends the iſle of Wight. Its chief towns are Wincheſter, Southampton, and Portſmouth.

New Hampshire, a province of New England, in North America, bounded by Nova Scotia, on the north; by the Atlantic ocean, on the eaſt; by the province of Maſſachuſets bay, on the ſouth; and by New York, on the weſt: ſubject to Great Britain.

HAMPSTEAD, a pleaſant village in Middleſex, four miles north of London.

HAMPTON, a market-town of Glouceſterſhire, twelve miles ſouth of Glouceſter: W. long. 2° 15. N. lat. 51° 38′.

HAMPTON-COURT, a town in Middleſex, ſituated on the north ſide of the Thames, twelve miles weſt of London, and two weſt of Kingſton; in which is the fineſt palace belonging to the king of Britain.

HANAU, the capital of a county of the ſame name in Germany, is pleaſantly ſituated on the river Kunts, thirteen miles eaſt of Frankfort, and twelve north-weſt of Aſchaffenburgh: E. long. 8° 45′. N. lat. 50° 12′.

HAND, in anatomy. See Anatomy, Part I. II. &c.

Hand, in the manege, a meaſure of four inches, or of a clinched fiſt, by which the height of a horſe is computed.

Hand-breadth, a meaſure of three inches.

Hands, in heraldry, are borne in coat armour dexter and ſiniſter, that is, right and left, expanded or open. Theſe are the moſt neceſſary parts of the human body, as they ſerve to expreſs all ſorts of actions, and even our very thoughts and deſigns; thus, joining of hands is an univerſal token of friendſhip, and clapping of hands a general mark of applauſe.

HANOVER, a city of Germany, in the circle of Lower Saxony, and dukedom of Brunſwic, ſituated on the river Leina, thirty-ſix miles weſt of Brunſwic: it is the capital of his Britannic majeſty's German dominions, ſituated in E. long. 9° 45′. N. lat. 52° 32′.

HANSE, or Hans, a company of merchants united for the promotion and advantage of trade.

Hanse-towns, port-towns of Germany of which Lubec and Hamburgh were the chief. They were formerly all of them imperial cities, confederated for their mutual defence, and the protection of their trade.

HAPPINESS, among philoſophers, conſiſts in the proſecution or enjoyment of ſome good.

HARBINGER, an officer of the king's houſhold, having four yeomen under him, who ride a day's journey before the court, when it travels, to provide lodgings, &c.

HARBOROUGH, a town of Leiceſter ſhire, thirteen miles ſouth-eaſt of Leiceſter: W. long. 1°. N. lat. 52°. 26′.

HARBOUR, a place where ſhips may ride ſafe at anchor, chiefly uſed in ſpeaking of thoſe ſecured by a boom and chain, and furniſhed with a mole.

HARBURGH, a port town of Germany, in the circle of Lower Saxony, and duchy of Lunenburg, ſituated on the river Elbe, oppoſite to Hamburgh: E. long. 9° 30′. N. lat. 53° 57.

HARCOURT, a town of France, in the province of Normandy, twenty-three miles ſouth-weſt of Rouen.

HARDENING, the giving a greater degree of hardneſs to bodies than they had before.

There are ſeveral ways of hardening iron and ſteel, as by hammering them, quenching them when hot in cold water, &c. Chemistry, p 134.

HARDERWICK, a town of Guelderland, in the United Netherlands, twenty-three miles north weſt of Zutphen: E. long. 5° 30'. N. lat. 52° 35'.

HARDNESS, in phyſiology, that quality in bodies whereby their parts cohere firmly together, ſo as not to give way to any external impulſe, nor yield inwards, without breaking.

In this ſenſe hardneſs coincides with what on other occaſions we call firmneſs, in oppoſition to ſoftneſs and fluidity.

HARE, in zoology. See Lepus.

Hare-lip, in ſurgery. See Surgery.

HARENGUS. See Clupea.

HARFLEUR, a port-town of France, in the province of Normandy, ſituated near the mouth of the Seyne, four miles weſt of Havre de Grace: E. long. 15° N. lat. 49° 30'.

HARIOT, or Heriot, in law, a due belonging to a lord at the death of his tenant, conſiſting of the beſt beaſt, either horſe, ox, or cow, which he had at the time of his death; and in ſome manors, the beſt goods, piece of plate, *&c.* are called hariots.

HARLEBECK, a town of the Auſtrian Netherlands, in the province of Flanders, ſituated on the river Lys, ſix miles north-eaſt of Courtray: E. long. 3° 15', N. lat. 50° 50'.

HARLEQUIN, a buffoon or merry andrew; but is now uſed for a perſon of extraordinary agility, dreſſed in party-coloured cloaths, the principal character in a pantomime entertainment. See Pantomime.

HARLESTON, a market-town of Norfolk, ſituated on the river Waveney, fourteen miles ſouth of Norwich: E. long. 1° 25', N. lat. 52° 35'.

HARLINGEN, a port-town of the United Netherlands, in the province of Weſt Frieſland, ſituated on the German ſea: E. long 5° 20', N. lat. 53° 15'.

HARLOW, a market-town of Eſſex, ſituated fifteen miles weſt of Chelmsford: E. long. 6', N. lat. 51° 45'.

HARMONICAL, ſomething belong to harmony. See Harmony.

Harmonical composition, in a general ſenſe, includes both harmony and melody, *i. e.* of muſic or ſongs, both in a ſingle part, and in ſeveral parts.

Harmonical series, a ſeries of many numbers in continual harmonical proportion. Thus, if there are four or more numbers, of which every three immediate terms are harmonical, the whole will make an harmonical ſeries: ſuch is 30 : 20 : 15 : 12 : 10. Or, if every four terms immediately next each other are harmonical, it is alſo a continual harmonical ſeries, but of another ſpecies, as 3, 4, 6, 9, 18, 36, *&c.*

Harmonical sounds, an appellation given, by Mr Sauveur, to ſuch ſounds as always make a determinate number of vibrations, in the time that one of the fundamentals, to which they are referred, makes one vibration.

Harmonical ſounds are produced by the parts of chords, *&c.* which vibrate a certain number of times, while the whole chord vibrates once.

The relations of ſounds had only been conſidered in the ſeries of numbers, 1 : 2, 2 : 3, 3 : 4, 4 : 5, *&c.* which produced the intervals called octave, fifth, fourth, third, *&c.* Mr Sauveur firſt conſidered them in the natural ſeries, 1, 2, 3, 4, 5, *&c.* and examined the relations of ſounds ariſing therefrom. The reſult is, that the firſt interval, 1 : 2, is an octave; the ſecond, 1 : 3, a twelfth; the third, 1 : 4, a fifteenth, or double octave; the fourth, 1 : 5, a ſeventeenth; the fifth, 1 : 6, a nineteenth, *&c.*

This new conſideration of the relations of ſounds is more natural than the old one; and is, in effect, all the muſic that nature makes without the aſſiſtance of art.

HARMONICS, that part of muſic which conſidered the differences and proportions of ſounds, with reſpect to acute and grave; in contradiſtinction to rythmica and metrica.

HARMONY, in muſic, the agreeable reſult or union of ſeveral muſical ſounds heard at one and the ſame time; or the mixture of divers ſounds, which together have an effect agreeable to the ear.

Harmony *of the ſpheres*, or *Celeſtial* **Harmony**, a ſort of muſic much talked of by many of the ancient philoſophers and fathers, ſuppoſed to be produced by the ſweetly tuned motions of the ſtars and planets. This harmony they attributed to the various proportionate impreſſions of the heavenly globes upon one another, acting at proper intervals. It is impoſſible, according to them, that ſuch prodigious large bodies, moving with ſo much rapidity, ſhould be ſilent; on the contrary, the atmoſphere continually impelled by them, muſt yield a ſet of ſounds proportionate to the impreſſion it receives; conſequently, as they do not all run the ſame circuit, nor with one and the ſame velocity, the different tones ariſing from the diverſity of motions, directed by the hand of the Almighty, muſt form an admirable ſymphony, or concert.

They therefore ſuppoſed, that the moon, as being the loweſt of the planets, correſponded to *mi*; mercury, to *fa*; venus, to *ſol*; the ſun, to *la*; mars, to *ſi*; jupiter, to *ut*; ſaturn, to *re*; and the orb of the fixed ſtars, as being the higheſt of all, to *mi*, or the octave.

HARP, a muſical inſtrument of the ſtring-kind, of a triangular figure, held upright between the legs of the perſon who plays upon it.

HARPIES, among the ancient poets, fabulous impure monſters, ſaid to be the daughters of Neptune and Earth. Virgil mentions three of them, Aello, Ocypete, and Celœno; they are deſcribed to be fowls, with the face of a virgin, bears ears, their bodies like vultures, and hands like their crooked talons.

HARPINEER, or Harponeer, the perſon who manages the harping-iron.

HARPSICHORD, the moſt harmonious of all the muſical inſtruments of the ſtring-kind. It is played on after the manner of the organ, and is furniſhed with a ſet, and ſometimes with two ſets of keys; the touching or ſtriking of theſe keys moves a kind of little jacks, which alſo move a double row of chords or ſtrings, of braſs or iron, ſtretched over four bridges on the table of the inſtrument.

HARQUEBUSS, a piece of fire-arms, of the length of a muſket, uſually cocked with a wheel. It carried a ball that weighed one ounce ſeven eighths.

There was alſo a larger ſort, called the great harquebuſs, uſed for the defence of ſtrong places, which carried a ball of about three ounces and a half: but they are now but little uſed, except in ſome old caſtles, and by the French in ſome of their garriſons.

HARRIER, a kind of hound, endowed with an admirable gift of ſmelling, and very bold in the purſuit of his game.

HARROW, in agriculture. See Agriculture, p. 58.

HART, a ſtag, or male deer, in the ſixth year. See Cervus.

Hart's horns, in pharmacy, the whole horns of the common male deer, as ſeparated from the head, without farther preparation.

The chemical analyſis of hart's-horn is ſufficiently known: it yields a water highly impregnated with a volatile ſalt, which is called ſpirit of hart's-horn, with a fetid oil, and a volatile ſalt by the common diſtillation in a retort.

The ſalt of hart's horn is a great ſudorific, and is given in fevers of many kinds with great ſucceſs; the ſpirit has the ſame, and all the other virtues of volatile alkalis, and is uſed to bring people out of faintings by its pungency, on holding it under their noſe, and at the ſame time pouring ſome drops of it in water down the perſon's throat.

Hart-wort, in botany. See Tordyllium.

HARTFORD, the capital of Hartfordſhire, ſituated twenty-one miles north of London: W. long. 7′, and N. lat. 51° 45′.

Hartford is alſo a town of New England, in the province of Connecticut, ſituated 50 miles weſt of Boſton: W. long. 71° 15′, and N. lat. 42°.

HARTLAND, a market-town of Devon, ſituated near the Briſtol channel; it gives name to a cape, called Hartland-point, at the entrance of the Briſtol channel: W. long. 4° 45′, and N. lat. 51° 9′.

HARTLEPOOL, a port-town of the county of Durham, ſituated on the German ocean, fourteen miles ſouth-eaſt of Durham: W. long. 55′, and N. lat. 54° 40′.

HARVEST, the time or ſeaſon that the corn is ripe, and fit to be reaped and taken into barns.

HARWICH, a borough and port-town of Eſſex, ſixty-two miles north-eaſt of London: E. long. 1° 25′, N. lat. 52° 5′. It ſends two members to parliament.

HASLEM, an iſland of Denmark, in the Categate-ſea, north of the iſland of Zealand.

HASLEMERE, a borough-town of Surry, thirty eight miles ſouth-weſt of London, and ten miles ſouth-weſt of Guildford. It ſends two members to parliament.

HASSELT, a town of Weſtphalia, in Germany, fifteen miles north-weſt of Maeſtricht.

HASSIDEANS, or Assideans, an appellation given to thoſe Jews who reſorted to Mattathias, to fight for the law of God, and the liberties of their country.

HASSOCK, a baſs made of ruſhes, to kneel or reſt the feet upon in churches.

HASP and Staple, in Scots law, the ſymbol commonly uſed in burgage tenements for entering and infeſting an heir, by delivering into his hands the haſp and ſtaple of the door. See Scots Law, title 27.

HASTA, among medalliſts, a kind of javelin, not ſhod or headed with iron; or rather an ancient ſort of ſceptre, longer than ordinary, occaſionally given to all the gods.

HASTATED leaf. See Botany, p. 639.

HASTINGS, a borough-town of Suſſex, ſituated on the coaſt of the Engliſh channel, fifty miles ſouth-eaſt of London: E. long. 36′, and N. lat. 50° 50′.

HAT, a covering for the head, worn by the men in moſt parts of Europe. Thoſe moſt in eſteem are made of the pure hair of the caſtor or beaver; for they are alſo made of the hair or wool of divers other animals, and that by much the ſame proceſs.

Method of making Hats. To make the beaver-hats, they tear off the long and ſhort hair from the ſkin, with knives ſuitable to the occaſion: after which they proportion the quantity of the ſeveral ſorts of beaver-hair, by mixing one third of the dry caſtor to two thirds of old-coat, which is a term for a ſkin that has been worn ſome time by the Indians of America, who catch and ſell them to the Europeans. The hair, ſo mixed, is carded and weighed out into parcels, according to the ſize and thickneſs of the hat intended. The ſtuff is now laid on the hurdle, with an inſtrument called a bow, reſembling that of a violin, but larger; whoſe ſtring being worked with a ſmall bow-ſtick, and made to play on the furs, they fly, and mix themſelves together, the duſt and filth at the ſame time paſſing through the chinks. Inſtead of a bow, ſome hat-makers uſe a ſearce of hair, through which they paſs the ſtuff. Thus hats are formed of an oval figure, ending with an acute angle at the top: with what ſtuff remains, they ſtrengthen them where ſlendereſt, yet deſignedly make them thicker in the brim near the crown, than towards the circumference, or in the crown itſelf. They next harden the ſtuff, ſo managed, into more compact flakes, by preſſing down a hardened leather upon it. This done, they are carried to the baſon, upon which laying one of the hardened hats, they ſprinkle it over with water, and mould it; and the heat of the fire, with the water and preſſing, imbody the ſtuff into a ſlight hairy ſort of felt; after which, turning up the edges all round over the mould, they lay it by, and proceed with another; which being in like manner reduced to the ſame conſiſtence and form, they are both joined together, ſo as to make them meet in an angle at top, making only one conical cap. The next proceſs is to remove the hat to a trough, reſembling a mill-hopper, which is a copper kettle filled with water and grounds, kept hot for the purpoſe; and, after being dipped in the kettle, the hat is laid on the ſloping ſide, called the plank. Here they proceed to work it, by rolling and unrolling it again and again, one part after another, firſt with the hand, and afterwards with a ſmall wooden roller, taking care to dip it from time to time, till at length, by thus fulling and thickening it four or five hours, it is brought to the dimenſions intended. In this violent labour, the workmen uſually guard their hands with thick leather, which they call gloves. The hat thus wrought into the form of a conical cap, is reduced into proper ſhape on a block of the ſize of the intended crown, by tying it round with a ſtring, called a commander; after which, with a bent iron, called a ſtamper, they gradually beat down the commander all round, till it has reached the bottom of the block, and what remains at the bottom below the ſtring forms the brim In this ſtation it is ſet to dry, and afterwards ſinged, by holding it over the blaze of a fire, made of ſtraw, or ſhavings: it is then rubbed with pumice-ſtone, to take off the coarſer nap; then rubbed over with ſeal ſkin, to lay the nap ſtill finer; and, laſtly, carded with a fine card, to raiſe the fine cotton, with which the hat is to appear when finiſhed: then fitting it to the block, they tie it, cut round the edges, and deliver it to the dyers. (See Dying.) The dye being completed, the hat is dried by being hung in the roof of a ſtove heated with a charcoal-fire; and, when dry, it is ſtiffened with melted glue, or rather gum-ſenega, which is ſmeared over the hat with a bruſh, and rubbed in with the hand. Then, having ſpread a cloth over the ſteaming baſon, which is a little fire-place raiſed about three feet high, with an iron plate laid over it, exactly covering the fire, the hat is laid uoon the cloth, with the brim downwards, the cloth being firſt ſprinkled with water, to raiſe a ſtrong ſteam, to force in the ſtiffening. When it is moderately hot, the workman ſtrikes gently on the brim, with the flat of his hand, to make the joinings incorporate and bind ſo as not to appear, turning it from time to time, and at laſt ſetting it on the crown. And when it has been ſufficiently ſteamed and dried, it is put again on the block, bruſhed, ironed, well ſmoothed, and fitted for lining.

Hats make a conſiderable article in commerce: England ſupplies Spain, Portugal, Italy, and Germany, with extraordinary quantities of them; and as our manufacturers have the reputation of making the beſt hats in Europe, their importation is prohibited.

Hats are alſo made for womens wear, of chips, ſtraw, or cane, by platting, and ſewing the plats together; beginning with the centre of the crown, and working round till the whole is finiſhed Hats for the ſame purpoſe are alſo wove and made of horſe-hair, ſilk, *&c.*

HATCHEL, or **Hitchel**, a tool with which flax and hemp are combed into fine hairs. It conſiſts of long iron pins, or teeth, regularly ſet in a piece of board.

HATCHES, in a ſhip, a kind of trap-doors between the main-maſt and fore-maſt, through which all goods of bulk are let down into the hold.

Hatch-way, the place where the hatches are. Thus, to lay a thing in the hatch way, is to put it ſo, that the hatches cannot be come at, or opened.

HATCHING, the maturating fecundated eggs, whether by the incubation and warmth of the parent-bird, or by artificial heat, ſo as to produce young chickens alive.

The art of hatching chickens by means of ovens has long been practiſed in Egypt; but it is there only known to the inhabitants of a ſingle village named Berme, and to thoſe that live at a ſmall diſtance from it. Towards the beginning of autumn they ſcatter themſelves all over the country, where each perſon among them is ready to undertake the management of an oven, each of which is of a different ſize, but in general they are capable of containing from forty to fourſcore thouſand eggs. The number of theſe ovens placed up and down the country is about three hundred and eighty-ſix, and they uſually keep them working for about ſix months: as therefore each brood takes up in an oven, as under a hen, only twenty-one days, it is eaſy in every one of them to hatch eight different broods of chickens. Every Bermean is under the obligation of delivering to the perſon who intruſts him with an oven, only two thirds of as many chickens as there have been eggs put under his care; and he is a gainer by this bargain, as more than two thirds of the eggs uſually produce chickens. In order to make a calculation of the number of chickens yearly ſo hatched in Egypt, it has been ſuppoſed, that only two thirds of the eggs are hatched, and that each brood conſiſts of at leaſt thirty thouſand chickens; and thus it would appear, that the ovens of Egypt give life yearly to at leaſt ninety-two millions ſix hundred and forty thouſand of theſe animals.

This uſeful and advantageous method of hatching eggs has been lately diſcovered in France, by the ingenious Mr Reaumur, who, by a number of experiments, has reduced the art to certain principles. He found by experience that the heat neceſſary for this purpoſe is nearly the ſame with that marked 32 on his thermometer, or that marked 96 on Farenheit's. This degree of heat is nearly that of the ſkin of the hen, and, what is remarkable, of the ſkin of all other domeſtic fowls, and probably of all other kinds of birds. The degree of heat which brings about the developement of the cygnet, the goſling, and the turkey-pout, is the ſame as that which fits for hatching the canary-ſongſter, and, in all probability, the ſmalleſt humming bird: the difference is only in the time during which this heat ought to be communicated to the eggs of different birds: it will bring the canary bird to perfection in eleven or twelve days, while the turkey-pout will require twenty ſeven or twenty-eight.

After many experiments, Mr Reaumur found that ſtoves heated by means of a baker's oven, ſucceeded better than thoſe made hot by layers of dung: and the furnaces of glaſs-houſes, and thoſe of the melters of metals, by means of pipes, to convey heat into a room, might, no doubt, be made to anſwer the ſame purpoſe. As to the form of the ſtoves, no great nicety is required; a chamber over an oven will do very well; nothing more will be neceſſary but to aſcertain the degree of heat, which may be done by melting a lump of butter, of the ſize of a walnut, with half as much tallow, and putting it into a phial; this will ſerve to indicate the heat with ſufficient exactneſs, for when it is too great, this mixture will become as liquid as oil, and when the heat is too ſmall, it will remain fixed in a lump; but it will flow like a thick ſyrup, upon inclining the bottle, if the ſtove be of a right temper: great attention therefore ſhould be given to keep the heat always at this degree, by letting in freſh air, if it be too great, or ſhutting the ſtove more cloſe, if it be too ſmall; and that all the eggs in the ſtove may equally ſhare the irregularities of the heat, it will be neceſſary to ſhift them from the ſides to the centre; thereby imitating the hens, who are frequently ſeen to make uſe of their bills, to puſh to the outer parts thoſe eggs that were neareſt to the middle of their neſts, and to bring into the middle ſuch as lay neareſt the ſides.

Mr Reaumur has invented a ſort of low boxes, without bottoms, and lined with furs. Theſe, which he calls artificial parents, not only ſhelter the chickens from the injuries of the air, but afford a kindly warmth, ſo that they preſently take the benefit of their ſhelter as readily as they would have done under the wings of a hen. After hatching, it will be neceſſary to keep the chickens, for ſome time, in a room artfully heated and furniſhed with theſe boxes; but afterwards they may be ſafely expoſed to the air in the court yard, in which it may not be amiſs to place one of theſe artificial parents to ſhelter them if there ſhould be occaſion for it.

As to the manner of feeding the young brood, they are generally a whole day after being hatched, before they take any food at all; and then a few crumbs of bread may be given them for a day or two, after which they will begin to pick up inſects and graſs for themſelves.

But to ſave the trouble of attending them, capons may be taught to watch them in the ſame manner as hens do. Mr Reaumur aſſures us, that he has ſeen above two hundred chickens at once, all led about and defended only by three or four ſuch capons. Nay, cocks may be taught to perform the ſame office, which they, as well as the capons, will continue to do all their lives after.

HATFIELD, a market-town of Hartfordſhire, ſituated twenty miles north-weſt of London.

HATHERLY, a market-town of Devonſhire, twenty miles north weſt of Exeter.

HATTEM, a town of Gelderland, one of the United Provinces: E. long. 6°, N. lat. 52° 30′.

HATTOCK, a ſhock of corn containing twelve ſheaves: others make it only three ſheaves laid together.

HATUAN, a town of Upper Hungary, fifteen miles north-eaſt of Buda: E. long. 19° 35′, and N. lat. 47° 48′.

HAVANNA, a port-town of the iſland of Cuba, in America, ſituated at the entrance of the gulph of Mexico; ſubject to Spain: W. long. 84°, and N. lat. 23°.

HAVANT, a market-town of Hampſhire, ſix miles north-eaſt of Portſmouth.

HAVEL, a river of Brandenburg, in Germany, which receives the river Spree, near Berlin, and diſcharges itſelf into the Elbe, a little below Havelburg.

HAVELBURG, a town of Germany, in the circle of Upper Saxony, and marquiſate of Brandenburg, ſubject to the king of Pruſſia: E. long. 12° 44′, and N. lat. 53°.

HAVEN, a ſea-port or harbour. See HARBOUR.

HAVERFORD-WEST, a borough-town of Pembrokeſhire, in ſouth Wales, ſituated twelve miles ſouth-eaſt of St David's. It ſends only one member to parliament.

HAUNCH, or HANCH, the hip, or that part of the body between the laſt ribs and the thigh.

HAVRE DE GRACE, is a port-town of France, in the province of Normandy, ſituated on the Engliſh channel, at the mouth of the river Seyne: E. long. 10′, and N. lat. 49° 30′.

HAUTBOY, a muſical inſtrument of the wind-kind, ſhaped much like the flute, only that it ſpreads and widens towards the bottom, and is ſounded through a reed. The treble is two feet long; the tenor goes a fifth lower, when blown open: it has only eight holes; but the baſs, which is five feet long, has eleven.

HAW, a ſort of berry, the fruit of ſeveral ſpecies of meſpilus, thence denominated haw-thorns. See MESPILUS.

HAW, among farriers, an excreſcence reſembling a griſtle, growing under the nether eye-lid and eye of a horſe, which, if not timely removed, will put it quite out. See FARRIERY.

HAWK. See FALCO.

HAWKING, the exerciſe of taking wild-fowl by means of hawks.

HAWSER, in the ſea-language, a large rope, or a kind of ſmall cable, ſerving for various uſes a-board a ſhip, as to faſten the main and fore ſhrouds, to warp a ſhip as ſhe lies at anchor, and wind her up to it by a capſtan, *&c.* The hawſer of a man of war may ſerve for a cable to the ſheet-anchor of a ſmall ſhip.

HAWSES, in a ſhip, are two large holes under the bow, through which the cables run when ſhe lies at anchor.

HAY, any kind of graſs, cut and dried, for the food of cattle.

The time of mowing graſs for hay, muſt be regulated according to its growth and ripeneſs; nothing being more prejudicial to the crop than mowing it too ſoon, becauſe the ſap is not then fully come out of the root, and when made into hay, it ſhrinks away to nothing. It muſt not, however, be let ſtand too long, till it have ſhed its ſeeds. When the tops of the graſs look brown, and begin to bend down, and the red honey-ſuckle flowers begin to wither, you may conclude it ripe for mowing.

St Foin-HAY. See AGRICULTURE, p. 65.

HAY, in geography, a market-town in Brecknockſhire, ſouth Wales, thirteen miles north-eaſt of Brecknock.

HAYNAULT, a province of the Netherlands, bounded by Brabant and Elanders, on the north; by Namur and Liege, on the eaſt; by the Cambreſis, Picardy, and Champaign, on the ſouth; and by Artois, and another part of Flanders, on the weſt: the north part is ſubject to the houſe of Auſtria, and the ſouth part to France. Its capital is Mons.

HAYWARD, the perſon who keeps the common herd or cattle of a town.

HAZARD, a game on dice, without tables, is very properly ſo called; ſince it ſpeedily makes a man, or undoes him.

It is played with only two dice; and as many may play at it as can ſtand round the largeſt round table.

Two things are chiefly to be obſerved, *viz.* main and chance; the latter belonging to the caſter, and the former, or main, to the other gameſters. There can be no main thrown above nine, nor under five; ſo that five, ſix, ſeven, eight, and nine, are the only mains flung at hazard. Chances and nicks are from four to ten: thus four is a chance to nine, five to eight, ſix to ſeven, ſeven to ſix, eight to five; and nine and ten a chance to five, ſix, ſeven, and eight: in ſhort, four, five, ſix, ſeven, eight, nine, and ten, are chances to any main, if any of theſe nick it not. Now nicks are either when the chance is the ſame with the main, as five and five, or the like; or ſix and twelve, ſeven and eleven, eight and twelve. Here obſerve, that twelve is out to nine, ſeven, and five; eleven is out to nine, eight, ſix, and five; and ames-ace and duce-ace, are out to all mains whatever.

HAZLE, in botany. See CORYLUS.

HAZLE-EARTH, or **HAZLEY-EARTH**, a kind of red loam, which is ſaid to be an excellent mixture with other ſorts of earth; uniting what is too looſe, cooling what is too hot, and gently entertaining the moiſture.

HEAD, in anatomy. See ANATOMY, Part I. II. &c.

HEAD-ACH, a moſt troubleſome ſenſation in the head, produced by various cauſes, and attended with different ſymptoms, according to its different degrees, and the place where it is ſeated. See MEDICINE.

Dragon's **HEAD**, in aſtronomy, &c. is the aſcending node of the moon, or other planet.

HEADFORD, a town of Galway, in Ireland, twelve miles north of the city of Galway.

HEALTH is a right diſpoſition of the body, and of all its parts; conſiſting in a due temperature, a right conformation, juſt connection, and ready and free exerciſe of the ſeveral vital functions.

HEAM, in beaſts, is the ſame with the ſecundines, or after-birth in women.

HEARING, the ſenſe whereby we perceive ſounds.

The organ of hearing is the ear, and particularly the auditory nerve and membrane. See ANATOMY, p. 295.

This membrane, in the various degrees of tenſion and relaxation, adapts itſelf to the ſeveral natures and ſtates of ſonorous bodies; becoming tenſe for the reception of acute ſounds, and relaxed for the admiſſion of grave ſounds. In ſhort, it is rendered tenſe and relaxed in a thouſand different degrees, according to the various degrees of acuteneſs or gravity in ſounds.

Sound, then, is in effect nothing but a certain modulation of the air, which being collected by the external ear, paſſes through the meatus auditorius, and beats upon the membrane of the tympanum, which moves the bones in the tympanum: theſe move the internal air, which finally communicates the motion to the auditory nerve, in the labyrinth and cochlea; and according as the vibrations are quick or ſlow, the ſound is either acute or grave.

It deſerves obſervation, that though the air be the uſual matter of ſounds; ſo that if a bell be hung in vacuo, it will not be heard at all; yet moſt other bodies, properly diſpoſed, will do its office, only ſome more faintly than others. Thus a ſound may be heard through water, or even through earth, of which there are various inſtances.

As the ſight is aſſiſted by ſpectacles, or other glaſſes; ſo the hearing is enlivened and rendered quick, by means of acouſtic inſtruments; which are of various figures, but for the moſt part bear ſome reſemblance to a trumpet, diverging and growing wider towards the external mouth.

HEARSE, among ſportſmen, a hind of the ſecond year of her age.

HEART, in anatomy. See ANATOMY, p. 278.

Force of the **HEART**. Several ingenious perſons have, from time to time, attempted to make eſtimates of the force of the blood in the heart and arteries; who have as widely differed from each other, as they have from the truth, for want of a ſufficient number of data to argue upon. This ſet the truly ingenious Dr Hales upon making proper experiments, in order to aſcertain the force of the blood in the veins and arteries of ſeveral animals.

If, according to Dr Keil's eſtimate, the left ventricle of a man's heart throw out in each ſyſtole an ounce or 1.638 cubic inches of blood, and the area of the orifice of the aorta be $=0.4187$; then dividing the former by this, the quotient 3.9 is the length of the cylinder of blood, which is formed in paſſing through the aorta in each ſyſtole of the ventricle; and in the ſeventy-five pulſes of a minute, a cylinder of 292.5 inches in length will paſs: this is at the rate of 1462 feet in an hour. But the ſyſtole of the heart being performed in one third of this time, the velocity of the blood in that inſtant will be thrice as much, *viz.* at the rate of 4386 feet in an hour, or 73 feet in a minute. And if the ventricle throws out one ounce in a pulſe, then in the ſeventy five pulſes of a minute, the quantity of blood will be equal to 4.4 ℔ 11 oz. and, in thirty-four minutes, a quantity equal to a middle-ſized man, *viz.* 158 ℔. will paſs through the heart. But if, with Dr Harvey and Dr Lower, we ſuppoſe two ounces of blood, that is, 3.276 cubic inches, to be thrown out at each ſyſtole of the ventricle, then the velocity of the blood in entering the orifice of the aorta, will be double the former, *viz.* at the rate of 146 feet in a minute, and a quantity of blood equal to the weight of a man's body will paſs in half the time, *viz.* 17 minutes.

If we ſuppoſe, what is probable, that the blood will riſe $7+\frac{1}{2}$ feet high in a tube fixed to the carotide artery of a man, and that the inward area of the left ventricle of his heart is equal to fifteen ſquare inches; theſe multiplied into 7+½ feet, give 1350 cubic inches of blood, which preſſes on that ventricle, when it firſt begins to contract, a weight equal to 15.5 pounds.

What the doctor thus calculates, from ſuppoſition, with regard to mankind, he actually experimented upon horſes, dogs, fallow-does, *&c.* by fixing tubes, in orifices opened in their veins and arteries; by obſerving the ſeveral heights, to which the blood roſe in theſe tubes, as they lay on the ground; and by meaſuring the capacities of the ventricles of the heart, and orifices of the arteries. And, that the reader may the more readily compare the ſaid eſtimates together, he has given a table of them, ranged in the following order.

The ſeveral animals.	Weight of each.		Height of the blood in the tube from the jugular vein.	Height of the blood in tubes fixed to arteries.		Capacity of the left ventricle of the heart.	Area of the orifice of the aorta.	Velocity of the blood in the aorta.	Quantities of blood equal to the weight of the animal, in what time.	How much in a minute	Weight of the blood ſuſtained by the left ventricle contracting.	Nº of pulſes in a minute.	Area of tranſverſe ſection of deſcending aorta.	Area of the tranſverſe ſection of aſcending aorta.
	Pounds.	Ounces.	Inches.	Feet	Inches.	Cubic inches.	Square inches.	Feet and inches in a minute.	Minutes.	Pounds.	Pounds.		Square inches.	Square inches.
Man	160		On ſtraining.	7	6	1.659	0.4187	56.55	34.18	4 38	51.5	75		
						3.318		113.3	17.5	9.36				
Horſe 1ſt.				8	3									
2d.				9	8									
3d.	825		12 52	9	6	10	1.036	86.85	60	13.75	113.22	86	0.677	0.369
Ox	1600					12.5	1.539	76.95	88	18.14		38	0.912	0.84
														right. left.
Sheep	91		5½ 9	6	5½	1 85	0.172	174.5	20	4.593	36.56	65	0.094	0.07 0.012
Doe				4	2	9	0.476						0.383	0.246
														right. left.
Dogs 1ſt.	52		0 6	6	8	1.172	0.196	144.77	11.9	4 34	33.61	97	0.106	0.041 0.034
2d.	24		5 7	2	8	1	0.185	130.9	6.48	3.7			0.102	0.031 0.009
3d.	18		5	4	8	0.633	0.118	130	7.8	2.3	19.8		0.07	0.022 0.009
4th.	12	8	4	3	3	0 5	0.101	120	6.7	1.85	11 1		0.061	0.015 0.007

HEAT, in phyſiology, one of the ſecondary qualities of bodies, produced by fire, and oppoſed to cold.

Under the article fire, we conſidered the ſun as the principal ſource of heat upon the earth's ſurface, and the confines of the earth and atmoſphere: without this, all the bodies upon our globe would doubtleſs grow rigid, lifeleſs, and fixed. It is this that ſtirs within them, as the main ſpring of their actions. Hence vegetation and animalization are evidently promoted; and hence the ocean and the atmoſphere continue in a fluid ſtate.

Heat in us is properly a ſenſation, excited by the action of fire; or it is the effect of fire on our organs of feeling. Hence it follows, that what we call heat is a particular idea or modification of our own mind, and not any thing exiſting in that form in the body that occaſions it. Heat, ſays Mr Locke, is no more in the fire that burns the finger, than pain is in the needle that pricks it. In effect, heat in the body that gives it, is only motion; and in the mind, only a particular idea.

Heat in the hot body, according to 'S Graveſande, is an agitation of the parts of the body, made by means of the fire contained in it: by ſuch an agitation a motion is produced in our bodies, which excites the idea of heat in our mind; ſo that heat in reſpect of us is nothing but that idea, and in the hot body nothing but motion. If ſuch motion expel the fire in right lines, it gives us the idea of light; if in a various and irregular motion, only heat.

Heat, with reſpect to our ſenſations, or the effect produced on us by a hot body, is eſtimated by its relation to the organ of feeling; no object appearing to be hot, unleſs its heat exceed that of our body. Whence the ſame thing to different perſons, or at different times to the ſame perſon, ſhall appear both hot and cold. The degree of heat is meaſured by the expanſion of the air, or ſpirit in the thermometer.

It has been juſtly obſerved, by ſome of our modern philoſophers, that actual or abſolute heat, is to ſenſible or relative heat, the ſame as motion is to velocity: for abſolute heat is nothing but the whole motion of all the parts of the ignited body; and ſenſible or relative heat, reſpects only the comparative velocity of the parts. Thus, equal bulks of mercury and water ſet in a ſand-heat, where the heat of the fire may be uniformly communicated to both, will acquire in equal times equal degrees of abſolute heat: but the relative heat of the water, or that which is ſenſible to the finger, will be near 14 times as great as that of the mercury, becauſe the water, having 14 times a leſs quantity of matter, will admit of velocity ſo much in proportion greater.

Again, if mercury and water have the ſame relative or ſenſible heat, that is, if both are heated in ſuch a manner as to cauſe an equal aſcent in the thermometer, then a quantity of mercury will heat 14 times as much water as the ſame quantity of water will do; or it will make the ſame quantity of cold water 14 times hotter than the ſame quantity of hot water can. All which is eaſy to be ſhewn by experiment, and abundantly proves, that heat and fire are wholly owing to the velocity of the parts of the heated or ardent body: on which theory the various phenomena of heat, cold, fire, burning, *&c.* are rationally accounted for. For, firſt, we are to conſider, that cold and heat are only comparative terms, or that the ſame thing may either be too hot, or too cold, according to the relative idea or ſtandard-degree. Thus, ice or ſnow is ſaid to be cold with reſpect to the finger, but ice or ſnow is warm if compared to a freezing mixture; ſo that if (as we commonly do) we make the hand or any part of the body the ſtandard of heat or cold, or the term of compariſon; then it is evident, 1. If the parts of any body, applied to the hand, have the ſame velocity as the parts of the hand, ſuch a body we naturally pronounce is neither hot nor cold. 2. If the particles of the body have a greater velocity than thoſe of the hand, we pronounce it warm, if the exceſs be ſmall; but hot, if it be great. 3. If the velocity of the parts of the body applied be leſs than that in the hand, the ſenſation then is what we call cold, which alſo may be in various degrees. 4. Hence it is plain, there can be no ſuch thing as abſolute cold, but where the particles of matter are abſolutely quieſcent or at reſt. 5. Hence alſo, there can be no ſuch thing as abſolute heat, becauſe no degree of velocity can be aſſigned but a greater is ſtill aſſignable, till we come to infinity, where we are quite loſt, as having no idea of infinite velocity or heat.

From this theory of heat and cold we may conclude, that there is no body in nature whoſe parts are not in motion, in ſome degree, ſince we have yet been able to diſcover no ultimate degree or limit of cold; and if any ſuch thing were to be found in nature, it is likely that it would be as impoſſible to bear or endure the teſt, as any extreme degree of heat; both heat and cold naturally tending to deſtroy the animated part, or teſt, in the extreme degrees: cold, by deſtroying the vital motion, and fixing the part rigid and inflexible; but heat, by putting the parts into too great an agitation, cauſing a greater velocity of the fluids, and diſſipation and a force of tenſion in the ſolids beyond what the natural ſtate of the body can bear; and therefore it will inevitably deſtroy it.

Heat, in the animal œconomy, known by the ſeveral names of natural heat, vital heat, innate heat, and animal heat, is commonly ſuppoſed to be that generated by the attrition of the parts of the blood, occaſioned by its circulatory motion, eſpecially in the arteries.

To what organs, or operations, the heat of the human body, and other animal bodies, is owing, is hitherto extremely doubtful. The opinions that at preſent prevail are, 1. That the heat of animal-bodies is owing to the attrition betwixt the arteries and the blood. 2. That the lungs are the fountain of this heat. 3. That the attrition of the parts of the ſolids on one another produce it. 4. That it is owing to the mechanical attrition of the particles of our fluids. To which opinions Dr Stevenſon of Edinburgh added a 5th, *viz.* That whole proceſs by which our aliment and juices are conſtantly undergoing ſome alteration.

The reaſonings in favour of theſe ſeveral opinions may be ſeen at large, as laid down by the above-mentioned author in an eſſay on the cauſe of animal-heat, in the Medical Eſſays, vol. vi. The chief arguments in favour of the firſt opinion, are, that if an artery is tied, or cut, the part to which it goes turns cold; and on the ceaſing of the pulſation of the arteries, cold and death follow. An increaſe of heat attends a briſk circulation, and a languid circulation is accompanied with a ſmall heat. One who burns in a fever, or is hot with exerciſe, has a full and frequent pulſe. In cold faintings, chloroſis, *&c.* the pulſe is ſmall and ſlow. To theſe they add, that the thermometer ſhews the arterial blood to be a little hotter than that of the veins.

This is accounted for from the conical figure of the arteries, from their fluxes and branches into exquiſitely ſmall capillaries; whence the reſiſtance, and conſequently the attrition, muſt be great, from the number, ſtrength, and elaſticity of their coats, from the propelling power of the heart, and their ſtrong reſiſtance. From all theſe it is inferred, that the particles of blood perpetually getting new motions, directions, and rotations, are attenuated, condenſed, have their angles grinded off, and are made homogeneous: hence, it is ſaid, follows the fluidity, red colour, and heat of the maſs, which is here perfected.

The ſecond opinion is, that the lungs are the fountain of heat in the human body. All that has been ſaid for the blood's being heated in the arteries is advanced to prove this hypotheſis, with conſiderable additions, *viz.* that in the lungs the blood-veſſels every where attend, divide, and ſubdivide, along with the ramifications of the wind-pipe; and as theſe are perpetually changing their ſituation and form, becoming longer or ſhorter, making more acute or more obtuſe angles, ſo muſt the concomitant blood-veſſels every moment make new angles, and give the blood new directions; that at laſt it enters into an exquiſitely fine net-work, ſpreads every where on the vaſtly thin air-veſicles, where theſe air-bladders are perpetually changing their angles, points of contact, their form, volume, interſtices, and ſo forth. From theſe and the elaſticity of the air, and weight of the atmoſphere, the blood is ſaid to be churned, preſſed backward and forward, broken and kneaded together, diſſolved and condenſed, made red and hot in reſpiration.

The third opinion is, that the cauſe of the animal heat is owing to the action of the ſolid parts upon one another. The reaſon in ſupport of this opinion, is, that the heart and arteries move moſt; thence that it is natural to think, that the heat ſhould be owing to this motion.

The fourth opinion is, the mechanical attrition of the particles of the fluids upon one another. Dr Stevenſon obſerves, that thoſe who ſupport this hypotheſis, muſt not only ſuppoſe that mechanical attrition begets heat, but begets itſelf without diminution; that they muſt not only ſhew what ſets this attrition agoing, but what maintains it, becauſe all mechanical force perpetually decreaſes in a reſiſting medium; in ſhort, that they muſt ſhew the poſſibility of a perpetuum mobile, the impoſſibility of which they themſelves demonſtrate.

The fifth opinion is, what Dr Stevenſon calls the animal proceſs, or that proceſs by which our aliment and fluids are perpetually undergoing ſome alteration. This proceſs, according to that writer, may be one *ſui generis*, ſomewhat of a middle nature betwixt fermentation and putrefaction; and he thinks it comes ſo near to the latter, that he chuſes to call it by that name. In putrefaction, which is a moſt powerful diſſolvent of bodies, the inteſtine action of their minute particles creates, collects, or ſome way or other is the cauſe or means of heat. The doctor thinks it probable that this proceſs is conſtantly carried on in all our juices, eſpecially where there is blood; and this is chiefly in the veins, ſo that the blood is both the fountain of heat and the firſt ſpring and motion.

The late Dr Mortimer, in the Philoſ. Tranſ. n° 476. gives it as his opinion, that the heat of animals is explicable from the phoſphorus and air they contain. Phoſphorus exiſts, at leaſt in a dormant ſtate, in animal fluids; and it is alſo known, that they all contain air: it is therefore only neceſſary to bring the phoſphoreal and aerial particles into contact, and heat muſt of conſequence be generated.

HEATH, in botany. See ERICA,

Berry-bearing HEATH. See EMPETRUM.

HEATHENS, in matters of religion. See PAGANS.

HEAVEN, literally ſignifies the expanſe of the firmament, ſurrounding our earth, and extended every way to an immenſe diſtance.

The Hebrews acknowledged three heavens: the firſt the aerial heaven, in which the birds fly, the winds blow, and the ſhowers are formed; the ſecond, the firmament in which the ſtars are placed; the third, the heaven of heavens, the reſidence of the Almighty, and the abode of ſaints and angels.

Heaven is conſidered by Chriſtian divines and philoſophers, as a place in ſome remote part of infinite ſpace, in which the omnipreſent Deity is ſaid to afford a nearer and more immediate view of himſelf, and a more ſenſible manifeſtation of his glory, than in the other parts of the univerſe. This is often called the empyrean, from that ſplendor with which it is ſuppoſed to be inveſted; and of this place the inſpired writers give us the moſt noble and magnificent deſcriptions.

The pagans conſidered heaven as the reſidence only of the celeſtial gods, into which no mortals were admitted after death, unleſs they were deified. As for the ſouls of good men, they were conſigned to the elyſian fields. See ELYSIAN FIELDS.

HEBDOMARY, a ſolemnity of the ancient Greeks, in honour of Apollo, in which the Athenians ſung hymns in honour of that god, and carried in their hands branches of laurel. The word ſignifies the ſeventh day, this ſolemnity being obſerved on the ſeventh day of every lunar month.

HEBENSTRETIA, in botany, a genus of the didynamia angioſpermia claſs. The calix is bilabiated; the corolla has but one labium, conſiſting of four ſegments; and the capſule contains two ſeeds. There are two ſpecies, both natives of Ethiopia.

HEBRAISM, an idiom or manner of ſpeaking peculiar to the Hebrew language. See the next article.

HEBREW, or HEBREW LANGUAGE, that ſpoken by the ancient Jews, and wherein the Old Teſtament is wrote.

This appears to be the moſt ancient of all the languages in the world, at leaſt we know of none older: and ſome learned men are of opinion, that this is the language in which God ſpoke to Adam in Paradiſe.

The books of the Old Teſtament are the only pieces to be found, in all antiquity, written in pure Hebrew; and the language of many of theſe is extremely ſublime; it appears perfectly regular, and particularly ſo in its conjugations; indeed, properly ſpeaking, it has but one conjugation, but this is varied in each ſeven or eight different ways, which has the effect of ſo many different conjugations, and affords a great variety of expreſſions to repreſent by a ſingle word the different modifications of a verb, and many ideas which in the modern and in many of the ancient and learned languages cannot be expreſſed without a periphraſis.

The primitive words, which are called roots, have ſeldom more than three letters or two ſyllables.

In this language there are twenty-two letters, only five of which are uſually reckoned vowels, which are the ſame with ours, *viz. a, e, i, o, u;* but then each vowel is divided into two, a long and a ſhort, the ſound of the former being ſomewhat grave and long, and that of the latter ſhort and acute: it muſt however be remarked, that the two laſt vowels have ſounds that differ in other reſpects beſides quantity, and a greater or leſs elevation. To theſe ten or twelve vowels may be added others called ſemi-vowels, which ſerve to connect the conſonants, and to make the eaſier tranſitions from one another. The number of accents to this language are, indeed, prodigious: of theſe there are near forty, the uſe of ſome of which, notwithſtanding all the inquiries of the learned, are not yet perfectly known. We know, in general, that they ſerve to diſtinguiſh the ſentences like the points called commas, ſemicolons, *&c.* in our language; to determine the quantity of the ſyllables, and to mark the tone with which they are to be ſpoken or ſung. It is no wonder then, that there are more accents in the Hebrew than in other languages, ſince they perform the office of three different things, which in other languages are called by different names.

HEBREWS, or *Epiſtle to the* HEBREWS, a canonical book of the New Teſtament.

Though St Paul did not prefix his name to this epiſtle, the concurrent teſtimony of the beſt authors ancient and modern afford ſuch evidence of his being the author of it, that the objections to the contrary are of little or no weight.

The Hebrews, to whom this epiſtle was wrote, were the believing Jews of Paleſtine; and its deſign was to convince them, and by their means all the Jewiſh converts whereſoever diſperſed, of the inſufficiency and aboliſhment of the ceremonial and ritual law.

HEBRIDES, iſlands on the weſt of Scotland, of which Sky, Mull, Iſla, and Arran are ſome of the largeſt.

HECATOMB, among the ancient pagans, was the ſacrifice of an hundred bulls or oxen; or, in a leſs confined ſenſe, an hundred animals of any ſort.

HECATOMBÆON, in ancient chronology, the firſt month of the Athenian year, conſiſting of thirty days, and anſwering to the latter part of our June.

HECK, an engine to take fiſh. A ſalmon heck is a grate for catching that ſort of fiſh.

HECTIC FEVER. See MEDICINE.

HEDERA, in botany, a genus of the pentandria monogynia claſs. The corolla conſiſts of five oblong petals, and the berry contains five ſeeds. There are two ſpecies; one of them, *viz.* the helix, is a native of Britain.

HEDERA TERRESTRIS. See GLECHOMA.

HEDGES, in agriculture, are either planted to make fences round incloſures, or to divide the ſeveral parts of a garden. When they are deſigned as outward fences, they are planted either with haw-thorn, crabs, or black-thorn; but thoſe hedges which are planted in gardens, either to ſurround wilderneſs-quarters, or to ſcreen the other parts of a garden from ſight, are planted according to the fancy of the owner, ſome preferring ever-greens, in which caſe the holly is beſt; next the yew, then the laurel, lauruſtinus, phillyria, *&c.* others prefer the beech, the hornbeam, and the elm.

HEDMORA, a city of Sweden, in the province of Weſtmania, ſituated on the river Dalecarlia, fifty miles north-weſt of Upſal: E. long. 15° 55′, and N. lat. 60° 16′.

HEDYOTIS, in botany, a genus of the tetrandria monogynia claſs. The calix conſiſts of one funnel ſhaped petal; and the capſule has two cells, and many ſeeds. There are three ſpecies, all natives of Ceylon.

HEDYSARUM, in botany, a genus of the diadelphia decandria claſs. The corolla is tranſverſely carinated; and the pod is jointed, each joint containing one ſeed. There are 46 ſpecies, only one of which is a native of Britain, *viz.* the St Foin, or cocks-head.

HEEL, in anatomy. See ANATOMY, p. 185.

HEEL, in the ſea language. If a ſhip leans on one ſide, whether ſhe be a-ground or a-float, then it is ſaid ſhe heels a-ſtarboard, or a-port; or that ſhe heels offwards, or to the ſhore; that is, inclines more to one ſide than to another.

HEELER, or *Bloody* HEEL-*cock*, a fighting cock that ſtrikes or wounds much with his ſpurs.

The maſters know ſuch a cock, even while a chicken, by the ſtriking of his two heels together in his going.

HEGIRA, in chronology, a celebrated epocha among the Mahometans.

The event which gave riſe to this epocha was the flight of Mahomet from Mecca, with his new proſelytes, to avoid the perſecution of the Coraiſchites; who, being then moſt powerful in the city, could not bear that Mahomet ſhould aboliſh idolatry, and eſtabliſh his new religion. This flight happened in the fourteenth year after Mahomet had commenced prophet: he retired to Medina, which he made the place of his reſidence.

HEIDELBURG, a city of Germany, in the circle of the lower Rhine, the capital of the Palatinate, ſituated on the river Neckar: E. long. 8° 40′, and N. lat. 49° 20′.

HEILA, a port-town of regal Pruſſia, in the kingdom of Poland, ſituated on the point of a peninſula in the Baltic ſea, twelve miles north of Dantzick: E. long. 19°, N. lat 54° 30′.

HEINUSE, among hunters, a roe-buck of the fourth year.

HEIR, in Scots law, a generic term applicable to thoſe who are intitled by law to take the poſſeſſion of any ſubject which belonged to a perſon deceaſed.—For the different kinds of heirs, *&c.* ſee LAW, tit. 27. & 28.

HEIRSHIP *moveables*, in Scots law, the beſt of certain kinds of moveables, which the heir of line is intitled to take, beſides the heretable eſtate. See LAW, tit. 27.

HEIR-APPARENT, is a perſon ſo called in the lifetime of his anceſtor, at whoſe death he is heir at law.

HEIRESS, a female heir to one who has an eſtate in lands, *&c.* Stealing an heireſs, and marrying her againſt her will, was declared felony by 3 Hen. VII.

HELENA, or *St* HELENA, an iſland in the Atlantic ocean, ſituated 1200 miles weſt of the coaſt of Africa, and 1800 eaſt of the coaſt of ſouth America: W. long. 6° 30′, S. lat. 16°.

HELENIUM, in botany, a genus of the ſyngeneſia polygamia ſuperflua claſs. The receptacle is naked; the calix is ſimple, and conſiſts of many leaves; and the corollulæ of the radius are ſemitrifid. There is but one ſpecies, a native of Auſtria.

HELIÆA, in Grecian antiquity, was the greateſt and moſt frequented court in Athens for the trial of civil affairs. The judges who ſat in it were at leaſt fifty, but the more uſual number was either two or five hundred. When cauſes of great moment were to be tried, it was cuſtomary to call in the judges of the other courts: ſometimes a thouſand were called in, and then two courts are ſaid to have been joined; ſometimes fifteen hundred or two thouſand were called in, and then three or four courts met together.

They had cognizance of civil affairs of the greateſt weight and importance, and were not permitted to give judgment till they had taken a ſolemn oath to do it with impartiality, and to give ſentence according to the laws, *&c.*

HELIACAL, in aſtronomy, a term applied to the riſing or ſetting of the ſtars; or, more ſtrictly ſpeaking, to their emerſion out of, and immerſion into, the rays and ſuperior ſplendor of the ſun.

A ſtar is ſaid to riſe heliacally, when after having been in conjunction with the ſun, and on that account inviſible, it comes to be at ſuch a diſtance from him, as to be ſeen in the morning before ſun-riſing; the ſun, by his apparent motion, receding from the ſtar towards the eaſt: on the contrary, the heliacal ſetting is when the ſun approaches ſo near a ſtar, as to hide it with his beams, which prevent the fainter light of the ſtar from being perceived; ſo that the terms apparition and occultation would be more proper than riſing and ſetting.

HELIANTHEMUM, in botany, ſee the article CISTUS.

HELIANTHUS, *the Great* SUN-FLOWER, in botany, a genus of the ſyngeneſia polygamia fruſtranea claſs. The receptacle is paleaceous and plane; the pappus conſiſts of two leaves; and the calix is imbricated and ſquarrous. There are twelve ſpecies, none of them natives of Britain.

HELIASTES, in antiquity, one of the judges of the court heliæa. See HELIÆA.

HELICTERES, the SREW-TREE, in botany, a genus of the gynandria decandria claſs. It has five ſtyli; the calix conſiſts of one oblique leaf; the petals are five; the nectarium conſiſts of five ſmall leaves; and it has five twiſted capſules. There are four ſpecies, none of them natives of Britain.

HELIOCARPUS, in botany, a genus of the dodecandria digynia claſs. The calix conſiſts of four leaves; the petals are four; the ſtyli are ſimple; and the capſule conſiſts of two compreſſed cells, radiated on each ſide. There is but one ſpecies, a native of America.

HELIOCENTRIC *latitude of a planet*, the inclination of a line drawn between the centre of the ſun and the center of a planet, to the plane of the ecliptic.

HELIOCENTRIC *place of a planet*, in aſtronomy, the place of the ecliptic wherein the planet would appear to a ſpectator placed at the centre of the ſun.

HELIOCOMETES, a phænomenon ſometimes obſerved about ſun ſetting; being a large luminous tail or column of light, proceeding from the body of the ſun, and dragging after it, not unlike the tail of a comet; whence the name.

HELIOSCOPE, in optics, a ſort of teleſcope, peculiarly fitted for viewing the ſun without hurting the eyes.

HELIOSTATA, in optics, an inſtrument invented by the late learned Dr S Graveſande; who gave it this name, from its fixing, as it were, the rays of the ſun in an horizontal direction acroſs the dark chamber all the while it is in uſe.

HELIX, in anatomy. See ANATOMY, p. 298.

HELIX, in zoology, a genus belonging to the order of vermes teſtacea. It is an animal of the ſnail-kind; the ſhell conſiſts of one ſpiral, brittle, and almoſt diaphanous valve; and the aperture is narrow. There are 60 ſpecies, principally diſtinguiſhed by the figure of their ſhells.

HELL, the place of divine puniſhment after death.

As all religions have ſuppoſed a future ſtate of exiſtence after this life; ſo all have their hell or place of torment, in which the wicked are ſuppoſed to be puniſhed. The hell of the ancient heathens was divided into two manſions; the one called elyſium, on the right hand, pleaſant and delightful, appointed for the ſouls of good men; the other called tartara, on the left, a region of miſery and torment, appointed for the wicked. The latter only was hell, in the preſent reſtrained ſenſe of the word. See ELYSIUM.

The philoſophers were of opinion, that the infernal regions were at an equal diſtance from all the parts of the earth; nevertheleſs it was the opinion of ſome, that there were certain paſſages which led thither, as the river Lethe near the Syrtes, and the Acheruſian cave in Epirus. At Hermione it was thought, that there was a very ſhort way to hell; for which reaſon the people of that country never put the fare into the mouths of the dead to pay their paſſage.

The Jews placed hell in the centre of the earth, and believed it to be ſituated under waters and mountains. According to them, there are three paſſages leading to it: the firſt is in the wilderneſs, and by that Korah, Dathan and Abiram deſcended into hell; the ſecond is in the ſea, becauſe Jonah, who was thrown into the ſea, cried to God out of the belly of hell; the third is in Jeruſalem, becauſe it is ſaid the fire of the Lord is in Zion, and his furnace is in Jeruſalem. They likewiſe acknowledged ſeven degrees of pain in hell, becauſe they find this place called by ſeven different names in ſcripture. Though they believed that infidels, and perſons eminently wicked, will continue for ever in hell; yet they maintained, that every Jew who is not infected with ſome hereſy, and has not acted contrary to the points mentioned by the rabbins, will not be puniſhed therein for any other crimes above a year at moſt.

The Mahometans believe the eternity of rewards and puniſhments in another life. In the Koran it is ſaid, that hell has ſeven gates, the firſt for the Muſſulmans, the ſecond for the Chriſtians, the third for the Jews, the fourth for the Sabians, the fifth for the Magians, the ſixth for the pagans, and the ſeventh for the hypocrites of all religions.

Among Chriſtians, there are two controverted queſtions in regard to hell; the one concerns locality, the other the duration of its torments. The locality of hell, and the reality of its fire, began firſt to be controverted by Origen. That father, interpreting the ſcripture account metaphorically, makes hell to conſiſt not in external puniſhments, but in a conſciouſneſs or ſenſe of guilt, and a remembrance of paſt pleaſures. Among the moderns, Mr Whiſton advanced a new hypotheſis. According to him, the comets are ſo many hells appointed in their orbits alternately to carry the damned into the confines of the ſun, there to be ſcorched by its violent heat, and then to return with them beyond the orb of Saturn, there to ſtarve them in theſe cold and diſmal regions. Another modern author, not ſatisfied with any hypotheſis hitherto advanced, aſſigns the ſun to be the local hell. As to the ſecond queſtion, *viz.* the duration of hell-torments, we have Origen again at the head of thoſe who deny that they are eternal; it being that father's opinion, that not only men, but devils, after a due courſe of puniſhment ſuitable to their reſpective crimes, ſhall be pardoned and reſtored to heaven. The chief principle upon which Origen built his opinion, was the nature of puniſhment, which he took to be emendatory, applied only as phyſic for the recovery of the patient's health. The chief objection to the eternity of hell torments among modern writers, is the diſproportion between temporary crimes and eternal puniſhments. Thoſe who maintain the affirmative, ground their opinions on ſcripture accounts, which repreſent the pains of hell under the figure of a worm which never dies, and a fire which is not quenched; as alſo upon the words, “Theſe ſhall go away into everlaſting puniſhment, but the righteous into life eternal.

HELLEBORUS, HELLEBORE, in botany, a genus of the polyandria polygynia claſs. It has no calix; the petals are five or more; the nectarium is tubular and bilabiated; and the capſule contains many ſeeds. There are five ſpecies, two of them natives of Britain, *viz.* the fœtidus, or great baſtard black hellebore; and the viridis, or wild black hellebore. The hellebore, when taken in large quantities, is poiſonous; but the root, in ſmall doſes, is ſuppoſed to attenuate the humours, and to promote urinary and uterine diſcharges.

HELLENISM, in matters of language, a phraſe in the idiom, genius, or conſtruction of the Greek tongue.

This word is only uſed when ſpeaking of the authors who, writing in a different language, expreſs themſelves in a phraſeology peculiar to the Greek.

HELLENISTIC, or HELENISTIC LANGUAGE, that uſed by the Grecian Jews who lived in Egypt and other parts where the Greek tongue prevailed. In this language it is ſaid the Septuagint was written, and alſo the books of the New Teſtament; and that it was thus denominated to ſhew that it was Greek filled with Hebraiſms and Syriaciſms.

HELLESPONT, the entrance of the ſtreights which divides Aſia from Europe, and paſſes from the Archipelago to Conſtantinople. It is now called the Dardanelles, and is about two miles wide.

HELM *of a ſhip*, is a piece of timber faſtened into the rudder, which comes forward into the ſteerage, or place where the perſon at the helm ſteers the ſhip, by holding the whipſtaff in his hand, which is joined to the helm. They begin however to be left off, ſteering-wheels being uſed in their room.

There are ſeveral terms in the ſea-language relating to the helm; as, *bear up the helm;* that is, let the ſhip go more large before the wind. *Helm a mid-ſhip*, or *right the helm;* that is, keep it even with the middle of the ſhip. *Port the helm*, put it over the left ſide of the ſhip. *Starboard the helm*, put it on the right ſide of the ſhip.

HELMET, an ancient defenſive armour worn by horſemen both in war and in tournaments. It covered both the head and face, only leaving an aperture in the front ſecured by bars, which was called the viſor.

HELMINTHOLITHUS, in natural hiſtory, a name given by Linnæus to petrified bodies reſembling worms.

Of theſe he reckons four genera. 1. Petrified lithophyta, found in the mountains of Sweden. 2. Petrified ſhells. 3. Petrified zoophytes. 4. Petrified reptiles.

HELMONT, a town of the Netherlands, in the province of Dutch Brabant, ſituated on the river Aa: E. long. 5° 40′, N. lat. 51° 30′.

HELMSTAT, a town of Germany, in the circle of Lower Saxony, and dukedom of Brunſwic: E. long. 11° 15′, N. lat. 52° 20′.

HELOTS, in Grecian antiquity, the inhabitants of Helos, a town of Laconia, conquered by the Spartans; who made them all priſoners of war, and reduced them into the condition of ſlaves.

The freemen of Sparta were forbidden the exerciſe of any mean or mechanical employment, and therefore the whole care of ſupplying the city with neceſſaries devolved upon the Helots.

HELSINGFORD a port-town of Sweden, ſituated on the gulph of Finland, in 24° 6′ E. long. and 60° 8′ N. lat.

HELSINGIA, a province of Sweden, bounded by the Bothnic gulph on the eaſt, and by Dalecarlia on the weſt.

HELSINGIC CHARACTER, a peculiar kind of character, found inſcribed on ſtones in the province of Helſingia: the Runic and Helſingic characters may be eaſily tranſformed into each other.

HELSTON, a borough of Cornwall, nine miles ſouth-weſt of Falmouth: it ſends two members to parliament.

HELVOETSLUYS, a port-town of the united Netherlands, ſituated in the iſland of Voorn, in the province of Holland, five miles ſouth of the Briel: it is one of the beſt harbours in Holland, and that to which the Engliſh packet alway goes.

HEMEROBIUS, in zoology, a genus of inſects of the neuroptera order, the characters of which are theſe: The mouth is furniſhed with two teeth; the palpi are four; the wings are deflected, but not plaited; and the antennæ are briſtly and longer than the breaſt. There are 15 ſpecies, principally diſtinguiſhed by their colours.

HEMEROCALLIS, DAY-LILLY, in botany, a genus of the hexandria-monogynia claſs. The corolla is bell-ſhaped, with a cylindrical tube; and the ſtamina are declinated. There are two ſpecies, none of them natives of Britain.

HEMI, a word uſed in the compoſition of divers terms, ſignifying the ſame with ſemi, or demi, *viz.* one half.

HEMINA, in Roman antiquity, a liquid meaſure which, according to Arbuthnot, was equal to half a wine-pint engliſh meaſure; its contents being 2,818 ſolid inches.

HEMIONITIS, in botany, a genus of the cryptogamia filices claſs. The parts of fructification lie in decuſſating lines. There are three ſpecies, none of them natives of Britain.

HEMIPLEGIA, or HEMIPLEXIA, among phyſicians, a palſy of one half of the body.

HEMISPHERE, in geometry, the half of a globe or ſphere, when it is ſuppoſed to be cut through its centre in the plane of one of its great circles.

HEMISPHERE is alſo uſed to denote a projection of half the terreſtrial globe, or half the celeſtial ſphere, on a plane, and frequently called planiſphere.

HEMISTICH, in poetry, denotes half a verſe, or a verſe not completed.

HEMITRITÆUS, among phyſicians, a kind of intermitting fever, being a ſemitertian. See MEDICINE.

HEMLOCK, in botany. See CICUTA.

HEMP, in botany. See CANNABIS.

The raiſing and dreſſing of hemp ſcarcely differs from the raiſing and dreſſing of flax, but in the following particulars.

Hemp requires a light, free, dry, duſty, and even a ſandy warm ſoil; which if not naturally rich, muſt be made ſo by manure. New broke up ground does not anſwer for hemp, producing it thin and poor upon the ſtalk. Hemp does well to follow beans. The ground ſhould be ploughed and harrowed three or four times, a fortnight or three weeks intervening between each time. In ſome parts of Lincoln and Holland the ſoil is naturally ſo free and rich, that it will produce hemp conſtantly year after year without manure. The leaves which fall off the ſtalk help to manure the ground. It is frequently ſown with a view to clear the ground of weeds; which it does moſt affectually, growing faſt, and ſoon checking every weed but mugwort, which is picked out with a fork.

It is ſown about the firſt of May; ſo thin, that about four pecks are ſufficient for an Engliſh acre; and the ground muſt then be covered as much as poſſible to preſerve the ſeed from the birds, who are very fond of it.

The *taper-topped* ſtalk which does not bear the pods, is called the *female*, though in fact it is the *male*, ſcattering from its bloom a ſmall duſt, which impregnates the pods of the *buſhy-topped*; which laſt is commonly, though improperly, called the male or carle hemp.

When hemp is the object of the farmer more than a crop of ſeed, the whole ſhould be pulled when the ſtalk begins to grow yellow, and the earth remaining about the roots ſhould be beat off to prevent more growth: but if the ſeed is wanted in its greateſt perfection, the ſtalks bearing the pods muſt be pulled before the upmoſt pod begins to open; the earth ſhould not be beat off from the roots; it ſhould be ſtooked in ſheaves upon the field, to dry and win as corn; and the top of theſe ſtooks ſhould be covered with undergrowth, or the like, to preſerve the ſeed from the birds.

Hemp is ſooner watered than flax, and the canals muſt be deeper.

In keeping the ſeed, care muſt be taken to preſerve it from rats, mice, and ſuch like vermin, who are all fond of it.

It is dreſſed as coarſe flax, but is ſooner dreſſed; and its greater length requires more care, and renders it more troubleſome in the handling, eſpecially in the ſkutching of it by the water lint-mills with horizontal ſkutchers, when it muſt be folded double. What is too coarſe and ſtrong in the ſtalk for the hand or foot machines, may be broke and peeled by the hand. See FLAX.

HEMPSTEAD, a market-town of Hartfordſhire, twenty-four miles north-weſt of London.

HEN, in ornithology. See PHASIANUS.

HEN-BANE. See HYOSCIAMUS.

HENDECAGON, in geometry, a figure that hath eleven ſides and as many angles.

HENLEY, a market-town of Oxfordſhire, ſituated on the river Thames, twenty miles ſouth-eaſt of Oxford, and thirty-two weſt of London.

HENNEBURG, a town of Germany, in the circle of Franconia, and the capital of the county of Heneburgh: E. long. 10° 27′, and N. lat. 50° 40′.

HENOTICON, in church-hiſtory, a decree or edict of the emperor Zeno, made at Conſtantinople, in the year 482, by which he pretended to reconcile all parties under one faith. It is generally agreed that Peter, patriarch of Alexandria, and Acacius, patriarch of Conſtantinople, were the authors of this decree, and that their deſign was to compliment the emperor with a right of preſcribing regulations in matters of faith. The emperor, by this decree, arrogated to himſelf the right of being head of the church. Pope Simplicius, however, in the year 483, condemned the henoticon, and cited Acacius, the chief promoter of it, to appear before him at Rome; but it was not entirely ſuppreſſed till the year 518.

HENRICO, a county of the colony of Virginia, in North America.

HENRY, or CAPE-HENRY, the ſouth cape of Virginia, at the entrance of Cheſepeak-bay: W. long. 74° 50′, N. lat. 37°.

HEPAR SULPHURIS, or LIVER OF SULPHUR. See CHEMISTRY.

HEPATIC, in medicine and anatomy, any thing belonging to the liver.

HEPATICA, in botany. See ANEMONE.

HEPATITIS, in medicine. See MEDICINE.

HEPATUS, in ichthyology. See LABRUS.

HEPHÆSTIA, in Grecian antiquity, an Athenian feſtival, in honour of Vulcan, the chief ceremony of which was a race with torches.

HEPSETUS, in ichthyology. See ESOX.

HEPTACHORD, in the ancient poetry, ſignified verſes that were ſung or played on ſeven chords, that is, on ſeven different notes. In this ſenſe it was applied to the lyre, when it had but ſeven ſtrings.

HEPTAGON, in geometry, a figure conſiſting of ſeven ſides and as many angles.

HEPTANDRIA, in botany. See BOTANY, p. 635.

HEPTANGULAR, in geometry, an appellation given to figures which have ſeven angles.

HEPTARCHY, a government of ſeven perſons: alſo a a ſtate or country divided into ſeven kingdoms, and governed by ſeven independent princes; in which ſenſe it is particularly applied to the government of ſouth Britains when divided amongſt the Saxons.

HEPTATEUCH, the ſeven firſt books of the Old Teſtament, containing the pentateuch, or five books of Moſes, and the books of Joſhua and Judges.

HEPHTHEMIMERIS, in ancient poetry, a verſe conſiſting of three feet and an half, or ſeven half feet.

It likewiſe denotes a cæſura after the third foot of a verſe.

HERACLEA, a port-town of Romania, in European Turky, ſituated on the Propontis, ſixty miles ſouth-weſt of Conſtantinople; it was once a great city: E. long. 28°, and N. lat. 41°.

HERACLEONITES, a ſect of chriſtians, the followers of Heracleon, who refined upon the gnoſtic divinity, and maintained that the world was not the immediate production of the Son of God, but that he was only the occaſional cauſe of its being created by the demiurgus. The Heracleonites denied the authority of the prophecies of the Old Teſtament, maintaining that they were mere random ſounds in the air; and that St. John the Baptiſt was the only true voice that directed to the Meſſiah.

HERACLEUM, in botany, a genus of the pentandria digynia claſs, the general flower of which is difform and radiated; the ſingle flowers of the diſc conſiſt each of five equal petals, but thoſe of the radius conſiſt of five unequal petals: the fruit is eliptic, compreſſed, and ſtriated on each ſide in the middle, and contains two oval compreſſed ſeeds. There are five ſpecies, one of which, *viz.* the ſphondylium, or cow-parſnip, is a native of Britain.

HERACLIDÆ, or *Return of the* HERACLIDÆ *into Peloponneſus*, in chronology, a famous epocha, that conſtitutes the beginning of profane hiſtory; all the time preceding that period being accounted fabulous.

This return happened in the year of the world 2862, an hundred years after they were expelled, and eighty after the deſtruction of Troy.

HERALD, an officer at arms, whoſe buſineſs it is to declare war, to proclaim peace, to marſhal all the ſolemnities at the coronation, chriſtening, marriage, and funeral of princes, to blazon and examine coats of arms, *&c.*

Heralds were formerly held in much greater eſteem than they are at preſent, and were created and chriſtened by the king, who pouring a gold-cup of wine on their head, gave them the herald-name; but this is now done by the earl-marſhal. They could not arrive at the dignity of herald without having been ſeven years pourſuivant; nor could they quit the office of herald, but to be made king at arms.

HERALDRY, is the art of armory and blazoning; or, the knowledge of what relates to the bearing of arms, and the laws and regulations thereof.

Arms, or *Armories*, are marks of dignity and honour, regularly compoſed of certain figures and colours, given or authorized by ſovereigns, and borne in banners, ſhields, coats, *&c.* for the diſtinction of perſons, families, and ſtates, and paſſing by deſcent to poſterity.

They are called *arms*, in regard they are borne principally on the buckler, cuiraſſe, banners, and other apparatus of war; and *coats of arms*, *coat-armour*, &c. becauſe anciently embroidered on a cloak or habit, worn by the ancient knights over their arms, both in war and at tournaments, and ſtill borne by the heralds at arms.

It was a kind of ſurcoat, reaching only as low as the navel, open at the ſides, with ſhort ſleeves; ſometimes furred with *ermine* and *vair*, wherein were applied the *armories* of the knight, embroidered with gold and ſilver, and enamelled with beaten tin, coloured *black*, *green*, *red*, and *blue*; whence the rule never to apply colour on colour, nor metal on metal.

The *coats of arms* were frequently open, and diverſified with bands and fillets of ſeveral colours, alternately placed, as we ſtill ſee cloths ſcarleted, watered, *&c.* Hence they were alſo called *devices* or *diviſes*; and being divided, or compoſed of ſeveral pieces ſewed together, whence the words *feſſe*, *pale*, *chevron*, *bend*, *croſs*, *ſalter*, *lozenge*, &c. See theſe articles.

The ſurcoat being embroidered with *gold* and *ſilver*, was the occaſion that thoſe two metals have been ſince placed in the coats of arms, under their *French* name of *or* and *argent*; and their being coloured *black*, *green*, *red*, and *blue*, that thoſe different colours have alſo been introduced in them: therefore,

There are two metals in *Heraldry*, viz. *or* and *argent*; and ſeven colours, which are, *gules*, *azure*, *ſable*, *vert*, *purpure*, *tenne*, and *ſanguine*. See theſe and all the other terms belonging to heraldry as they occur in the order of the alphabet.

HERAT, a city of Perſia, in the province of Choraſſan: E. long. 61°, and N. lat. 34° 30′.

HERB, in pharmacy, an appellation given to the ſtalks and leaves of plants, eſpecially ſuch as are fleſhy and ſucculent, and die away every year; but is alſo frequently uſed to denote the leaves alone.

HERBAL, a book that treats of the claſſes, genera, ſpecies, and virtues of plants. See BOTANY.

HERBIVOROUS ANIMALS, thoſe which feed only on vegetables.

HERBOURG, a town in the circle of the upper Rhine, and territory of Naſſau: E. lon. 8° 15′, and N. lat. 50° 36′.

HERCINIAN forest, a foreſt which anciently extended the whole length of Germany and Bohemia, ſome remains of which are ſtill in being, *viz.* the Black Foreſt, Odenwald near Heidelburg, Stigewald in Wurtſburg, and Bamberg, and Hartſwald in Brunſwic.

HERCOLE, a port-town of Tuſcany, on the coaſt called Stato del Preſidii: E. lon. 12°, and N. lat. 42° 25′.

HERCULES, in aſtronomy. See Astronomy. p. 486.

Hercules-pillars, in antiquity, a name given to mount Calpe in Spain, near Gibraltar, on the European ſide of the ſtreights, and mount Avila on the African ſide.

HEREDITAMENTS, whatever immoveable things a perſon may have to himſelf and his heirs by way of inheritance; and which, if not otherwiſe bequeathed, deſcend to him who is next heir, and not to the executor, as chattels do.

HEREDITARY, an appellation given to whatever belongs to a family by right of ſucceſſion, from heir to heir.

HEREDITAS jacens, in Scots law. An eſtate is ſaid to be *in hereditate jacente*, after the proprietor's death, till the heir's entry.

HEREFORD, the principal city of Herefordſhire, ſituated on the river Wye, twenty-four miles north-weſt of Gloceſter, and one hundred and twenty weſt of London: W. lon. 2° 42′, and N. lat. 52° 6′.

It ſends two members to parliament.

HERESY, the crime of obſtinately perſiſting in opinions that are contrary to the fundamentals of religion.

HERETABLE rights, in Scots law, all rights affecting lands, houſes, *&c.* or any immoveable ſubject. See Law, tit. 9.

HERETAGE, in Scots law, lands, houſes, or any immoveable ſubject, in contradiſtinction to moveables or moveable ſubjects. See Law, tit. 9. It alſo ſometimes ſignifies ſuch immoveable property as a perſon ſucceeds to as heir to another, in contradiſtinction to that which he himſelf purchaſes or acquires in any other manner, called *conqueſt*. See Law, tit. 27.

HERETIC, a general name for all ſuch perſons, under any religion, but eſpecially the Chriſtian, as profeſs or teach religious opinions contrary to the eſtabliſhed faith, or to what is made the ſtandard of orthodoxy.

HERLING, a market-town of Norfolk, twenty miles ſouth-weſt of Norwich.

HERMÆ, among antiquarians, ſtatues of the god Mercury, made of marble, and ſometimes of braſs, without arms or feet, and ſet up by the Greeks and Romans in the croſs ways.

HERMÆA, in antiquity, ancient Greek feſtivals, in honour of the god Hermes or Mercury.

HERMANIA, in botany, a genus of the monadelphia pentandria claſs. It has but one ſtylus; the capſule has five cells; and the petals are ſemitubular at the baſe. There are nine ſpecies, none of them natives of Britain.

HERMANASTAT, the capital city of Tranſilvania, ſubject to the houſe of Auſtria: E. lon. 24°, N. lat. 46° 32′.

HERMAPHRODITE, a perſon of both ſexes, or who has the parts of generation both of male and female.

It is now generally allowed, that there is no ſuch thing as a true hermaphrodite; moſt, if not all thoſe who paſs for ſuch, being mere women, whoſe clitoris is grown to an enormous ſize, and the labia pudendi become unuſually tumid.

Among the inſect-claſs of animals, indeed, hermaphrodites are very frequent: ſuch as worms, ſnails, leeches, *&c.*

Hermaphrodite flowers, among botaniſts. See Botany.

HERMATHENA, among antiquarians, a ſtatue repreſenting Mercury and Minerva both in one.

HERMES. See Hermæ.

HERMETIC, or Hermetical, an appellation given to whatever belongs to chemiſtry, from Hermes Triſmegiſtus, who is ſuppoſed to have been its inventor.

HERMETICAL philosophy, that which undertakes to ſolve the various phænomena of nature, from the chemical principles ſalt, ſulphur, and mercury.

Hermetical seal, among chemiſts, a method of ſtopping glaſs-veſſels, uſed in chemichal operations, ſo cloſely, that the moſt ſubtil ſpirit cannot eſcape through them.

It is commonly done by heating the neck of the veſſel in a flame, till ready to melt, and then twiſting it cloſely together with a pair of pincers. Or, veſſels may be hermetically ſealed, by ſtopping them with a glaſs plug, well luted; or, by covering the veſſel with another ovum philoſophicum.

HERMIT, a devout perſon retired into ſolitude to be more at leiſure for contemplation, and to diſencumber himſelf from the affairs of the world.

HERMON, a mountain on the eaſt of Syria and Paleſtine, in Aſia.

HERNANDIA, in botany, a genus of the monœcia triandria claſs. The calix of the male has three ſegments, and the corolla three petals. The calix of the female is entire and truncated; the corolla conſiſts of ſix petals; and the drupa is hollow, with an open mouth, and a looſe kernel. There are two ſpecies, both natives of the Indies.

HERNGRUNT, a town of Upper Hungary, ſituated north of Buda, near the Carpathian mountains: E. lon. 19° 20′ lat. 48° 47′.

HERNIA, in medicine. See Medicine and Surgery.

HERNIARIA, rupture-wort, in botany, a genus of the pentandria digynia claſs. The calix conſiſts of five ſegments; it has no corolla; and the capſule contains one ſeed. There are four ſpecies; three of them natives of Britain, *viz.* the glabra, or ſmooth rupture-wort; the hirſuta, or rough rupture-wort; and the lenticulata, or ſea rupture wort. The leaves may be uſed as a mild reſtringent; but have no title to their former reputation of curing ruptures.

HERO, in the ancient mythology, a great and illuſtrious perſon, of a mortal nature, though ſuppoſed by the populace to partake of immortality; and, after his death, placed among the number of the gods.

HEROIC POEM, that which deſcribes ſome extraordinary enterprize; being the ſame with epic poem. See COMPOSITION.

HEROIC VERSE, that wherein heroic poems are uſually compoſed; or it is that proper for ſuch poems. In the Greek and Latin, hexameter verſes are uſually denominated heroic verſes, as being alone uſed by Homer, Virgil, *&c.*

HERON, in ornithology. See ARDEA.

HERPES, in medicine, a bilious puſtule, which breaking out in different manners upon the ſkin, accordingly receives different denominations. See MEDICINE.

HERRING, in ichthyology. See CLUPEA.

HERSILLON, in the art of war, is a ſtrong plank or beam, about ten or twelve feet long, ſtuck full of ſpikes on both ſides, and uſed to incommode the march of the infantry or cavalry.

HESPER, an appellation given to the planet Venus, when ſhe ſets after the ſun.

HESPERIDES, in antiquity, the daughters of Heſperus, brother of Atlas, who kept a garden full of golden apples, guarded by a dragon: but Hercules having laid the dragon aſleep, ſtole away the apples.

HESPERIS, DAME'S VIOLET, in botany, a genus of the tetradynamia ſiliquoſa claſs. The petals are obliquely bent; there is a gland betwixt the ſhort ſtamina; and the ſtigma is forked at the baſe, and connivent at top. There are ſeven ſpecies, only one of which, *viz.* the martronalis, or unſavoury dame's violet, is a native of Britain.

HESSE-CASSEL landgraviate, including Wetteravia, is a circle of the Upper Rhine, bounded by Weſtphalia and Brunſwic on the north, by Franconia and Saxony on the eaſt, by the river Maine on the ſouth, and by another part of Weſtphalia and the electorate of Mentz and Triers on the weſt: it is ſubject to the king of Sweden.

HESSE-DARMSTAT, is bounded by the river Maine, which divides it from Heſſe-Caſſel, on the north, by the ſame river on the eaſt, and by the Palatinate on the ſouth and weſt.

HETEROCLITE, among grammarians, one of the three variations in irregular nouns, and defined by Mr Ruddiman, a noun that varies in declenſion; as, *hoc vas, vaſis; hæc vaſa, vaſorum.*

HETERODOX, in polemical theology, any thing contrary to the faith and doctrines of a church.

HETERODOMUS VECTIS, in mechanics, a lever, wherein the fulcrum, or point of ſuſpenſion, is placed between the power and the weight. See MECHANICS.

HETEROGENEITY, in phyſiology, that quality or property of bodies which denominates a thing heterogeneous. See the next article.

HETEROGENOUS, or HETEROGENEAL, ſomething that conſiſts of parts of diſſimilar kinds, in oppoſition to homogeneous.

HETEROSCII, in geography, a term of relation, denoting ſuch inhabitants of the earth as have their ſhadows falling but one way, as thoſe who live between the tropics and polar circles, whoſe ſhadows at noon in north latitude are always to the northward, and in ſouth latitude to the ſouthward.

HEUCHERA, in botany, a genus of the pentandria digynia claſs. The petals are five; and the capſule has a double beak, and two cells. There is but one ſpecies, a native of Virginia.

HEXACHORD, in ancient muſic, a concord called by the moderns a ſixth.

HEXAGON, in geometry, a figure of ſix ſides and angles; and if theſe ſides and angles be equal, it is called a regular hexagon. See GEOMETRY.

HEXAHEDRON, in geometry, one of the five Platonic bodies, or regular ſolids; being the ſame with a cube.

HEXAMETER, *carmen hexametrum*, in ancient poetry, a kind of verſe conſiſting of ſix feet; the firſt four of which may be indifferently either ſpondees or dactyls, the fifth is generally a dactyl, and the ſixth always a ſpondee. Such is the following verſe of Horace:

1 2 3 4 5 6
Aut pro|deſſe vo|lunt, aut|dele|ctare po|etæ.

HEXANDRIA, in botany. See BOTANY, p. 635.

HEXASTYLE, in architecture, a building with ſix columns in front.

HEXHAM, a market-town of Northumberland, ſixteen miles weſt of Newcaſtle.

HEYDON, a borough town in Yorkſhire, thirty-ſeven miles ſouth-eaſt of York, and ſix miles weſt of Hull. It ſends two members to parliament.

HEYTSBURY, a borough town of Wiltſhire, fourteen miles north-weſt of Saliſbury, ſends two members to parliament.

HIATICULA, in ornithology. See CHARADRIUS.

HIATUS, properly ſignifies an opening, chaſm, or gap; but it is particularly applied to thoſe verſes, where one word ends with a vowel, and the following word begins with one, and thereby occaſions the mouth to be more open, and the ſound to be very harſh.

The term hiatus is alſo uſed in ſpeaking of manuſcripts, to denote their defects, of the parts that have been loſt or effaced.

HIBISCUS, in botany, a genus of the monadelphia polyandria claſs. The calix is double; the exterior one conſiſts of many leaves; the capſule has five cells, and contains many ſeeds. There are twenty-five ſpecies, none of them natives of Britain.

HICCUP, or HICCOUGH, in medicine, a ſpaſmodic affection of the ſtomach and diaphragm, ariſing from any thing that irritates and vellicates their nervous coats. See MEDICINE.

HIDE, the ſkin of beaſts, but particularly applied to thoſe of large cattle, as bullocks, cows, horſes, *&c.*

Hides are either raw or green, juſt as taken off the carcaſe; ſalted or ſeaſoned with ſalt, alum, and ſaltpetre, to prevent their ſpoiling; or curried and tanned. See TANNING.

HIDE *of land*, was ſuch a quantity of land as might be plowed with one plough within the compaſs of a year, or ſo much as would maintain a family; ſome call it ſixty, ſome eighty, and ſome an hundred acres.

Hide-bound. See Farriery, p. 563.

HIERACHIUM, hawkweed, in botany, genus of the ſyngeneſia polygamia æqualis claſs. The receptacle is naked; the calix is oval and imbricated; and the pappus is ſimple and ſeſſile. There are 28 ſpecies, 8 of them natives of Britain. The leaves of the piloſella, or common creeping mouſe-ear, are recommended as aſtringents.

HIERACITES, in church-hiſtory, Chriſtian heretics in the third century, ſo called from their leader Hierax, a philoſopher of Egypt; who taught that Melchiſedek was the Holy Ghoſt, denied the reſurrection, and condemned marriage.

HIERARCHY, among divines, denotes the ſubordination of angels.

Some of the rabbins reckon four, others ten, orders or ranks of angels; and give them different names, according to their different degrees of power and knowledge.

Hierarchy likewiſe denotes the ſubordination of the clergy, eccleſiaſtical polity, or the conſtitution and government of the Chriſtian church conſidered as a ſociety.

HIEROGLYPHICS, in antiquity, myſtical characters, or ſymbols, in uſe among the Egyptians, and that as well in their writings as inſcriptions; being the figures of various animals, the parts of human bodies, and mechanical inſtruments.

But beſides the hieroglyphics in common uſe among the people, the prieſts had certain myſtical characters, in which they wrapped up and concealed their doctrines from the vulgar. It is ſaid, that theſe ſomething reſembled the Chineſe characters, and that they were the invention of Hermes. Sir John Marſham conjectures, that the uſe of theſe hieroglyphical figures of animals introduced the ſtrange worſhip paid them by that nation: for as theſe figures were made choice of, according to the reſpective qualities of each animal, to expreſs the qualities and dignity of the perſons repreſented by them, who were generally their gods, princes and great men, and being placed in their temples, as the images of their deities; hence they came to pay a ſuperſtitious veneration to the animals themſelves.

The meaning of a few of theſe hieroglyphics, has been preſerved by ancient writers. Thus we are told they repreſented the ſupreme Deity by a ſerpent with the head of a hawk. The hawk itſelf was the hieroglyphic of Oſiris; the river-horſe, of Typhon; the dog, of Mercury; the cat, of the moon, or Diana; the beetle, of a couragious warrior; a new-born child, of the riſing ſun; and the like.

HIEROGRAMMATISTS, *i. e.* holy regiſters, were an order of prieſts among the ancient Egyptians, who preſided over learning and religion.

They had the care of the hieroglyphics, and were the expoſitors of religious doctrines and opinions. They were looked upon as a kind of prophets, and it is pretended that one of them predicted to an Egyptian king, that an Iſraelite, (meaning Moſes) eminent for his qualifications and atchievements, would leſſen and depreſs the Egyptian monarchy.

HIEROMANCY, in antiquity, that part of divination which predicted future events from obſerving the various things offered in ſacrifice. See Divination and Sacrifice.

HEROMNEMON, the name of an officer in the Greek church, whoſe principal function it was to ſtand behind the patriarch at the ſacraments and other ceremonies of the church, and to ſhew him the prayers, pſalms, &c. in the order in which they were to be rehearſed.

HIEROPHANTES, in Grecian antiquity, the name by which the Athenians called thoſe prieſts and prieſteſſes who were appointed by the ſtate to have the ſuperviſal of things ſacred, and to take care of the ſacrifices.

HIEROPHYLAX, an officer in the Greek church, who was guardian or keeper of the holy utenſils, veſtments, &c. anſwering to our ſacriſta or veſtry-keeper.

High-way, a free paſſage for the king's ſubjects, on which account it is called the king's high-way, tho' the freehold of the ſoil belong to the owner of the land. Thoſe ways that lead from one town to another, and ſuch as are drift or cart-ways, and are for all travellers in great roads, or that communicate with them, are high-ways only; and as to their reparation, are under the care of ſurveyors.

HIGHAM-FERRERS, a borough town of Northamptonſhire, twelve miles north-eaſt of Northampton: it ſends two members to parliament.

HIGHNESS, a title given to princes. Before king James I. the kings of England had no other title but that of highneſs; which was alſo the caſe of the kings of Spain before Charles V.

At preſent all the ſons of crowned heads are ſtyled royal highneſs, as the electors of Germany are electoral highneſs.

HIGHWORTH, or Higworth, a market-town of Wiltſhire, ſituated thirty miles north of Saliſbury.

HILARIA, an ancient Roman feſtival, obſerved on the eighth of the calends of April, or the twenty-fifth day of March, in honour of the goddeſs Cybele. It was ſo called from the various expreſſions of joy and mirth on this occaſion.

HILARODI, in the ancient muſic and poetry, a ſort of poets among the Greeks, who went about ſinging little gay poems or ſongs, ſomewhat graver than the Ionic pieces, accompanied with ſome inſtrument. From the ſtreets they were at length introduced into tragedy, as the magodi were into comedy. They appeared dreſſed in white, and were crowned with gold. At firſt they wore ſhoes, but afterwards they aſſumed the crepida, being only a ſole tied over with a ſtrap.

HILARY-term. See Term.

HILDESHEIM, the capital of a biſhopric, ſurrounded by the territories of Brunſwic, and ſubject to its own biſhop: E. long. 10°, N lat. 52° 17'.

HILUM, among botaniſts, denotes the eye of a bean.

HIN, a hebrew meaſure of capacity for things liquid, containing the ſixth part of an ephah, or one gallon two pints, or 2.533 ſolid inches, Engliſh meaſure.

HIND, a female ſtag in the third year of its age. See CERVUS.

HINDON, a borough town of Wiltſhire, ſituated fourteen miles weſt of Saliſbury: it ſends two members to parliament.

HINDOWN, or HENDOWN, the capital of the country of the Hindowns, in the hither India: E. long 76° 30′, N. lat. 27°.

HINE, or HIND, a huſbandman's ſervant. Thus the perſon who overſees the reſt, is called the maſter hine.

HIPPOBOSCA, or HORSE-FLY, in zoology, a genus of inſects belonging to the order of diptera. The beak conſiſts of two valves, is cylindrical, obtuſe, and hanging; and the feet have ſeveral claws. There are four ſpecies, diſtinguiſhed by their wings, *&c.* The equina is extremely troubleſome to horſes.

HIPPOCAMPUS, in ichthyology. See SYNGNATHUS.

HIPPOCENTAUR, in antiquity, a fabulous animal, half man half horſe.

What gave riſe to the fable of Hippocentaurs, was this. The Theſſalians are ſaid to have been the firſt inventors of the art of breaking horſes; and being firſt ſeen on horſeback, they ſeemed to make but one body with the horſes; whence the origin of the fable.

HIPPOCREPIS, COMMON HORSE-SHOE VETCH, in botany, a genus of the diadelphia decandria claſs. The pod is compreſſed and crooked. There are three ſpecies, only one of which, *viz.* the comoſa, or tufted horſe ſhoe vetch, is a native of Britain.

HIPPODROME, in antiquity, the courſe where horſe-races were performed.

HIPPOGLOSSUS, in ichthyology, See PLEURONECTES.

HIPPOMANES ſignifies the expreſſed juice of the tithymallus; as alſo a juice diſtilling from the genitals of a mare, in the time of her covering: ſome again take it for the ſecundines of a mare; and, laſtly, it ſignifies a fleſhy ſubſtance adhering to the forehead of a colt newly foaled, which ſome imagine to have a virtue of procuring love, and promoting the birth.

HIPPOPHAE, in botany, a genus of the diœcia tetrandria claſs. The calix of the male has two ſegments; and the corolla is wanting The calix of the female conſiſts of two ſegments; it has no corolla; but one ſtylus; and the berry contains many ſeeds. There are three ſpecies, only one of which, *viz.* the rhamnoides, ſallow-thorn, or ſea buck thorn, is a native of Britain.

HIPPOPOTAMUS, the RIVER-HORSE, a genus of quadrupeds, belonging to the order of belluæ; the characters of which are theſe: It has 6 foreteth in the upper jaw, diſpoſed in pairs at a diſtance from each other; and four prominent foreteeth in the under jaw, the intermediate ones being longeſt: the dog-teeth are ſolitary and obliquely truncated; and the feet are hoofed on the edges.

There is but one ſpecies of hippopotamus, *viz.* the amphibius, or river-horſe. The hiſtory of this quadruped, though next to the elephant in magnitude, is far from being ſufficiently delineated. The beſt deſcription hitherto given of him is that of Frederic Zerenghi, an Italian ſurgeon, publiſhed in the year 1603. Zerenghi killed two of them (a male and a female) on the banks of the Nile, preſerved their ſkins, and brought them to Rome. Every ſkin took 400 pounds of ſalt in curing. He ſays, the ſkin of the hippopotamus is about an inch thick, extremely hard, impenetrable by a common muſket-ball; and there are only a few ſhort white hairs ſcattered very thin over it. The teeth are not protruded out of the mouth, as is commonly believed; for, when the mouth is ſhut, although the teeth be extremely large, they are entirely covered by the lips. The dimenſions of the female, of which Zerenghi gives a figure, are as follow: From the point of the muzzle to the origin of the tail, between 11 and 12 feet; the circumference of the body about 10 feet; the height of the body, $4\frac{1}{2}$ feet; the circumference of the leg, near the ſhoulder, 2 feet 9 inches, lower down 1 foot $9\frac{1}{2}$ inches; the height of the legs about $1\frac{1}{2}$ foot; the length of the feet from the extremity of the claws, $4\frac{1}{2}$ inches; the claws are nearly of an equal length and breadth, and are ſomewhat more than two inches; each toe is furniſhed with a claw, and each foot with four toes. The tail is about one foot long, more than a foot in circumference near the origin, and about 3 inches near the point. The tail is not round, but flattiſh. The head, from the extremity of the lips to the neck, is about 2 feet 4 inches, and the circumference 5 feet 8 inches The ears are about 3 inches long, and nearly as broad; they are a little pointed, and covered in the interior ſide with ſhort white hair. The mouth, when open is about $1\frac{1}{2}$ foot wide, and furniſhed with 44 teeth of different figures. Their teeth are of ſuch a hard ſubſtance, that they give fire with ſteel. Theſe dimenſions are taken from a female hippopotamus; but the male is generally about one third larger.

With ſuch powerful arms, and ſuch a prodigious ſtrength of body, the hippopotamus might render himſelf formidable to every other animal. But he is naturally of a mild diſpoſition; and beſides, his body is ſo heavy, and his motions ſo ſlow, that he cannot overtake any other quadruped. He ſwims ſwifter than he runs, and preys upon fiſhes. He dives in the water, and can ſtay very long under. He has no membrane betwixt his toes, as the caſtor or the otter; and he only ſwims eaſily in conſequence of the great bulk of his belly, which makes him nearly of an equal ſpecific gravity with the water Moreover, he often keeps himſelf at the bottom, and walks upon the channel with the ſame freedom as upon dry land. Beſides preying upon fiſhes, crocodiles, *&c.* he frequently goes out of the water and feeds upon ſugar-canes, ruſhes, millet, rice, roots, *&c.* Theſe he devours in large quantities, and often does great damage in the cultivated field. But as he is more timid on land than in the water, he is eaſily drove away. His legs are ſo ſhort, that he cannot eſcape by flight when at a diſtance from the river. He generally flies when approached by people in boats; but, if they wound him, he returns with fury, attacks the boats with his teeth, and frequently overſets them.

This animal ſeems to be confined principally to the rivers of Africa. The male and female generally go together, and the female is ſaid to produce but one at a birth.

HIPPURIS, in botany, a genus of the monandria monogynia claſs. It has neither calix nor corolla; the ſtigma is ſimple; and there is but one ſeed. There is only one ſpecies, *viz.* the vulgaris, a native of Britain.

HIPPURIS, in ichthyology, See Coryphæna.

HIRCANIA, in geography, the provinces of Perſia in Aſia, which lie on the ſouthern ſhore of the Caſpian ſea.

HIRCHFIELD, a city of Germany, in the circle of the upper Rhine, and landgraviate of Heſſe Caſſel, ſituated on the river Fuld, in E. long. 9° 32′, N. lat. 50° 47′.

HIRTELLA, in botany, a genus of the triandria monogynia claſs. The calix is divided into five parts; the petals are five, and equal; the filaments are ſpiral, and the ſtylus is lateral. There is but one ſpecies, a native of Brazil.

HIRUDO, the Leech, in zoology, a genus belonging to the order of vermes inteſtina. The body is flat, jointed, and moves either forward or backward. There are nine ſpecies, principally diſtinguiſhed by that colour. This well known animal is uſed for bleeding children, *&c.* When they once fix, they ſeldom quit till they are glutted with blood. Salt makes them quit their hold, and throw up the blood.

HIRUNDO, in ornithology, a genus of birds, of the order of paſſeres. The bill is ſmall, crooked, ſubulated, bent a little inward, and depreſſed at the baſe. There are 12 ſpecies, principally diſtinguiſhed by their colour. This includes the common ſwallow, martin, *&c.*

HISPANIOLA, an iſland of America, in the Atlantic ocean, ſituated between 67° and 74° of W. long. and between 18° and 20° N lat. being about 420 miles long from eaſt to weſt, and 120 in breadth. It is frequently called St. Domingo, from the capital thereof.

HISTORIOGRAPHER, a profeſſed hiſtorian, or writer of hiſtory.

HISTORY, a deſcription or recital of things as they are, or have been, in a continued orderly narration of the principal facts and circumſtances thereof.

Hiſtory, with regard to its ſubject, is divided into the hiſtory of Nature, (See Nat. Hist.) and the hiſtory of Actions. The hiſtory of Actions is a continued relation of a ſeries of memorable events.

HISTRIO, in the ancient drama, ſignified an actor or comedian, but more eſpecially a pantomime, who exhibited his part by geſtures and dancing.

HITCHING, a market-town in Hartfordſhire, fourteen miles north-weſt of Hartford, and thirty-two north-weſt of London.

Hithe, one of the Cinque Ports in the county of Kent, ſituated on the Engliſh channel, ſix miles weſt of Dover.

HIVE, in country affairs, a convenient receptacle for bees. See Apis.

HIVING *of Bees*. See Apis.

HOACHE, in natural hiſtory, a kind of earth approaching to the nature of chalk, but harder, and feeling like ſoap; whence ſome think, that it is either the ſame with our ſoap rock of Cornwal, or very like it. The Chineſe diſſolve it in water, till the liquor is of the conſiſtence of cream, and then varniſh their china-ware with it.

Hoar-hound, in botany. See Marubium.

HOARSENESS, in medicine, a diminution of the voice, commoly attended with a preternatural aſperity or roughneſs thereof

HOBBY, in ornithology. See Falco.

HOE, in country-affairs, a tool made like a cooper's adz, to cut upwards in gardens, field, *&c.* This tool is commonly called the hand-hoe. See Agriculture.

HOG, in zoology. See Sus.

HOGSHEAD, in commerce, a meaſure of capacity, containing ſixty-three gallons.

HOGUE, a town and cape on the north-weſt point of Normandy in France, near which admiral Rook burnt the French admiral's ſhip called the Riſing-ſun, with twelve more large men of war: W. lon. 2°, and N. lat. 49° 50′.

HOHIO, a river of North America; which riſing in the Apalachian mountains, near the confines of Carolina and Virginia, runs ſouth-weſt, and falls into the river Miſſiſſipi.

Hoke-day, the Tueſday after eaſter-week; which was the day on which the Engliſh conquered and expelled the Danes: this was therefore kept as a day of rejoicing; and a duty, called hoke-tueſday-money, was paid to the landlord, for giving his tenants and bondmen leave to celebrate it.

HOLCUS, in botany, a genus of the polygamia monœcia claſs. The calix of the hermaphrodite is a double-flowered glume; the corolla is a glume with an awn; and there are three ſtamina, two ſtyli, and one ſeed. The calix of the male is a double-valved glume; it has no corolla, but three ſtamina. There are ten ſpecies, only two of them natives of Britain, *viz.* the lanatus, or meadow ſoft-graſs; and the mollis, or creeping ſoft-graſs.

HOLDERNESS, a peninſula in the eaſt riding of Yorkſhire, which has the German ocean on the eaſt, and the river Humber on the ſouth.

HOLDING, in Scots law, the tenor or terms upon which a proprietor of lands holds or enjoys them of his ſuperior.—See Blench, Burgage, Feu, Ward.

HOLLAND, one of the United Provinces. It is about one hundred miles long from north to ſouth, and ſcarce thirty miles broad: but enjoys the greateſt trade of any province in the world, and in point of ſtrength and riches is equal to the other ſix united provinces. It is ſituated one hundred miles eaſt of England, and is bounded on the north and weſt by the German ſea, on the eaſt by the Zuider ſea, and on the ſouth by the provinces of Zealand and Utrecht.

Holland is alſo the name of the ſouth-eaſt diviſion of Lincolnſhire.

Holland, in commerce, a fine and cloſe kind of linen, ſo called from its being firſt manufactured in Holland.

HOLLY, in botany. See Ilex.

Sea-Holly. See Eryngium.

HOLOCAUST, a burnt-offering, or ſacrifice, wholly conſumed by fire: of this kind was the daily ſacrifice in the Jewiſh church. This was done by way of acknowledgment, that the perſon offering and all that belonged to him, were the effects of the divine bounty.

HOLOGRAPH, among civilians, a will wholly written by the hand of the teſtator.

HOLSTEIN, a dutchy of Germany, in the circle of lower Saxony, one hundred miles long, and fifty broad. It is bounded by Sleſwic or ſouth Jutland on the north, by the Baltic ſea and the duchy of Sax-Lawenburg on the eaſt, by the riven Elbe on the ſouth, and by the German ſea on the weſt.

HOLY-GHOST, one of the Perſons of the Holy Trinity.

Order of the Holy ghost, the principal military order in France, inſtituted by Henry III. in 1569. It conſiſts of an hundred knights, who are to make proof of their nobility for three deſcents. The king is the grand-maſter, or ſovereign; and as ſuch, takes an oath on his coronation-day, to maintain the dignity of the order.

Holy-days. See Festival.

Holy-head, a cape and town in the iſle of Angleſea, ſituated in the Iriſh channel: W. long. 4° 45′, and N. lat. 53° 26′.

Holy-island, an iſland in the German ſea, ſix miles ſouth of Berwick upon Tweed: W. long. 1° 42′, and N. lat. 55° 45′.

Holy-well, a town of north Wales, in Flintſhire, ten miles eaſt of St. Aſaph.

HOMAGE, in law, is the ſubmiſſion, loyalty, and ſervice which a tenant promiſed to his lord, when he was firſt admitted to the land which he held of the lord in fee: alſo that owing to a king, or to any ſuperior.

HOMBERG, a town of Germany, in the circle of the upper Rhine, and landgraviate of Heſſe, ſituated ten miles north of Francfort: E. long. 8° 24′, N. lat. 50° 20′.

Homberg is alſo a town of Germany, in the palatinate of the Rhine, and dukedom of Deuxponts: E. long. 7° 6′. and N. lat. 49° 20′.

HOMER. See Omer.

HOMICIDE, ſignifies in general the taking away of any perſon's life. See Scots Law, tit. 33.

HOMILY, in eccleſiaſtical writers, a ſermon, or diſcourſe, upon ſome point of religion, delivered in a plain manner, ſo as to be eaſily underſtood by the common people.

HOMO, man, is ranked by Linnæus under the order of primates, and characteriſed by having four parallel foreteeth both in the upper and lower jaw, and two mammæ on the breaſt. The ſpecies, according to this author, are two, *viz.* the homo ſapiens, and the homo troglodytes. He ſubdivides the homo ſapiens into five varieties, *viz.* the American, the European, the Aſiatic, the African, and what he calls the monſtrous. The troglodytes, or orang outang, is a native of Æthiopia, Java, and Amboina. His body is white; he walks erect; and is about one half the ordinary human ſize. He generally lives about 25 years. He conceals himſelf in caves during the day, and ſearches for his prey in the night. He is ſaid to be exceedingly ſagacious, but is not endowed with the faculty of ſpeech.

HOMOLOGOUS, in geometry, an appellation given to the correſponding ſides and angles of ſimilar figures, as being proportional to each other.

HONAN, a province of China, bounded by thoſe of Xanſi and Pekin on the north, by Xantong and Nankin on the eaſt, by Suchuen on the ſouth, and by Xenſi on the weſt; lying between 33° and 37° north latitude. Its capital is Caiſum.

HONDURAS, a province of Mexico, in North America; which including the country of the Moſkito-Indians, is ſituated between 85° and 94° W. long. and between 12° and 16° N. lat.

HONE, a fine kind of whiteſtone, uſed for ſetting razors, pen-knives, and the like.

HONEY, is, in general, a thick, viſcous, and more or leſs fluid ſubſtance, of a whitiſh or yellowiſh colour, ſweet to the taſte, ſoluble in water, becoming vinous in fermentation, inflammable, liquable by a gentle heat, and of a fragrant ſmell. See Apis.

HONFLEUR, a port-town of France, in the province of Normandy, ſituated on the ſouth ſide of the river Seyne, near the Engliſh channel: E. long. 15′, and N. lat. 49° 24′.

HONITON, a borough-town of Devonſhire, twelve miles eaſt of Exeter. It ſends two members to parliament.

HONOUR, a teſtimony of eſteem or ſubmiſſion, expreſſed by words, actions, and an exterior behaviour, by which we make known the veneration and reſpect we entertain for any one on account of his dignity or merit. The word honour is alſo uſed in general for the eſteem due to virtue, glory, and reputation. It is alſo uſed for virtue and probity themſelves, and for an exactneſs in performing whatever we have promiſed; and in this laſt ſenſe we uſe the term, *a man of honour*. But honour is more particularly applied to two different kinds of virtue, bravery in men, and chaſtity in women.

Maids of Honour, are ſix young ladies in the houſehold of the queen and princeſs-royal; the ſalary of thoſe of a queen are 300 l. per ann. each, and thoſe of the princeſs dowager of Wales, 200 l.

Honour-point, in heraldry, is that next above the centre of the eſcutcheon, dividing the upper part into two equal portions.

HOOF, the horny ſubſtance that covers the feet of divers animals, as oxen, horſes, ſheep, *&c.*

HOOKS are a neceſſary ſort of utenſils, and uſed for various purpoſes.

HOOKER, in naval architecture, a veſſel much uſed by the Dutch, built like a pink, but rigged and maſted like a hoy.

Hookers will lie nearer a wind than veſſels with croſs ſails can do. They are from fifty to two hundred tons burden, and with a few hands will ſail to the Eaſt Indies.

HOP, in botany. See Humulus.

New land is found to ſucceed better with hops than old; and on this principle they are very cautious in their plantations in Kent, and look forward for the after-produce. When they make a new hop-ground, they plant it with apple-trees at a large diſtance aſunder, and with cherry-trees between; by this means, when the hops have grown ten years, which they judge as much as they will do well, they place their account in the cherry-trees, which bear large crops; theſe they gather for about thirty years, and then they cut them up, and depend upon their apple-trees only, which they find very large and ſtrong by that time.

The dry ſtalks of hops ſhould be burnt on the ground in winter, covering them with a little freſh earth as they burn. This makes together an excellent compoſt, to make the hills of. The land muſt be dug or plowed well, and laid very even, and then the places for the hills marked out by a line, and a ſtick put in every place where one is to be. A thouſand hills may be made in an acre of ground, and ſix or ſeven plants ſet on every hill. From ſix to nine feet ſhould be allowed between every hill, and the grounds in the hills ſhould be better and richer than the common earth. Some plant hops in March and April, but the moſt experienced people prefer the month of October, becauſe they will then ſtrike firm roots, and be ſtrong and vigorous againſt ſpring. The largeſt plants are to be choſen; and it is beſt to procure them from ſome rich ground, where the hills have been laid high; they ſhould be about eight or ten inches long, and have three or four joints or buds a-piece; the holes for planting them are to be dug eight or ten inches deep, and about a foot over; and in each of theſe holes four plants are to be ſet, one in each corner: they may be covered an inch deep over the top, if planted in October; but in ſpring, when they have ſhot from the joints, then they muſt not be buried: after this, the ground muſt be carefully kept clear of weeds.

Dreſſing of Hops. This is preparing the ground in winter and ſpring for the making a good ſummer-crop. In doing this, the hills upon which the plants ſtand muſt be all pulled down, and undermined on every ſide, till the ſpade comes near the principal root; then ſhake off or remove with the hand the looſe mould from the upper or looſe roots, that you may ſee where the new roots grow out of the old ſets. The old ſets are to be carefully preſerved, but the other roots may be cut away. Whatever time the hills are pulled down, the roots muſt not be cut till March. When the young hops are dreſſed for the firſt time, all the roots are to be cut away that grew the year before, and the ſets are to be cut off within one inch of the ſame; and every year after, they muſt be cut as cloſe as may be to the old roots; but to a weak hop, ſome of the ſhoots are to be left at the dreſſing. Thoſe roots of the plant which grow downwards, are never to be injured, but only thoſe which run horizontally are to be cut. The old roots and the young ones may be eaſily diſtinguiſhed, in that the old ones are always red, and the young white. If there are by accident any wild hops got among the reſt, the places where they grow are to be marked with ſticks, or otherwiſe, at the time of their being gathered; and after this, at the time of dreſſing the ground, that whole hill is to be deſtroyed, and a new one made with new plants in the room of it. When the roots are cut and dreſſed, the rich compoſt is to be put to them; and the hills muſt not be made too high at firſt, leſt they hinder the young ſhoots.

Gathering and drying of Hops. Hops blow in the latter end of July, in the beginning of Auguſt they bell; and they are ſometimes ripe at the beginning of September, ſometimes later. When they begin to change colour, are eaſily pulled to pieces, and their ſeeds look brown within them, they are ripe; and they are then to be gathered as quick as poſſible, for the leaſt blaſt of wind will hurt them at this time.

The manner of gathering hops, is to take down four hills ſtanding together in the midſt of the garden, and to cut the roots even with the ground, then lay the ground level; and when it is ſwept clean, it makes a floor, on which the hops may be laid and picked. The hop-plants are firſt unwound from the poles, and then the people ſit round and pick off the hops into baſkets.

Care ſhould be taken to dry the hops as faſt as they are picked, for in lying undried they are apt to heat and change colour very quickly. If the quantity picked be ſo large, that the kiln in which they are to be dried is over-ſtocked, they muſt be ſpread thin upon a floor, and they will keep two or three days in that manner without any harm. Indeed, where the quantity is but ſmall, there is no need to have recourſe to the kiln at all, for they will dry much better than any other way, by being laid thin upon a floor, and often turned. The drying of hops is the moſt material part of their manufacture; for if they be ill dried, they loſe all their agreeable flavour; and great caution ſhould be uſed, that they be all equally dried.

Bagging of Hops, a term uſed by the farmers, who cultivate hops, for the laſt thing they have to do with with them, in order to bring them to market; that is, the putting them up in large bags of coarſe cloth, for carriage. When the hops have been picked and dried in the ooſt, or tin-floor, they are ſo brittle that they would break to pieces and be ſpoiled if they were immediately to be put up; they are therefore to lie together three weeks, or thereabouts, that they may become tough: if they are covered from the air by blankets in the heap, they may be bagged much ſooner than if left open.

The manner of bagging them is this; a hole is made in an upper-floor, ſo large that a man may eaſily go up and down it; then a hoop is fitted to the mouth of the bag, and ſo firmly ſewed on, that it cannot be torn off; the bag is then let down through the hole, and the hoop remaining above, ſtops it from being pulled quite through, being larger than the hole: a few hops are to be firſt thrown into the bag, and a perſon below is to take up a parcel of theſe in each corner of the bag, tying it with a packthread; this makes a ſort of taſſel, by which the bags are afterwards the eaſier managed and turned about. When this is done, one man muſt go down into the bag, and, while another caſts in the hops, he muſt tread them down equally every way with his feet; when the bag is in this manner filled, it is to be ripped from the hoop, and ſewed up, leaving two taſſels at the corners, as at the bottom. A bag of hops thus prepared, may be kept for ſeveral years in a dry place.

The tops of this plant, being of a cooling quality, are eaten, when boiled, as an emollient. A decoction of hop-flowers is alſo accounted an antidote againſt poiſon, and cures the itch, as well as the ſyrup thereof, and is eſteemed excellent in choleric and peſtilential fevers. The heads and tendrils are good in the ſcurvy and moſt cutaneous diſeaſes. Juleps and apozems are alſo prepared with hops for hypochondriacal and hyſterical affections, and to promote the menſes: but the chief uſe of this plant conſiſts in preſerving beer and other malt-liquors (in which the flower of this plant is a principal ingredient) from turning ſowr, and rendering it wholeſome and grateful to the taſte, *&c.*

HORD, in geography, is uſed for a company of wandering people, which have no ſettled habitation, but ſtroll about, dwelling in waggons, or under tents, to be ready to ſhift as ſoon as the herbage, fruit, and the preſent province is eaten bare: ſuch are ſeveral tribes of the Tartars, particularly thoſe who inhabit beyond the Wolga, in the kingdom of Aſtracan and Bulgaria.

HORDEUM, BARLEY, in botany, a genus of the triandria digynia claſs. The involucrum conſiſts of ſix leaves, and contains three flowers. There are eight ſpecies, only one of which, *viz.* the murinum, or wall-barley-graſs, is a native of Britain. The native place of the vulgare, or common barley cultivated in our fields, is not known. For the culture, *&c.* of common barley, ſee AGRICULTURE, p. 61.

HORDICALIA, or HORDICIDIA, in antiquity, a religious feaſt held among the Romans, wherein they ſacrificed cattle big with young. This feaſt fell on April 15. on which day they ſacrificed thirty cows with calf to the goddeſs Tellus or the Earth; part of them were ſacrificed in the temple of Jupiter. The calves taken out of their bellies were burnt to aſhes at firſt by the pontifices, afterwards by the eldeſt of the veſtal virgins.

HOREHOUND, BALLOTA, STACHYS, in botany. See MARUBIUM.

HORIZON, in aſtronomy and geography, that great circle which divides the heavens and the earth into two equal parts, or hemiſpheres, diſtinguiſhing the upper from the lower. See ASTRONOMY and GEOGRAPHY.

HORIZONTAL, ſomething relating to the horizon; or that is taken in, or on a level with the horizon: thus we ſay, an horizontal plane, *&c.*

HORMINUM, CLARY, in botany, a genus of the didynamia gymnoſpermia claſs. The calix is bell-ſhaped, with four nearly equal ſegments, and a fifth larger and emarginated; and the upper labium of the corolla is concave. There are two ſpecies, none of them natives of Britain.

HORN, a hard ſubſtance growing on the heads of divers animals, particularly the cloven-footed quadrupeds; and ſerving them both as weapons of offence and defence.

HORN-BEAM, in botany. See CARPINUS.

HORN-WORK, in fortification, an out-work compoſed of two demi-baſtions, joined by a curtin. See FORTIFICATION.

HORNET, in zoology. See APIS.

HORNING, in Scots law, a writing iſſuing from the ſignet, in his Majeſty's name, at the inſtance of a creditor againſt his debtor, commanding him to pay or perform within a certain time. See DENUNCIATION, —and LAW, tit. 12. §. 13. 14.

HORNSEY, a market-town of the eaſt riding of Yorkſhire, thirty-five miles eaſt of York.

HOROGRAPHY. See DIALLING.

HOROLOGIUM, a general name for inſtruments to meaſure the hours, as a watch, clock, dial, *&c.* See WATCH.

HOROSCOPE, in aſtrology, is the degree of the aſcendent, or the ſtar that riſes above the horizon at a certain moment, which is obſerved in order to predict ſome future event, as the ſucceſs of a deſign, the fortune of a perſon who was at that inſtant born, *&c.*

HORSE, in zoology. See EQUUS.

HORSEMANSHIP;

Or, The Art of Riding, and of Training and Managing HORSES.

The method of preparing horſes to be mounted.

THOUGH all horſes are generally bought at an age when they have already been backed, they ſhould be begun and prepared for the rider with the ſame care, gentleneſs and caution, as if they had never been handled or backed, in order to prevent accidents, which might elſe ariſe from ſkittiſhneſs or other cauſes: and as it is proper that they ſhould be taught the figure of the ground they are to go upon, when they are at firſt mounted, they ſhould be previouſly trotted in a *longe* on circles, without any one upon them.

The manner of doing this is as follows: Put an eaſy *caveſſon* upon the horſe's noſe, and make him go forwards round you, ſtanding quiet and holding the *longe*; and let another man, if you find it neceſſary, follow him with a whip. All this muſt be done very gently, and but a little at a time: for more horſes are ſpoilt by over-much work, than by any other treatment whatever; and that by very contrary effects; for ſometimes it drives them into vice, madneſs and deſpair, and often ſtupifies and totally diſpirits them.

The firſt obedience required in a horſe is going forwards: Till he performs this duty freely, never even think of making him rein back, which would inevitably make him reſtive: As ſoon as he goes forwards readily, ſtop and careſs him. You muſt remember in this, and likewiſe in every other exerciſe, to uſe him to go equally well to the right and left; and when he obeys, careſs him and diſmiſs him immediately. If a horſe, that is very young, takes fright and ſtands ſtill, lead on another horſe before him, which probably will induce him inſtantly to follow. Put a ſnaffle in his mouth; and when he goes freely, ſaddle him, girting him at firſt very looſe. Let the cord, which you hold, be long and looſe; but not ſo much, ſo as to endanger the horſe's entangling his legs in it. It muſt be obſerved, that ſmall circles, in the beginning, would conſtrain the horſe too much, and put him upon defending himſelf. No bend muſt be required at firſt: never ſuffer him to gallop falſe; but whenever he attempts it, ſtop him without delay, and then ſet him off afreſh. If he gallops of his own accord, and true, permit him to continue it; but if he does it not voluntarily, do not demand it of him at firſt. Should he fly and jump, ſhake the cord gently upon his noſe without jerking it, and he will fall into his trot again. If he ſtands ſtill, plunges or rears, let the man who holds the whip, make a noiſe with it; but never touch him, till it be abſolutely neceſſary to make him go on. When you change hands, ſtop and careſs him, and entice him by fair means to come up to you: For by preſenting yourſelf, as ſome do, on a ſudden before horſes, and frightening them to the other ſide, you run a great riſk of giving them a ſhyneſs. If he keeps his head too low, ſhake the *caveſſon* to make him raiſe it: And in whatever the horſe does, whether he walks, trots, or gallops, let it be a conſtant rule, that the motion be determined and really ſuch as is inteded, without the leaſt ſhuffling, pacing, or any other irregular gait.

The method of placing the rider and rendering him firm on horſeback, with ſome occaſional inſtructions for riders and the horſes.

It is neceſſary that the greateſt attention, and the ſame gentleneſs, that is uſed in teaching the horſes, be obſerved likewiſe in teaching the rider, eſpecially at the beginning. Every method and art muſt be practiſed to create and preſerve, both in man and horſe, all poſſible feeling and ſenſibility, contrary to the uſage of moſt riding maſters, who ſeem induſtriouſly to labour at aboliſhing theſe principles both in one and the other. As ſo many eſſential points depend upon the manner in which a man is at firſt placed on horſeback, it ought to be conſidered and attended to with the ſtricteſt care and exactneſs.

The abſurdity of putting a man, who perhaps has never before been upon a horſe, on a rough trotting horſe, on which he is obliged to ſtick with all the force of his arms and legs, is too obvious to need mentioning. This rough work, all at once, is plainly as detrimental at firſt, as it is excellent afterwards in proper time. No man can be either well, or firmly ſeated on horſeback, unleſs he be maſter of the balance of his body, quite unconſtrained, with a full poſſeſſion of himſelf, and at his eaſe; none of which requiſites can he enjoy, if his attention be otherwiſe engaged; as it muſt wholely be in a raw, unſuppled, and unprepared lad, who is put at once upon a rough horſe: in ſuch a diſtreſsful ſtate he is forced to keep himſelf on at any rate, by holding to the bridle, (at the expence of the ſenſibility both of his own hand, and the horſe's mouth,) and by clinging with his legs, in danger of his life, and to the certain depravation of a right feeling in the horſe.

The firſt time a man is put on horſeback, it ought to be upon a very gentle one. He never ſhould be made to trot, till he is quite eaſy in the walk; nor gallop, till he is able to trot properly. The ſame muſt be obſerved in regard to horſes: they ſhould never be made to trot, till they are obedient, and their mouths are well formed on a walk; nor be made to gallop, till the ſame be effected on a trot. When he is arrived at ſuch a degree of firmneſs in his ſeat, the more he trots, and the more he rides rough horſes, the better. This is not only the beſt method, but alſo the eaſieſt and the ſhorteſt: by it, a man is ſoon made ſufficiently an horſeman for a ſoldier; but by the other deteſtable methods, that are commonly uſed, a man, inſtead of improving, contracts all ſorts of bad habits, and rides worſe and worſe every day; the horſe too becomes daily more and more unfit for uſe. In proceeding according to the manner propoſed, a man is rendered firm and eaſy upon the horſe, both his own and the horſe's ſenſibility is preſerved, and each in a ſituation fit to receive and practiſe all leſſons effectually.

Among the various methods that are uſed of placing people on horſeback, few are directed by reaſon. Before you let the man mount, teach him to know, and always to examine, if the curb be well placed, (that is, when the horſe has a bit in his mouth, which at firſt he ſhould not; but only a ſnaffle, till the rider is firm in his ſeat, and the horſe alſo ſomewhat taught;) and likewiſe if the noſe-band be properly tight; the throat-band looſiſh, and the mouth-piece neither too high nor too low in the horſe's mouth, but rightly put ſo as not to wrinkle the ſkin, nor to hang lax; the girts drawn moderately, but not too tight; and the crupper and the breaſt-plate properly adjuſted. A very good and careful hand may venture on a bit at firſt, and ſucceed with it full as well, as by beginning with a ſnaffle alone: on colts, indeed, it is better, in all ſchools whatſoever, to avoid any preſſure on the bars juſt at firſt, which a curb, though ever ſo delicately uſed, muſt in ſome degree occaſion. When the bridle, *&c.* have been well looked to, let the man approach the horſe gently near the ſhoulder; then taking the reins and an handful of the mane in his left hand, let him put his foot ſoftly in the left ſtirrup, by pulling it towards him, leaſt he touch the horſe with his toe, then raiſing himſelf up, let him reſt a moment on it with his body upright, but not ſtiff: and after that paſſing his right leg clear over the ſaddle without rubbing againſt any thing, let him ſeat himſelf gently down. He muſt be cautious not to take the reins too ſhort, for fear of making the horſe rear, run, or fall back, or throw up his head; but let him hold them of an equal length, neither tight nor ſlack, and with the little finger betwixt them. It is fit that horſes ſhould be accuſtomed to ſtand ſtill to be mounted, and not to ſtir till the rider pleaſes. All ſoldiers ſhould be inſtructed to mount and diſmount equally well on both ſides, which may be of very great uſe in times of hurry and confuſion. Then place the man in his ſaddle, with his body rather back, and his head held up with eaſe, without ſtiffneſs; ſeated neither forwards, nor very backwards, with the breaſt puſhed out a little, and the lower part of the body likewiſe a little forwards; the thighs and legs turned in without conſtraint, and the feet in a ſtraight line, neither turned in nor out: By this poſition, the natural weight of the thighs has a proper and ſufficient preſſure of itſelf, and the legs are in readineſs to act, when called upon: they muſt hang down eaſy and naturally, and be ſo placed, as not to be wriggling about, touching and tickling the horſe's ſides, but always near them in caſe they ſhould be wanted, as well as the heels.

The body muſt be carefully kept eaſy and firm, and without any rocking, when in motion; which is a bad habit very eaſily contracted, eſpecially in galloping. The left elbow muſt be gently leant againſt the body, a little forwards; unleſs it be ſo reſted, the hand cannot be ſteady, but will be always checking, and conſequently have pernicious effects on the horſe's mouth: and the hand ought to be of equal height with the elbow; if it were lower, it would conſtrain and confine the motion of the horſe's ſhoulders; but, as the mouths of horſes are different, the place of the hand alſo muſt occaſionally differ: a leaning, low, heavy fore hand requires a high hand; and a horſe that pokes out his noſe, a low one. The right hand arm muſt be placed in ſymmetry with the left: only let the right hand be a little forwarder or backwarder, higher or lower, as occaſions may require, in order that both hands may be free: both arms muſt be a little bent at the elbow, to prevent ſtiffneſs.

A ſoldier's right hand ſhould be kept unemployed in riding; it carries the ſword, which is a ſufficient buſineſs for it.

There remains one farther obſervation, that ought not to be omitted, about the hand, that it muſt be kept clear of the body; *i. e.* about two inches and half forwards from it, with the nails turned oppoſite to the belly, and the wriſt a little rounded with eaſe; a poſition not leſs graceful than ready for ſlackening, tightening, and moving the reins from on ſide to the other, as may be found neceſſary.

When the men are well placed, the more rough trotting they have without ſtirrups, the better; but with a ſtrict care always, that their poſition be preſerved very exactly. In all caſes, great care muſt be taken to hinder their clinging with their legs: In ſhort, no ſticking by hands or legs is ever to be allowed of at any time. If the motion of the horſe be too rough, ſlacken it, till the rider grows by degrees more firm: and when he is quite firm and eaſy on his horſe in every kind of motion, ſtirrups may be given him; but he muſt never leave off trotting often without any.

The ſtirrups muſt be neither ſhort nor long; but of ſuch a length, that when the rider, being well placed, puts his feet into them, (about one third of the length of each foot from the point of it,) the points may be between two and three inches higher than the heels. The rider muſt not bear upon his ſtirrups, but only let the natural weight of his legs reſt on them: For if he bear upon them, he would be raiſed above and out of his ſaddle; which ſhould never be, except in charging ſword in hand, with the body inclined forwards at the very inſtant of attacking. Spurs may be given, as ſoon as the rider is grown familiar with ſtirrups, or even long before, if his legs are well placed.

A hand ſhould always be firm, but delicate: a horſe's mouth ſhould never be ſurpriſed by any ſudden tranſition of it, either from ſlack to tight, or from tight to ſlack. Every thing in horſemanſhip muſt be effected by degrees, but at the ſame time with ſpirit and reſolution. That hand which, by giving and taking properly, gains its point with the leaſt force, is the beſt; and the horſe's mouth, under this ſame hand's directions, will alſo conſequently be the beſt, ſuppoſing equal advantages in both from nature. This principle of gentleneſs ſhould be obſerved upon all occaſions in every branch of horſemanſhip. Sometimes the right hand may be neceſſary, upon ſome troubleſome horſes, to aſſiſt the left; but the ſeldomer this is done, the better; eſpecially in a ſoldier, who has a ſword to carry, and to make uſe of.

The ſnaffle muſt on all occaſions be uppermoſt; that is to ſay, the reins of it muſt be above thoſe of the bridle, whether the ſnaffle or the bit be uſed ſeperately, or whether they be both uſed together. When the rider knows enough, and the horſe is ſufficiently prepared and ſettled to begin any work towards ſuppling, one rein muſt be ſhortened according to the ſide worked to; but it muſt never be ſo much ſhortened, as to make the whole ſtrength reſt on that rein alone; for, not to mention that the work would be falſe and bad, one ſide of the horſe's mouth would by that means be always deadened; whereas on the contrary, it ſhould always be kept freſh by its own play, and by the help of the oppoſite rein's acting delicately in a ſomewhat ſmaller degree of tenſion; the joint effect of which produces in a horſe's mouth the proper, gentle and eaſy degree of *appui* or bearing.

A coward and a madman make alike bad riders, and are both alike diſcovered and confounded by the ſuperior ſenſe of the creature they are mounted upon, who is equally ſpoilt by both, though in very different ways. The coward, by ſuffering the animal to have his own way, not only confirms him in his bad habits, but creates new ones in him: and the madman, by falſe and violent motions and corrections, drives the horſe, through deſpair, into every bad and vicious trick that rage can ſuggeſt.

It is very requiſite in horſemanſhip, that the hand and legs ſhould act in correſpondence with each other in every thing; the latter always ſubſervient and aſſiſtant to the former. Upon circles, in walking, trotting, or galloping, the outward leg is the only one to be uſed, and that only for a moment at a time, in order to ſet off the horſe true, or put him right, if he be falſe; and as ſoon as that is done, it muſt be taken away again immediately: but if the horſe be lazy, or otherwiſe retains himſelf, both legs muſt be uſed, and preſſed to his ſides at the ſame time together. The leſs the legs are uſed in general, the better. Very delicate good riders, with horſes they have dreſſed themſelves, will ſcarcely ever want their help. By the term *outward* is underſtood the ſide which is more remote from the centre; and by *inward* is meant the ſide next to the centre. In reining back, the rider ſhould be careful not to uſe his legs, unleſs the horſe backeth on his ſhoulders; in which caſe they muſt be both applied gently at the ſame time, and correſpond with the hand. If the horſe refuſe to back at all, the riders legs muſt be gently approached, till the horſe lifts up a leg, as if to go forwards; at which time, when that leg is in the air, the rein of the ſame ſide with that leg, which is lifted up, will eaſily bring that ſame leg backwards, and accordingly oblige the horſe to back: but if the horſe offers to rear, the legs muſt be inſtantly removed away. The inward rein muſt be the tighter on circles, ſo that the horſe may bend and look inwards; and the outward one croſſed over a little towards it; and both held in the left hand.

Let the man and horſe begin on very ſlow motions, that they may have time to underſtand, and reflect on what is taught them; and in proportion as the effects of the reins are better comprehended, and the manner of working becomes more familiar, the quickneſs of motion muſt be increaſed. Every rider muſt learn to feel, without the help of the eye, when a horſe goes falſe, and remedy the fault accordingly: this is an intelligence, which nothing but practice, application and attention can give, in the beginning on ſlow motions. A horſe may not only gallop falſe, but alſo trot and walk falſe. If a horſe gallops falſe, that is to ſay, if going to the right, he leads with the left leg; or if going to the left, he leads with the right; or in caſe he is diſunited, *i. e.* if he leads with the oppoſite leg behind to that which he leads with before; ſtop him immediately, and put him off again properly: the method of effecting this, is by approaching your outward leg and putting your hand outwards, ſtill keeping the inward rein the ſhorter, and the horſe's head inwards, if poſſible; and if he ſhould ſtill reſiſt, then bend and pull his head outwards alſo, but replace it again, bent properly inwards, the moment he goes off true. A horſe is ſaid to be diſunited to the right, when going to the right, and conſequently leading with the right leg before, he leads with the left behind; and is ſaid to be diſunited to the left, when going to the left, and conſequently leading with the left leg before, he leads with the right behind. A horſe may at the ſame time be both falſe and diſunited; in correcting both which faults, the ſame method muſt be uſed. He is both falſe and diſunited to the right, when in going to the right he leads with the left leg before, and the right behind; notwithſtanding that hinder leg be with propriety more forward under his belly than the left, becauſe the horſe is working to the right: and he is falſe and diſunited to the left, when in going to the left he leads with the right leg before, and the left behind; notwithſtanding, as above, that hinder leg be with propriety more forward under his belly than the right, becauſe the horſe is working to the left.

In teaching men a right ſeat on horſeback, the greateſt attention muſt be given to prevent ſtiffneſs, and ſticking by force in any manner upon any occaſion: ſtiffneſs diſgraces every right work; and ſticking ſerves only to throw a man (when diſplaced) a great diſtance from his horſe by the ſpring he muſt go off with: whereas by a proper equilibrating poſition of the body, and by the natural weight only of the thighs, he cannot but be firm, and ſecure in his ſeat.

As the men become more firm, and the horſes more ſupple, it is proper to make the circles leſs, but not too much ſo, for fear of throwing the horſes forwards upon their ſhoulders.

Some horſes, when firſt the bit is put into their mouths, if great care be not taken, will put their heads very low. With ſuch horſes, raiſe your right hand with the *bridoon* in it, and play at the ſame time with the bit in the left hand, giving and taking.

On circles, the rider muſt lean his body inwards; unleſs great attention be given to make him do it, he will be perpetually looſing his ſeat outwards. It is ſcarce poſſible for him to be diſplaced if he leans his body properly inwards.

The method of ſuppling horſes with men upon them, by the EPAULE en dedans, *&c. with and without a* longe, *on circles and on ſtrait lines.*

WHEN a horſe is well prepared and ſettled in all his motions, and the rider firm, it will be proper then to proceed on towards a farther ſuppling and teaching of both.

In ſetting out upon this new work, begin by bringing the horſe's head a little more inwards than before, pulling the inward rein gently to you by degrees. When this is done, try to gain a little on the ſhoulders, by keeping the inward rein the ſhorter, as before, and the outward one croſſed over towards the inward one. The intention of theſe operations is this; the inward rein ſerves to bring in the head, and procures the bend; whilſt the outward one, that is a little croſſed, tends to make that bend perpendicular, and as it ſhould be, that is to ſay, to reduce the noſe and the forehead to be in a perpendicular line with each other: it alſo ſerves, if put forwards, as well as alſo croſſed, to put the horſe forwards, if found neceſſary, which is often requiſite, many horſes being apt in this and other works rather to loſe their ground backwards than otherwiſe, when they ſhould rather advance: if the noſe were drawn in towards the breaſt beyond the perpendicular, it would confine the motion of the ſhoulders, and have other bad effects. All other bends, beſides what are above ſpecified, are falſe. The outward rein, being croſſed, not in a forward ſenſe, but rather a little backwards, ſerves alſo to prevent the outward ſhoulder from getting too forwards, and makes it approach the inward one; which facilitates the inward leg's croſſing over the outward one; which is the motion that ſo admirably ſupples the ſhoulders. Care muſt be taken, that the inward leg paſs over the outward one, without touching it; this inward leg's croſſing over muſt be helped alſo by the inward rein, which you muſt croſs towards and over the outward rein every time the outward leg comes to the ground, in order to lift and help the inward leg over it: at any other time, but juſt when the outward leg comes to the ground, it would be wrong to croſs the inward rein, or to attempt to lift up the inward leg by it; nay, it would be demanding an abſolute impoſſibility, and lugging about the reins and horſe to no purpoſe: becauſe in this caſe, a very great part of the horſe's weight reſting then upon that leg, would render ſuch an attempt, not only fruitleſs, but alſo prejudicial to the ſenſibility of the mouth, and probably oblige him to defend himſelf: and moreover, it would put the horſe under a neceſſity of ſtraddling before, and alſo of leading with the wrong leg, without being productive of any ſuppling motion whatſoever.

When the horſe is thus far familiarly accuſtomed to what you have required of him, then proceed to effect by degrees the ſame croſſing in his hinder legs. By bringing in the fore-legs more, you will of courſe engage the hinder ones in the ſame work: if they reſiſt, the rider muſt bring both reins more inwards; and, if neceſſary, put back alſo, and approach his inward leg to the horſe; and if the horſe throws out his croup too far, the rider muſt bring both reins outwards, and if abſolutely neceſſary, he muſt alſo make uſe of his outward leg, in order to replace the horſe properly; obſerving that the croup ſhould always be conſiderably behind the ſhoulders, which in all actions muſt go firſt; and the moment that the horſe obeys, the rider muſt put his hand and leg again into their uſual poſition.

Nothing is more ungraceful in itſelf, more detrimental to a man's ſeat, or more deſtructive of the ſenſibility of a horſe's ſides, than a continual wriggling unſettledneſs in a horſeman's legs, which prevents the horſe from ever going a moment together true, ſteady, or determined.

A horſe ſhould never be turned, without firſt moving a ſtep forwards; and when it is doing, the rider muſt not lift up his elbow, and diſplace himſelf; a motion only of the hand from the one ſide to the other being ſufficient for that purpoſe. It muſt alſo be a conſtant rule never to ſuffer a horſe to be ſtopped, mounted or diſmounted, but when he is well placed. The ſlower the motions are, when a man or horſe is taught any thing, the better.

At firſt, the figures worked upon muſt be great, and afterwards made leſs by degrees, according to the improvement which the man and horſe make; and the cadenced pace alſo, which they work in, muſt be accordingly augmented. The changes from one ſide to the other, muſt be in a bold determined trot, and at firſt quite ſtraight forwards, without demanding any ſide motion on two *piſtes*, which is very neceſſary to require afterwards, when the horſe is ſufficiently ſuppled. By two *piſtes* is meant, when the fore-parts and hinder-parts do not follow, but deſcribe two different lines.

In the beginning, a *longe* is uſeful on circles, and alſo on ſtraight lines, to help both the rider and the horſe; but afterwards, when they are grown more intelligent, they ſhould go alone. At the end of the leſſon, rein back; and then put the horſe, by a little at a time, forwards, by approaching both legs gently to his ſides, and playing with the bridle: if he rears, puſh him out immediately into a full trot. Shaking the *caveſſon* on the horſe's noſe, and alſo putting one's ſelf before him and rather near to him, will generally make him back, though he otherwiſe refuſe to do it: and moreover a ſlight uſe and approaching of the rider's legs, will ſometimes be neceſſary in backing, in order to prevent the horſe from doing it too much upon his ſhoulders; but the preſſure of the legs ought to be very ſmall, and taken quite away the moment that he puts himſelf enough upon his haunches. If the horſe does not back upon a ſtraight line properly, the rider muſt not be permitted to have recourſe immediately to his leg, and ſo diſtort himſelf by it, but firſt try, if croſſing over his hand and reins to which ever ſide may be neceſſary, will not be alone ſufficient; which moſt frequently it will; if not, then employ the leg.

After a horſe is well prepared and ſettled, and goes freely on in all his ſeveral paces, he ought to be in all his works kept, to a proper degree, upon his haunches, with his hinder legs well placed under him; whereby he will be always pleaſant to himſelf and his rider, will be light in hand, and ready to execute whatever may be demanded of him, with facility, vigour, and quickneſs.

The common method that is uſed, of forcing a horſe ſideways, is a moſt glaring abſurdity, and very hurtful to the animal in its conſequences; for inſtead of ſuppling him, it obliges him to ſtiffen and defend himſelf, and often makes a creature, that is naturally benevolent, reſtive, frightened and vicious.

For horſes, who have very long and high fore-hands, and who poke out their noſes, a running ſnaffle is of excellent uſe; but for ſuch as bore and keep their heads low, a common one is preferable; though any horſe's head indeed may be kept up alſo with a running one, by the rider's keeping his hands very high and forwards: but whenever either is uſed alone without a briddle upon horſes that carry their heads low and that bore, it muſt be ſawed about from one ſide to the other.

This leſſon of the *epaul en dedans*, ſhould be taught to ſuch people as are likely to become uſeful in helping to teach men and to break horſes; and the more of ſuch that can be found, the better: none others ſhould ever be ſuffered upon any occaſion to let their horſes look any way beſides the way they are going. But all horſes whatever, as likewiſe all men, who are deſigned for the teaching others, muſt go thoroughly and perfectly through this excellent leſſon, under the directions of intelligent inſtructors; and often practiſe it too afterwards, and when that is done, proceed to, and be finiſhed by the leſſons of the head and tail to the wall.

Of the head to the wall, and of the croup to the wall.

THIS leſſon ſhould be practiſed immediately after that of the *epaule en dedans*, in order to place the horſe properly the way he goes, *&c.* The difference between the head to the wall, and the croup to the wall, conſiſts in this: in the former, the fore parts are more remote from the centre, and go over more ground; in the latter, the hinder-parts are more remote from the center, and conſequently

ſequently go over more ground: in both, as likewiſe in all other leſſons, the ſhoulders muſt go firſt. In riding-houſes, the head to the wall is the eaſier leſſon of the two at firſt, the line to be worked upon being marked by the wall, not far from his head.

The motion of the legs to the right, is the ſame as that of the *epaule en dedans* to the left, and ſo *vice verſa*; but the head is always bent and turned differently: in the *epaule en dedans*, the horſe looks the contrary way to that which he goes; in this he looks the way he is going.

In the beginning, very little bend muſt be required; too much at once would aſtoniſh the horſe and make him defend himſelf: it is to be augmented by degrees. If the horſe abſolutely refuſes to obey, it is a ſign, that either he or his rider has not been ſufficiently prepared by previous leſſons. It may happen, that weakneſs or a hurt in ſome part of the body, or ſometimes temper, though ſeldom, may be the cauſe of the horſe's defending himſelf: it is the rider's buſineſs to find out from whence the obſtacle ariſes; and if he finds it to be from the firſt mentioned cauſe, the previous leſſons muſt be reſumed again for ſome time; if from the ſecond, proper remedies muſt be applied; and if from the laſt cauſe, when all fair means that can be tried have failed, proper corrections with coolneſs and judgment muſt be uſed.

In practiſing this leſſon to the right, bend the horſe to the right with the right rein; helping the left leg over the right (at the time when the right leg is juſt come to the ground,), with the left rein croſſed towards the right, and keeping the right ſhoulder back with the right rein towards your body, in order to facilitate the left legs croſſing over the right; and ſo likewiſe *vice verſa* to the left, each rein helping the other by their properly mixed effects. In working to the right, the rider's left leg helps the hinder parts on to the right, and his right leg ſtops them, if they get too forwards; and ſo *vice verſa* to the left; but neither ought to be uſed, till the hand being employed in a proper manner has failed, or finds that a greater force is neceſſary to bring what is required about than it can effect alone; for the legs ſhould not only be correſponding with, but alſo ſubſervient to the hand; and all unneceſſary aids, as well as all force, ought always to be avoided, as much as poſſible.

In the execution of all leſſons, the equilibre of the rider's body is of great uſe to the horſe: it ought always to go with and accompany every motion of the animal; when to the right, to the right; and when to the left, to the left.

Upon all horſes, in every leſſon and action, it muſt be obſerved, that there is no horſe but has his own peculiar appui or degree of bearing, and alſo a ſenſibility of mouth, as likewiſe a rate of his own, which it is abſolutely neceſſary for the rider to diſcover and make himſelf acquainted with. A bad rider always takes off at leaſt the delicacy of both, if not abſolutely deſtroys it. The horſe will inform his rider when he has got his proper bearing in the mouth, by playing pleaſantly and ſteadily with his bit, and by the ſpray about his chaps. A delicate and good hand will not only always preſerve a light appui, or bearing, in its ſenſibility; but alſo of a heavy one, whether naturally ſo or acquired, make a light one. The lighter this appui can be made, the better; provided that the rider's hand correſponds with it; if it does not, the more the horſe is properly prepared, ſo much the worſe. Inſtances of this inconvenience of the beſt of appuis, when the rider is not equally taught with the horſe, may be ſeen every day in ſome gentlemen, who try to get their horſes bitted as they call it, without being ſuitably prepared themſelves for riding them: the conſequence of which is, that they ride in danger of breaking their necks; till at length after much hauling about, and by the joint inſenſibility and ignorance of themſelves and their grooms, the poor animals gradually become mere ſenſeleſs, unfeeling poſts; and thereby grow, what they call, ſettled. When the proper appui is found, and made of courſe as light as poſſible, it muſt not be kept duly fixed without any variation, but be played with; otherwiſe one equally continued tenſion of reins would render both the rider's hand and the horſe's mouth very dull. The ſlighteſt, and frequent giving and taking, is therefore neceſſary to keep both perfect.

Whatever pace or degree of quickneſs you work in, (be it ever ſo faſt, or ever ſo ſlow,) it muſt be cadenced; time is as neceſſary for an horſeman as for a muſician.

This leſſon of the head and of the tail to the wall, muſt be taught every ſoldier: ſcarce any manœuvre can be well performed without it. In cloſing and opening of files, it is almoſt every moment wanted.

The method of teaching horſes to ſtand fire, noiſes, alarms, ſights, &c.

In order to make horſes ſtand fire, the ſound of drums, and all ſorts of different noiſes, you muſt uſe them to it by degrees in the ſtable at feeding-time; and inſtead of being frightened at it, they will ſoon come to like it as a ſignal for eating.

With regard to ſuch horſes as are afraid of burning objects, begin by keeping them ſtill at a certain diſtance from ſome lighted ſtraw: careſs the horſe; and in proportion as his fright diminiſhes, approach gradually the burning ſtraw very gently, and increaſe the ſize of it. By this means he will very quickly be brought to be ſo familiar with it, as to walk undaunted even through it.

As to horſes that are apt to lie down in the water, if animating them, and attacking them vigorouſly, ſhould fail of the deſired effect, then break a ſtraw bottle full of water upon their heads, and let the water run into their ears, which is a thing they apprehend very much.

All troop-horſes muſt be taught to ſtand quiet and ſtill when they are ſhot off from, to ſtop the moment you preſent, and not to move after firing, till they are required to do it; this leſſon ought eſpecially to be obſerved in light-troops; in ſhort, the horſes muſt be taught to be ſo cool and undiſturbed, as to ſuffer the rider to act upon him with the ſame freedom as if he was on foot. Patience, coolneſs, and temper, are the only means requiſite for accompliſhing this end. Begin by walking the horſe gently, then ſtop and keep him from ſtirring for ſome time, ſo as to accuſtom him by degrees not to have the leaſt idea of moving without orders: if he does, then back him;

and when you ſtop him, and he is quite ſtill, leave the reins quite looſe.

To uſe a horſe to fire-arms, firſt put a piſtol or carabine in the manger with his feed; then uſe him to the ſound of the lock and the pan; after which, when you are upon him, ſhew the piece to him, preſenting it forwards, ſometimes on one ſide, ſometimes on the other: when he is thus far reconciled, proceed to flaſh in the pan; after which, put a ſmall charge into the piece, and ſo continue augmenting it by degrees to the quantity which is commonly uſed: if he ſeems uneaſy, walk him forwards a few ſteps ſlowly; and then ſtop, back and careſs him. Horſes are often alſo diſquieted and unſteady at the claſh, and drawing, and returning of ſwords, all which they muſt be familiarized to by little and little, by frequency and gentleneſs.

It is very expedient for all cavalry in general, but particularly for light cavalry, that their horſes ſhould be very ready and expert in leaping over ditches, hedges, gates, *&c.* The leaps, of whatever ſort they are, which the horſes are brought to in the beginning, ought to be very ſmall ones; the riders muſt keep their bodies back, raiſe their hands a little in order to help the foreparts of the horſe up, and be very attentive to their equilibre. It is beſt to begin at a low bar covered with furze, which pricking the horſe's legs, if he does not raiſe himſelf ſufficiently, prevents his contracting a ſluggiſh and dangerous habit of touching, as he goes over, which any thing yielding and not pricking would give him a cuſtom of doing. Let the ditches you firſt bring horſes to, be narrow; and in this, as in every thing elſe, let the increaſe be made by degrees. Accuſtom them to come up to every thing which they are to leap over, and to ſtand coolly at it for ſome time; and then to raiſe themſelves gently up in order to form to themſelves an idea of the diſtance. When they leap well ſtanding, then uſe them to walk gently up to the leap, and to go over it without firſt halting at it; and after that practice is familiar to them, repeat the like in a gentle trot, and ſo by degrees faſter and faſter, till at length it is as familiar to them to leap flying on a full gallop, as any other way: all which is to be acquired with great facility by calm and ſoft means without any hurry.

As horſes are naturally apt to be frightened at the ſight and ſmell of dead horſes, it is adviſable to habituate them to walk over, and leap over carcaſſes of dead horſes: and as they are particularly terrified at this ſight, the greater gentleneſs ought conſequently to be uſed.

Horſes ſhould alſo be accuſtomed to ſwim, which often may be neceſſary upon ſervice; and if the men and horſes both are not uſed to it, both may be frequently liable to periſh in the water. A very ſmall portion of ſtrength is ſufficient to guide a horſe, any where indeed, but particularly in the water, where they muſt be permitted to have their heads, and be no ways conſtrained in any ſhape.

The unreaſonable rage in Britain of cutting off all extremities from horſes, is in all caſes a very pernicious cuſtom. It is particularly ſo in regard to a troop-horſe's tail. It is almoſt incredible, how much they ſuffer at the picket for want of it: conſtantly fretting, and ſweating, kicking about and laming one another, tormented, and ſtung off their meat, miſerable, and helpleſs; whilſt other horſes, with their tails on, bruſh off all flies, are cool and at their eaſe, and mend daily, whilſt the docked ones grow every hour more and more out of condition.

The method of reining back,—and of moving forwards immediately after,—of piaſing,—of pillars, &c.

NEVER finiſh your work by reining back with horſes that have any diſpoſition towards retaining themſelves; but always move them forwards and a little upon the haunches alſo after it, before you diſmount, (unleſs they retain themſelves very much indeed, in which caſe nothing at all muſt be demanded from the haunches.) This leſſon of reining back, and piaſing, is excellent to conclude with, and puts an horſe well and properly on the haunches. It may be done, according as horſes are more or leſs ſuppled, either going forwards, backing, or in the ſame place: if it is done well advancing, or at moſt on the ſame ſpot, it is full ſufficient for a ſoldier's horſe: For to piaſe in backing, is rather too much to be expected in the hurry, which cannot but attend ſuch numbers both of men and horſes as muſt be taught together in regiments. This leſſon muſt never be attempted at all, till horſes are very well ſuppled, and ſomewhat accuſtomed to be put together; otherwiſe it will have very bad conſequences, and create reſtiveneſs. If they refuſe to back, and ſtand motionleſs, the rider's legs muſt be approached with the greateſt gentleneſs to the horſe's ſides; at the ſame time as the hand is acting on the reins to ſolicite the the horſe's backing. This ſeldom fails of procuring the deſired effect, by raiſing one of the horſe's fore-legs, which being in the air, has no weight upon it, and is conſequently very eaſily brought backwards by a ſmall degree of tenſion in the reins. When this leſſon is well performed, it is very noble, and uſeful, and has a pleaſing air; it is an excellent one to begin teaching ſcholars with.

The leſſon is particularly ſerviceable in the pillars, for placing ſcholars well at firſt. Very few regimental riding-houſes have pillars, and it is fortunate they have not; for though, when properly made uſe of with ſkill, they are one of the greateſt and beſt diſcoveries in horſemanſhip; they muſt be allowed to be very dangerous and pernicious, when they are not under the direction of a very knowing perſon.

The method of curing reſtiveneſſes, vices, defences, ſtarting, &c.

WHENEVER a horſe makes reſiſtance, one ought, before a remedy or correction is thought of, to examine very minutely all the tackle about him, if any thing hurts or tickles him, whether he has any natural or accidental weakneſs, or in ſhort any the leaſt impediment in any part. For want of this precaution, many fatal diſaſters happen: the poor dumb animal is frequently accuſed falſely of being reſtive and vicious; is uſed ill without reaſon, and, being forced into deſpair, is in a manner obliged to act accordingly, be his temper and inclination ever ſo well diſpoſed. It is very ſeldom the caſe, that a horſe is really and by nature vicious; but if ſuch be found, he will deſpiſe all careſſes, and then chaſtiſements become neceſſary.

Correction, according as you uſe it, throws a horſe into more or leſs violent action, which, if he be weak, he cannot ſupport: but a vitious ſtrong horſe is to be conſidered in a very different light, being able both to undergo and conſequently to profit by all leſſons; and is far preferable to the beſt-natured weak one upon earth. Patience and ſcience are never-failing means to reclaim ſuch a horſe: in whatſoever manner he defends himſelf, bring him back frequently with gentleneſs (not however without having given him proper chaſtiſement, if neceſſary,) to the leſſon which he ſeems moſt averſe to. Horſes are by degrees made obedient, through the hope of recompence and the fear of puniſhment: how to mix theſe two motives judiciouſly together, is a very difficult matter; it requires much thought and practice; and not only a good head, but a good heart likewiſe. The cooleſt, and beſt natured rider, will always ſucceed beſt. By a dexterous uſe of the incitements above mentioned, you will gradually bring the horſe to temper and obedience; mere force and want of ſkill and coolneſs, would only tend to confirm him in bad tricks. If he be impatient or choleric, never ſtrike him, unleſs he abſolutely refuſes to go forwards; which you muſt reſolutely oblige him to do, and which will be of itſelf a correction, by preventing his having time to meditate, and put in execution any defence by retaining himſelf. Reſiſtance in horſes, you muſt conſider, is ſometimes a mark of ſtrength and vigour, and proceeds from ſpirits, as well as ſometimes from vice and weakneſs. Weakneſs frequently drives horſes into vitiouſneſs, when any thing wherein ſtrength is neceſſary is demanded from them; nay, it inevitably muſt: great care therefore ſhould always be taken to diſtinguiſh from which of theſe two cauſes any remedy or puniſhment is thought of. It may ſometimes be a bad ſign, when horſes do not at all defend themſelves, and proceed from a ſluggiſh diſpoſition, a want of ſpirit, and of a proper ſenſibility. Whenever one is ſo fortunate as to meet with a horſe of juſt the right ſpirit, activity, delicacy of feeling, with ſtrength and good-nature, he cannot be cheriſhed too much; for ſuch a one is a rare and ineſtimable jewel, and, if properly treated, will in a manner do every thing of himſelf. Horſes are oftener ſpoilt by having too much done to them, and by attempts to dreſs them in too great an hury, than by any other treatment.

If after a horſe has been well ſuppled, and there are no impediments, either natural or accidental, if he ſtill perſiſts to defend himſelf, chaſtiſements then become neceſſary: but whenever this is the caſe, they muſt not be frequent, but always firm, though always as little violent as poſſible: for they are both dangerous and very prejudicial, when frequently or ſlightly played with; and ſtill more ſo, when uſed too violently.

It is impoſſible, in general, to be too circumſpect in leſſons of all kinds, in aids, chaſtiſements, or careſſes. Some have quicker parts, and more cunning, than others. Many will imperceptibly gain a little every day on their rider. Various, in ſhort, are their diſpoſitions and capacities. It is the rider's buſineſs to find out their different qualities, and to make them ſenſible how much he loves them, and deſires to be loved by them; but at the ſame time that he does not fear them, and will be maſter.

Plunging is a very common defence among reſtive and vitious horſes: if they do it in the ſame place, or backing, they muſt, by the rider's legs and ſpurs firmly applied, be obliged to go forwards, and their heads kept up high. But if they do it flying forwards, keep them back, and ride them gently and very ſlow for a good while together. Of all bad tempers and qualities in horſes, thoſe which are occaſioned by harſh treatment and ignorant riders, are the worſt.

Rearing is a bad vice, and, in weak horſes eſpecially, a very dangerous one. Whilſt the horſe is up, the rider muſt yield his hand, and when the horſe is deſcending, he muſt vigorouſly determine him forwards: if this be done at any other time but whilſt the horſe is coming down, it may add a ſpring to his rearing, and make him fall backwards. With a good hand on them, horſes ſeldom perſiſt in this vice; for they are themſelves naturally much afraid of falling backwards. If this method fails, you muſt make the horſe kick up behind, by getting ſomebody on foot to ſtrike him behind with a whip; or, if that will not effect it, by pricking him with a goad.

Starting often proceeds from a defect in the ſight; which therefore muſt be carefully looked into. Whatever the horſe is afraid of, bring him up to it gently; if you careſs him every ſtep he advances, he will go quite up to it by degrees, and ſoon grow familiar with all ſorts of objects. Nothing but great gentleneſs can correct this fault: for if you inflict puniſhment, the apprehenſion of chaſtiſement becomes prevalent, and cauſes more ſtarting than the fear of the object. If you let him go by the object, without bringing him up to it, you increaſe the fault, and confirm him in his fear: the conſequence of which is, he takes his rider perhaps a quite contrary way from what he was going, becomes his maſter, and puts himſelf and the perſon upon him every moment in great danger.

With ſuch horſes as are to a very great degree fearful of any objects, make a quiet horſe, by going before them, gradually entice them to approach nearer and nearer to the thing they are afraid of. If the horſe, thus alarmed, be undiſciplined and head-ſtrong, he will probably run away with his rider; and if ſo, his head muſt be kept up high, and the ſnaffle ſawed backwards and forwards from right to left, taking up and yielding the reins of it, as alſo the reins of the bit: but this latter muſt not be ſawed backwards and forwards, like the ſnaffle, but only taken up, and yielded properly. No man ever yet did, or ever will ſtop a horſe, or gain any one point over him, by main force, or by pulling a dead weight againſt him.

Remarks and hints on Shoeing.

As feet differ, ſo ſhould ſhoes accordingly. The only ſyſtem of farriers, is to ſhoe in general with exceſſive heavy and clumſy ill-ſhaped ſhoes, and very many nails, to the total deſtruction of the foot. The cramps they annex, tend to deſtroy the bullet; and the ſhoes made in the ſhape of a walnut-ſhell prevent the horſe's walking upon the firm baſis which God has given him for that end, and thereby oblige him to ſtumble and fall. They totally pare away alſo, and lay bare the inſide of the animal's foot with their deteſtable butteris, and afterwards put on very long ſhoes, whereby the foot is hindred from having any preſſure at all upon the heels, which preſſure otherwiſe might ſtill perchance, notwithſtanding their dreadful cutting, keep the heels properly open, and the foot in good order. The frog ſhould never be cut out; but as it will ſometimes become ragged, it muſt be cleaned every now and then, and the ragged pieces cut off with a knife. In one kind of foot indeed a conſiderable cutting away muſt be allowed of, but not of the frog; we mean that very high feet muſt be cut down to a proper height; becauſe if they were not, the frog, though not cut, would ſtill be ſo far above the ground, as not to have any bearing on it, whereby the great tendon muſt inevitably be damaged, and conſequently the horſe would go lame.

The weight of ſhoes muſt greatly depend on the quality and hardneſs of the iron. If the iron be very good, it will not bend; and in this caſe, the ſhoes cannot poſſibly be made too light: care however muſt be taken, that they be of a thickneſs ſo as not to bend; for bending would force out the nails, and ruin the hoof. That part of the ſhoe which is next the horſe's heel, muſt be narrower than any other, (as is ſeen in the draught, plate 101. fig. 4.) that ſtones may be thereby prevented from getting under it, and ſticking there; which otherwiſe would be the caſe; becauſe the iron, when it advances inwardly beyond the bearing of the foot, forms a cavity, wherein ſtones being lodged would remain, and, by preſſing againſt the foot, lame the horſe. The part of the ſhoe, which the horſe walks upon, ſhould be quite flat, and the inſide of it likewiſe; only juſt ſpace enough being left next the foot, to put in a picker, (which ought to be uſed every time the horſe comes into the ſtable,) and alſo to prevent the ſhoe's preſſing upon the ſole. Four nails on each ſide hold better than a greater number, and keep the hoof in a far better ſtate. The toe of the horſe muſt be cut ſhort, and nearly ſquare, (the angles only juſt rounded off,) nor muſt any nails be driven there; this method prevents much ſtumbling, eſpecially in deſcents, and ſerves, by throwing nouriſhment to the heels, to ſtrengthen them; on them the horſe ſhould in ſome meaſure walk, and the ſhoe be made of a proper length accordingly; by this means, narrow heels are prevented, and many other good effects produced. Many people drive a nail at the toe, but it is an abſurd practice. Leaving room to drive one there cauſes the foot to be of an improper length; and moreover that part of the hoof is naturally ſo brittle, that even when it is kept well greaſed, the the nail there ſeldom ſtays in, but tears out and damages the hoof. That the directions for ſhoeing a proper length may be the more clear and intelligible, we have annexed (plate 101.) a draught of a foot ſhoed a proper length ſtanding on a plain ſurface, and with it a draught of the right kind of ſhoe.

In wet, ſpungy, and ſoft ground, where the foot ſinks in, the preſſure upon the heels is of courſe greater, than on hard ground; and ſo indeed it ſhould be upon all accounts. The hinder feet muſt be treated in the ſame manner as the fore-ones; and the ſhoes the ſame: except in hilly and ſlippery countries, they may not improperly be turned up a little behind: but turning up the fore-ſhoes is of no ſervice, and is certain ruin to the fore-legs, eſpecially to the bullets. In deſcending hills, cramps are apt to throw horſes down, by ſtopping the fore-legs, out of their proper baſis and natural bearing, when the hinder ones are rapidly preſſed; which unavoidably muſt be the caſe, and conſequently cannot but puſh the horſe upon his noſe. With them on a plain ſurface, a horſe's foot is always thrown forwards on the toe, out of its proper bearing, which is very liable to make the horſe ſtumble. The notion of their utility in going up hills is a falſe one. In aſcending, the toe is the firſt part of the foot, which bears on, takes hold of the ground, and whether the horſe draws or carries, and conſequently the buſineſs is done before the part where the cramps are comes to the ground. Ice-nails are preferable to any thing to prevent ſlipping, as alſo to help horſes up hill, the moſt forward ones taking hold of the ground early, conſiderably before the heels touch the ground: they muſt be ſo made, as to be, when driven in, ſcarce half inch above the ſhoe, and alſo have four ſides ending at the top in a point. They are of great ſervice to prevent ſlipping on all kinds of places, and by means of them a horſe is not thrown out of his proper baſis. They muſt be made of very good iron. If they are not, the heads of them will be perpetually breaking off. From the race-horſe to the cart-horſe, the ſame ſyſtem of ſhoeing ſhould be obſerved. The ſize, thickneſs, and weight of them only ſhould differ. The ſhoe of a race-horſe muſt of courſe be lighter than that of a ſaddle horſe; that of a ſaddle horſe lighter than that of a coach or bât horſe; and theſe laſt more ſo than a cart, waggon, or artillery horſe. At preſent all ſhoes in general are too *heavy*; if the iron is good, ſhoes need not be ſo thick as they are now generally made. The utmoſt ſeverity ought to be inflicted upon all thoſe who clap ſhoes on hot: This unpardonable lazineſs of farriers in making feet thus fit ſhoes, inſtead of ſhoes fitting feet, dries up the hoof, and utterly deſtroys them. Frequent removals of ſhoes are detrimental and tear the foot; but ſometimes they are very neceſſary: this is an inconvenience which half-ſhoes are liable to; for the end of the ſhoe, being very ſhort, is apt to work ſoon into the foot, and conſequently muſt then be moved.

For the *Natural Hiſtory* and *Treatment of the Diſeaſes of Horſes*, ſee EQUUS, and FARRIERY.

HORSHAM, a market-town and borough of Suſſex, ſituated twenty miles north weſt of Lewis, in W. long, 22', N. lat. 51° 10'. It ſends two members to parliament.

HORTAGILERS, in the grand ſeignior's court, upholſterers, or tapeſtry-hangers. The grand ſeignior has conſtantly four hundred in his retinue when he is in the camp: theſe go always a day's journey before him, to fix upon a proper place for his tent, which they prepare firſt; and afterwards thoſe of the officers, according to their rank.

HORTULANUS, in ornithology. See EMBERIZA.

HORTUS SICCUS, a DRY-GARDEN, an appellation given to a collection of ſpecimens of plants, carefully dried and preſerved.

Take a ſpecimen of a plant in flower, and with it one of its bottom-leaves, if it have any; bruiſe the ſtalk, if too rigid; ſlit it, if too thick; ſpread out the leaves and flowers on paper; cover the whole with more paper, and lay a weight over all. At the end of eighteen hours take out the plants, now perfectly flatted; lay them on a bed of dry common ſand; ſift over them more dry ſand, to the depth of two inches, and thus let them lie about three weeks: the leſs ſucculent dry much ſooner, but they take no harm afterwards. If the floor of a garret be covered in ſpring with ſand two inches deep, leaving ſpace for walking to the ſeveral parts, it will receive the collection of a whole ſummer, the covering of ſand being ſifted over every parcel as laid in. They need no farther care, from the time of laying them, till they are taken up to be ſtuck on paper. The cement uſed is a ſolution of gum-arabic in water.

Plants may be dried very well without ſand, by only putting them frequently into freſh quires of paper, or a few by only preſſing them between the leaves of a book; but the ſand-method preſerves the colour beſt, and is done with leaſt trouble.

HOSANNA, a Hebrew word, ſignifying *Save now*, or *Save, we beſeech thee*; from the frequent uſe of which, during the feaſt of tabernacles, the whole ſolemnity got the appellation of *Hoſanna Rabbi*.

HOSEA, a canonical book of the Old Teſtament, ſo called from the prophet of that name, its author, who was the ſon of Beri, and the firſt of the leſſer prophets. He lived in the kingdom of Samaria, and delivered his prophecies under the reign of Jeroboam II. and his ſucceſſors, kings of Iſrael; and under the reigns of Uzziah, Jotham, Ahaz, and Hezekiah, kings of Judah. His principal deſign is to publiſh the groſs idolatries of the people of Iſrael and Judah, to denounce the divine vengeance againſt them, and to foretel the captivity in Aſſyria.

HOST, denotes either a perſon who entertains another, or the perſon ſo entertained; but it is now generally uſed in the firſt of theſe ſenſes.

HOST, in the church of Rome, a name given to the elements uſed in the euchariſt, or rather to the conſecrated wafer; which they pretend to offer up every day, a new hoſt or ſacrifice, for the ſins of mankind.

They pay adoration to the hoſt, upon a falſe preſumption that the elements are no longer bread and wine, but tranſubſtantiated into the real body and blood of Chriſt. See TRANSUBSTANTIATION.

HOSTAGE, a perſon given up to an enemy as a ſecurity for the performance of the articles of a treaty.

HOT-BEDS, in gardening, beds made with freſh horſe-dung, or tanner's bark, and covered with glaſſes to defend them from cold winds.

HOTTONIA, WATER-VIOLET, in botany, a genus of the pentandria monogynia claſs. The corolla is ſhaped like a jug; the ſtamina are fixed to the tube of the corolla; and the capſule has but one cell. There are two ſpecies, none of them natives of Britain.

HOVINGHAM, a market-town of the eaſt riding of Yorkſhire, ſeventeen miles north-eaſt of York.

HOULSWORTHY, a market-town of Devonſhire, thirty-eight miles north-weſt of Exeter.

HOUND. See CANIS.

HOUR, in chronology, an aliquot part of a natural day, uſually a 24th, ſometimes a 12th. See ASTRONOMY, DIALING, GEOGRAPHY.

HOUSE, a habitation, or place built with conveniencies for dwelling in. See ARCHITECTURE.

HOUSE, in aſtrology, denotes the twelfth part of the heavens.

HOUSTONIA, in botany, a genus of the tetrandria-monogynia claſs. The corolla conſiſts of one bell-ſhaped petal; and the ſeeds are two, and furrowed. There are two ſpecies, none of them natives of Britain.

HOY, in naval architecture, a ſmall veſſel, fitted only with one maſt.

HOYE, a town of Weſtphalia, capital of a county of the ſame name, and ſubject to the elector of Hanover: E. long. 9°, N. lat. 53° 5′.

HUDSON's BAY, a large mediterranean ſea of north America, ſituated between 51° and 63° of N. lat. and of unequal breath from 130 to 35 leagues.

HUDSON's *ſtreights*, giving entrance into Hudſon's bay, lie between 65° and 75° of W. lon.

HUDSON's *river*, riſes near the lake Champlain, in Canada, and falls into the Atlantic, a little below the city of New-York.

HUE AND CRY, in law, the purſuit of a perſon who has committed felony on the highway.

HUEGLY, a large town in the Eaſt Indies, ſituated on an iſland in the moſt weſterly branch of the river Ganges, in the province of Bengal: E. long. 87° N. lat. 23°.

HUETTE, a city of Spain, in the province of New Caſtile, ſixty-ſeven miles eaſt of Madrid: W. lon. 2° 45′, N. lat. 40° 35′.

HUGUENOTS, a name given by way of contempt to the Calviniſts of France.

The name had its riſe in the year 1560; but authors are not agreed as to its origin. The moſt plauſible opinion, however, is that of Paſquier, who obſerves, that at Tours, the place where they were firſt thus denominated, the people had a notion, that an apparition or hobgoblin, called king Hugon, ſtrolled about the ſtreets in the night-time; from whence as thoſe of the reformed religion met chiefly in the night to pray, &c. they called them Huguenots, that is, the diſciples of king Hugon.

HULKS, large veſſels uſed in ſetting the maſts of ſhips.

HULL, in the ſea-language, is the main body of a ſhip, without either maſts, yards, ſails, or rigging. Thus to ſtrike a hull in a ſtorm is to take in her ſails, and to laſh the helm on the lee-ſide of the ſhip; and to hull, or lie a-hull, is ſaid of a ſhip whoſe ſails are thus taken in, and helm laſhed a-lee.

Hull, in geography, a ſtrong ſea port town in the eaſt riding of Yorkſhire, ſituated on the river Hull, near the mouth of the Humber, thirty-two miles ſouth-eaſt of York.

HULPEN, a town of the Auſtrian Netherlands, in the province of Brabant, ſituated nine miles ſouth eaſt of Bruſſels: E long. 4° 22′. N. lat. 50° 42′.

HUMAN, in general, is an appellation given to whatever relates to mankind: thus we ſay, the human ſoul, human body, human laws, *&c.*

HUMANITY, the peculiar nature of man, whereby he is diſtinguiſhed from all other beings.

Humanities, in the plural, ſignify grammar, rhetoric, and poetry, known by the name of *literæ humaniores*; for teaching of which, there are profeſſors in the univerſities of Scotland, called humaniſts.

HUMBER, a river formed by the Trent, the Ouſe, and ſeveral other ſtreams united. It divides Yorkſhire from Lincolnſhire, and falls into the German Sea at Holderneſs.

HUMBLE-BEE. See Apis.

HUMERUS, in anatomy. See Anat. p. 176.

Luxation of the **Humerus**. See Surgery.

HUMIDITY, that quality in bodies whereby they are capable of wetting other bodies. This differs very much from fluidity, and ſeems to be merely a relative thing, depending upon the congruity of the component particles of the liquor to the pores of ſuch particular bodies, as it is capable of adhering to, penetrating a little into, or wetting. Thus, for inſtance, quickſilver is not a moiſt thing with regard to our hands or clothes, but may be called ſo in reference to gold, tin, or lead, to whoſe ſurfaces it will perfectly adhere, and render them ſoft and moiſt.

HUMMING-BIRD. See Trochilus.

HUMOUR, in a general ſenſe, denotes much the ſame with liquid or fluid. See Fluid.

Humour. See Wit.

HUMULUS, in botany, a genus of the diœcia pentandria claſs. The calix of the male is divided into five parts, and it has no corolla. The calix of the female conſiſts of one entire leaf opening at one ſide; the corolla is wanting; it has two ſtyli; and the nut has two valves, and is incloſed within the calix. There is but one ſpecies, *viz.* the lupulus, or hop, a native of Britain. See Hop.

HUNDRED, *hundredum*, or *centuria*, a part or diviſion of a county, which was anciently ſo called from its containing an hundred families, or from its furniſhing an hundred able men for the king's wars. After king Alfred's dividing this kingdom into counties, and giving the government of each county to a ſheriff, theſe counties were divided into hundreds, of which the conſtable was the chief officer. The grants of hundreds were at firſt made by the king to particular perſons but they are not now held by grant or preſcription; their juriſdiction being devolved to the county-court; a few of them only excepted, that have been by privilege annexed to the crown, or granted to ſome great ſubjects, and ſtill remain in the nature of a franchiſe.

HUNGARY, a kingdom bounded by the Carpathian mountains, which divide it from Poland, on the north; by Tranſilvania and Walachia on the eaſt; by the river Drave, which ſeparates it from Sclavonia, on the ſouth; and by Auſtria and Moravia on the weſt. It is one continued plain of 300 miles long, and is ſituated between 16° and 23° of E. lon. and between 45° and 49° of N. lat. It is now ſubject to the empreſs queen.

Hungary-water, a diſtilled-water, ſo denominated from a queen of Hungary, for whoſe uſe it was firſt prepared.

Quincy gives the following directions for making it. Take of freſh gathered flowers of roſemary, two pounds; rectified ſpirits of wine, two quarts; put them together, and diſtil them immediately in balneo.

Or, Take of freſh tops of roſemary, one pound and a half; proof ſpirit, one gallon; and diſtil in balneo till five pints are obtained.

HUNGER, an uneaſy ſenſation, which creates an appetite or deſire of food.

Hunger is by ſome attributed to a ſharp acrimonious humour, which vellicates the coats of the ſtomach; others, who deny the exiſtence of any ſuch liquor, attribute it to the attrition or rubbing of the coats of the ſtomach; and others, again, account for it from the acidity of the blood.

HUNGERFORD, a market-town of Berkſhire, ſituated on the river Kennet, twenty-four miles weſt of Reading.

HUNNINGHEN, a town of Germany, in the langraviate of Alſace, ſituated on the Rhine, three miles north of Baſil: E long. 7° 35′, N. lat. 47° 37′.

HUNNOBY, a market-town in the eaſt riding of Yorkſhire, ſituated thirty four miles north eaſt of York.

HUNTING the exerciſe or diverſion of purſuing four-footed beaſts of game.

Four-footed beaſts are hunted in the fields, woods, and thickets, and that both with guns and greyhounds.

Birds, on the contrary, are either ſhot in the air, or taken with nets and other devices, which exerciſe is called fowling; or they are purſued and taken by birds of prey, which is called hawking.

The purſuing of four-footed beaſts, as badgers, deer, does, roebucks, foxes, hares, *&c.* properly termed hunting, is a noble exerciſe, ſerving not only to recreate the mind, but to ſtrengthen the body, whet the ſtomach, and chear the ſpirits.

HUNTINGDON, the capital of Huntingdonſhire, ſituated on the river Ouſe, fifty ſix miles north of London: W. lon. 15′, and N. lat 52° 23′.

It ſends two members to parliament.

HUQUAM, a province of China, bounded by Honan on the north, and by Quamſi and Canton on the ſouth; lying between 25° and 30° of north latitude.

HURA, the SAND BOX TREE, in botany, a genus of the monoecia monadelphia claſs. The male has no calix; the corolla conſiſts of four petals; it has eight ſtamina, and four glandular bearded nectaria; the calix and corolla of the female are the ſame as in the male; the ſtylus is filiform; the ſtigma is peltated; the capſule has four valves, and but one ſeed. There is only one ſpecies, a native of Mexico.

HURDLES, in fortification, twigs of willows or oſiers interwoven cloſe together, ſuſtained by long ſtakes, and uſually laden with earth.

Hurdles, in huſbandry, certain frames, made either of ſplit timber, or of hazel-rods, watled together, to ſerve for gates in incloſures, or to make ſheep-folds, &c.

HURDS, or Hords, *of flax*, or *hemp*, the coarſer parts ſeparated in the dreſſings from the tear or fine ſtuff. See Flax.

HURLE BONE, in a horſe, a bone near the middle of the buttock, very apt to go out of its ſockets with a hurt or ſtrain.

HURON, a vaſt lake of North America, ſituated between 84° and 89° W. long. and between 43° and 46° N. lat. from whence the country contiguous to it is called the country of the Hurons, whoſe language is ſpoken over a great extent in the ſouthern parts of north America.

HURRICANE, a furious ſtorm of wind, owing to a contrariety of winds. See Wind and Whirlwind.

Hurricanes are frequent in the Weſt-indies, where they make terrible ravages, by rooting up trees, deſtroying houſes and ſhipping, and the like.

HUSBAND, a man joined or contracted with a woman in marriage.

HUSBANDRY. See Agriculture.

HUSK, the ſame with what botaniſts call the calix, or cup of a flower. See Botany, p. 636, &c.

HUSO. in ichthyology. See Accipenser.

HUSSARS, a kind of irregular cavalry armed with the ſabre and bayonet, are retained in the ſervice of moſt princes or the continent.

They are very reſolute partiſans, and better in an invaſion or haſty expedition than in a ſet battle.

HUSSITES, the diſciples of John Huſs, a Bohemian, and curate of the chapel of Bethlehem at Prague; who, about the year 1414, embraced and defended the opinions of Wickliff of England, for which he was cited before the council of Conſtance, and, refuſing to renounce his ſuppoſed errors, he was condemned to be burnt alive, which ſentence was accordingly executed upon him at Conſtance.

It is evident in what the pretended hereſy of John Huſs and Jerom of Prague, who ſuffered with him, conſiſted, from the anſwer they made to the council, when they were admoniſhed to conform to the ſentiments of the church: They were lovers, they ſaid, of the holy goſpel, and true diſciples of Chriſt; that the church of Rome, and all other churches of the world, were widely departed from the apoſtolical tradition; that the clergy ran after pleaſures and riches, lorded it over the people, affected the higheſt ſeats at entertainments, bred horſes and dogs; and the revenues of the church, which belonged to the poor members of Chriſt, were conſumed in vanity and wantonneſs; and that the prieſts were ignorant of the commandments of God, or, if they did know them, paid but little regard to them. The followers of Huſs were alſo called Calixtins, Taberites, and Bohemian brethren.

HUSTINGS, a court held in Guildhall before the lord-mayor and aldermen of London, and reckoned the ſupreme court of the city. Here deeds may be inrolled, recoveries paſſed, out-lawries ſued out, and replevins and writs of error determined. In this court alſo is the election of aldermen, of the four members of parliament for the city, &c.

This court is very ancient, as appears by the laws of Edward the Confeſſor.

Some other cities have likewiſe had a court bearing the ſame name, as Wincheſter, York, &c.

HUSUM, a port-town of Sleſwic or ſouth Jutland, ſituated on the German ſea; ſubject to the duke of Holſtein Gottorp: E. long. 8° 30′, N. lat. 54° 40.

HUTHERFIELD, a market-town in the weſt riding of Yorkſhire: W. long. 1° 34′, N. lat. 53° 37′.

HUY, a ſtrong town in the biſhopric of Liege, ſituated on the Maes, ſixteen miles north-eaſt of Namur: E. long. 5° 15, N. lat. 50° 35′.

HYACINTH, in botany. See Hyacinthus.

Hyacinth, in natural hiſtory, a genus of pellucid gems, whoſe colour is red with an admixture of yellow.

The hyacinth, though leſs ſtriking to the eye than any other red gems, is not without its beauty in the fineſt ſpecimens. It is found of various ſizes, from that of a pin's head to the third of an inch in diameter. Like common cryſtal, it is ſometimes found columnar, and ſometimes in a pebble-form; and is always hardeſt and brighteſt in the larger maſſes.

Its colour is a dull or deadiſh red, with an admixture of yellow in it; and this mixed colour is found in all the variety of tints that a prevalence of the red or of the yellow in different degrees is capable of giving it.

Our jewelers allow all thoſe gems to be hyacinths or jacinths, that are of a due hardneſs with this mixed colour; and as they are of very different beauty and value in their ſeveral degrees and mixture of colours, they divide them into four kinds; three of which they call hyacinths, but the fourth, very improperly, a ruby. 1. When the ſtone is in its moſt perfect ſtate, and of a pure and bright flame-colour, neither the red nor the yellow prevailing, in this ſtate they call it hyacintha la belle 2. When it has an over proportion of the red, and that of a duſkier colour than the fine high red in the former, and the yellow that appears in a faint degree in it is not a fine, bright, and clear, but a duſky browniſh-yellow, then they call it the ſaffron hyacinth. 3. Such ſtones as are of a dead whitiſh-yellow, with a very ſmall proportion of red in them, they call amber-hyacinths. And, 4. When the ſtone is of a fine deep red, blended with a duſky and very deep yellow, they call it a rubacelle. But though the over-proportion of a ſtrong red in this gem has made people refer it to the claſs of rubies, its evident mixture of yellow ſhews that it truly belongs to the hyacinths.

The hyacinth la belle is found both in the Eaſt and Weſt Indies. The oriental are the harder, but the American are often equal to them in colour. The rubacelle is found only in the Eaſt Indies, and is generally brought over among the rubies, but it is of little value: the other varieties are found in Sileſia and Bohemia.

HYACINTHUS, in botany, a genus of the hexandria monogynia claſs. The corolla is bell ſhaped; and there are three melliferous pores in the germen. There are 13 ſpecies, only one of which, *viz.* the non-ſcriptus, Engliſh hyacinth, or hare-bells, is a native of Britain.

HYADES, in aſtronomy, ſeven ſtars in the bull's head, famous among the poets for the bringing of rain. See Astronomy, p. 487.

HYATIDES, in medicine, little tranſparent veſicles or bladders, full of water, ſometimes found ſolitary, and ſometimes in cluſters, upon the liver, and various other parts, eſpecially in hydropical conſtitutions.

HYDATOSCOPIA, called alſo hydromancy, a kind of divination or method of foretelling future events by means of water.

HYDNUM, in botany, a genus of the cryptogamia fungi claſs: it is an horizontal fungus, echinated or beſet with ſharp-pointed fibres on its under part. There are four ſpecies, only one of which, *viz.* the imbricatum, or common hydnum, is a native of Britain.

HYDRA, in aſtronomy. See Astronomy, p. 487.

HYDRAGOGUES, among phyſicians, remedies which evacuate a large quantity of water in dropſies.

Quincy obſerves, that the ſtrongeſt cathartics chiefly anſwer to the character of hydragogues, in that by their forcibly ſhaking and vellicating the bowels and their appendages, they ſqueeze out water enough to make the ſtools appear little elſe.

The principal hydragogues, in the common opinion, are the juices of elder, of the root of iris, of ſoldanella, mechoacan, jalop, *&c.*

HYDRANGÆA, in botany, a genus of the decandria digynia claſs. The capſule has two cells, and a double beak. There is but one ſpecies, a native of Virginia.

HYDRAULICS, the ſcience of the motion of fluids, and the conſtruction of all kinds of inſtruments and machines relating thereto.

As the conſtruction of hydraulic engines depends upon the knowledge of the general laws of fluids, it will be better to give the deſcription of them under the article hydroſtatics. See Hydrostatics.

HYDRENTEROCELE, in ſurgery, a ſpecies of hernia, wherein the inteſtines deſcend into the ſcrotum, together with a quantity of water.

HYDROCELE, in ſurgery, denotes any hernia ariſing from water; but is particularly uſed for ſuch a one of the ſcrotum which ſometimes grows to the ſize of one's head, without pain, but exceeding troubleſome to the patient. See Surgery.

HYDROCEPHALUS, in ſurgery, a preternatural diſtention of the head, to an uncommon ſize, by a ſtagnation and extravaſation of the lymph, which, when collected within ſide of the bones of the cranium, the hydrocephalus is then termed internal; as it is external, when retained betwixt the common integuments and the cranium. See Surgery.

HYDROCHARIS, the little water-lily, in botany, a genus of the diœcia decandria claſs. The ſpatha of the male conſiſts of two leaves, the calix of three ſegments, and the corolla of three petals. The calix of the female conſiſts of three ſegments, and the corolla of three petals; it has ſix ſtyli; and the capſule has ſix cells and many ſeeds. There is but one ſpecies, *viz.* the morſus ranæ, or frog bit, a native of Britain.

HYDROCORAX, in ornithology. See Buceros.

HYDROCOTYLE, in botany, a genus of the pentandria digynia claſs. The umbella is ſimple; the involucrum conſiſts of four leaves; the petals are entire, and the ſeeds are roundiſh and compreſſed. There are five ſpecies, only one of them, *viz.* the vulgaris, march penny wort, or white rot, is a native of Britain.

HYDROGRAPHY, the art of meaſuring and deſcribing the ſea, rivers, lakes, and canals.

With regard to the ſea, it gives an account of its tides, counter-tides, ſoundings, bays, gulphs, creeks, *&c.* as alſo of the rocks, ſhelves, ſands, ſhallows, promontories, harbours, the diſtance and bearing of one port from another, with every thing that is remarkable, whether out at ſea, or on the coaſt.

HYDROMANCY, a method of divination by water, practiſed by the ancients in this manner. They filled a cup or bowl of water: then faſtening a ring to a piece of thread tied to their finger, held it over the water, and repeated a certain form of words, deſiring to be ſatisfied with regard to their inquiry; and if the queſtion was anſwered in the affirmative, the ring would ſtrike the ſides of the bowl of its own accord.

Another kind of hydromancy was to look upon the water in which the figure of ſeveral dæmons uſed to appear. This expedient Numa is ſaid to have made uſe of, to ſettle the ceremonies of religion.

This way of divination is ſaid to have been uſed firſt by the Perſians, and afterwards approved by Pythagoras.

HYDROMEL, among phyſicians, water empregnated with honey, either before or after fermentation.

Vinous hydromel, commonly called mead, is ſaid to be good for the gravel. See the article Mead.

HYDROMETER, an inſtrument to meaſure the gravity, denſity, velocity, force, *&c.* of water and other fluids. See Hydrostatics.

HYDROPHACE, in botany. See Lemna.

HYDROMPHALUS, in medicine and ſurgery, a tumour in the navel, ariſing from a collection of water.

HYDROPHANÆ, in natural hiſtory, a genus of ſemipellucid gems, compoſed of cryſtal and earth; the latter ingredient being in large proportion, and mixed imperfectly, as in the chalcedony; and giving a general cloudineſs or miſtineſs to the ſtone, but of ſo imperfect and irregular an admixture, as not to be capable of ſo good a poliſh as the chalcedony; and appearing of a duſky and foul ſurface, till thrown into water, in which they become lucid, and in ſome degree tranſparent, either in part or totally; alſo changing their colour, which returns to them on being taken out of the water.

To this genus belong the oculus beli of authors, or whitiſh-grey hydrophanes, variegated with yellow, and with a black central nucleus; and the oculus mundi, or lapis mutabilis, which is likewiſe a whitiſh-grey kind without veins.

HYDROPHOBIA, an averſion or dread of water; a terrible ſymptom of the rabies canina. See MEDICINE.

HYDROPHYLLUM, in botany, a genus of the pentandria monogynia claſs. The corolla is bell-ſhaped; the ſtigma is bifid; and the capſule is roundiſh with two valves. There are two ſpecies, none of them natives of Britain.

HYDROPS, in medicine. See MEDICINE.

HYDROSCOPE, an inſtrument anciently uſed for the meaſuring of time.

The hydroſcope was a kind of water-clock, conſiſting of a cylindrical tub, conical at bottom: the cylinder was graduated, or marked out with diviſions, to which the top of the water becoming ſucceſſively contiguous, as it trickled out at the vertex of the cone, pointed out the hour.

HYDROSTATICS.

THE ſcience of HYDROSTATICS treats of the nature gravity, preſſure, and motion of fluids in general; and of weighing ſolids in them.

A fluid is a body that yields to the leaſt preſſure or difference of preſſures. Its particles are ſo exceedingly ſmall, that they cannot be diſcerned by the beſt of microſcopes; they are hard, ſince no fluid, except air or ſteam, can be preſſed into a leſs ſpace than it naturally poſſeſſes; and they are round and ſmooth, ſince they are ſo eaſily moved among one another.

All bodies, both fluid and ſolid, preſs downwards by the force of gravity: but fluids have this wonderful property that their preſſure upwards and ſidewiſe is equal to their preſſure downwards; and this is always in proportion to their perpendicular height, without any regard to their quantity: for, as each particle is quite free to move, it will move towards that part or ſide on which the preſſure is leaſt. And hence, no particle or quantity of a fluid can be at reſt, till it is every way equally preſſed.

(Plate XCIX. fig. 2.) To ſhew by experiment that fluids preſs upward as well as downward, let AB be a long upright tube filled with water near to its top; and CD a ſmall tube open at both ends, and immerſed into the water in the large one: if the immerſion be quick, you will ſee the water riſe in the ſmall tube to the ſame height that it ſtands in the great one, or until the ſurfaces of the water in both are on the ſame level: which ſhews that the water is preſſed upward into the ſmall tube by the weight of what is in the great one; otherwiſe it could never riſe therein contrary to its natural gravity; unleſs the diameter of the bore were ſo ſmall, that the attraction of the tube would raiſe the water; which will never happen, if the tube be as wide as that in a common barometer. And as the water riſes no higher in the ſmall tube than till its ſurface be on a level with the ſurface of the water in the great one, this ſhews that the preſſure is not in proportion to the quantity of water in the great tube, but in proportion to its perpendicular height therein: for there is much more water in the great tube all around the ſmall one, than what is raiſed to the ſame height in the ſmall one, as it ſtands in the great.

Take out the ſmall tube, and let the water run out of it; then it will be filled with air. Stop its upper end with the cork C, and it will be full of air all below the cork: this done, plunge it again to the bottom of the water in the great tube, and you will ſee the water riſe up in it to the height E; which ſhews that the air is a body, otherwiſe it could not hinder the water from riſing up to the ſame height as it did before, namely, to A; and in ſo doing, it drove the air out at the top; but now the air is confined by the cork C: and it alſo ſhews that the air is a compreſſible body; for if it were not ſo, a drop of water could not enter into the tube.

The preſſure of fluids being equal in all directions, it follows, that the ſides of a veſſel are as much preſſed by a fluid in it, all around in any given ring of points, as the fluid below that ring is preſſed by the weight of all that ſtands above it. Hence the preſſure upon every point in the ſides, immediately above the bottom, is equal to the preſſure upon every point of the bottom. To ſhew this by experiment, let a hole be made at E (fig. 3.) in the ſide of the tube AB cloſe by the bottom; and another hole of the ſame ſize in the bottom, at C; then pour water into the tube, keeping it full as long as you chuſe the holes ſhould run, and have two two baſons ready to receive the water that runs through the two holes, until you think there is enough in each baſon; and you will find, by meaſuring the quaintities, that they are equal; which ſhews that the water run with equal ſpeed through both holes; which it could not have done, if it had not been equally preſſed through them both: for if a hole of the ſame ſize be made in the ſide of the tube, as about *f*; and if all three are permitted to run together, you will find that the quantity run through the hole at *f* is much leſs than what has run in the ſame time through either of the holes C or *e*.

Plate XCIX.

Fig. 1.

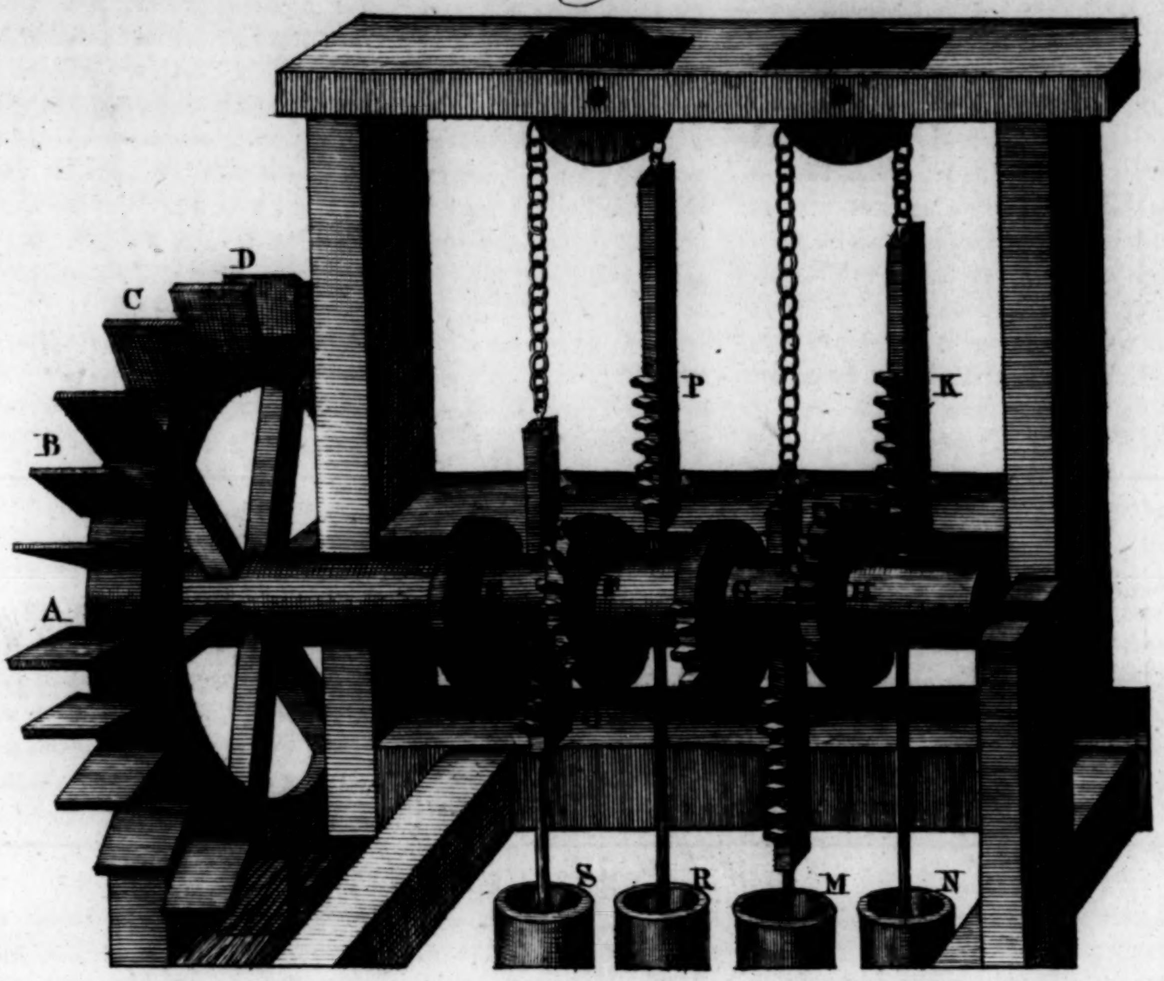
D
C
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Fig. 2.

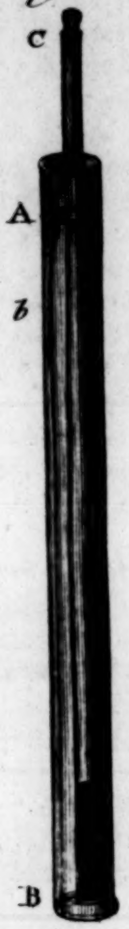

Fig. 3.

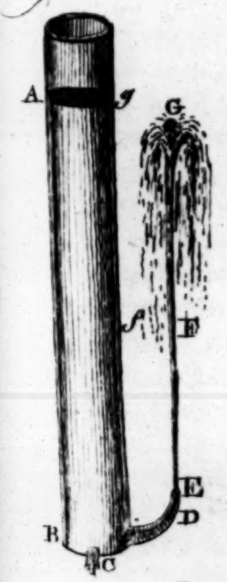

Fig. 4.

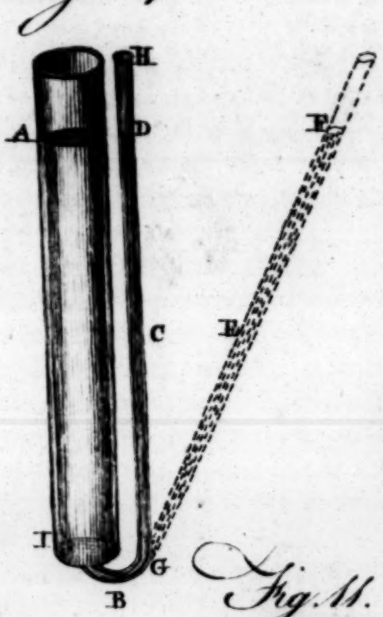

Fig. 5.

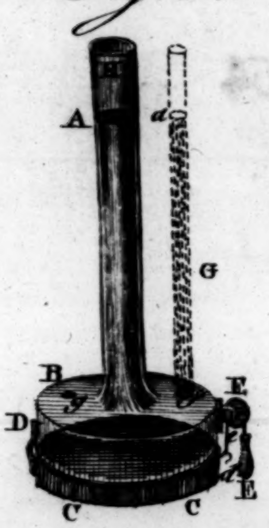

Fig. 6.

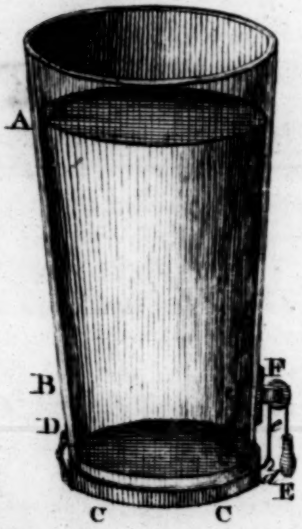

Fig. 8.

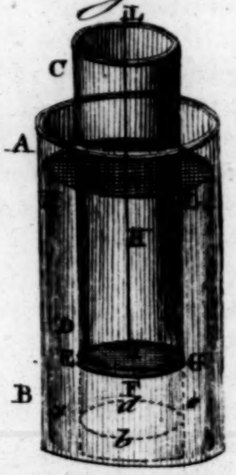

Fig. 9.

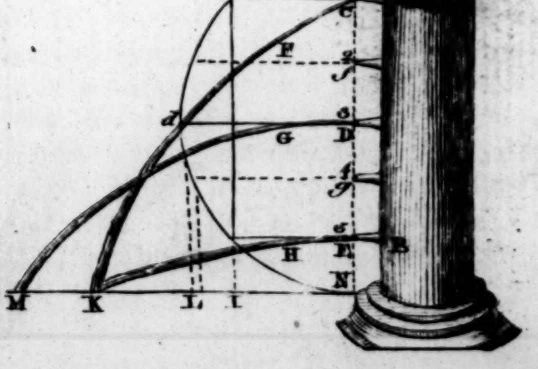
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Fig. 7.

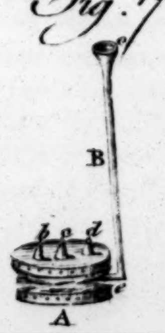


Fig. 11.

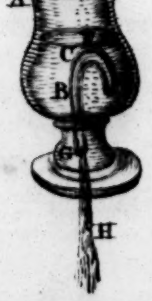
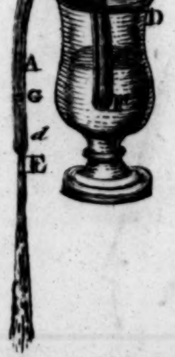


Fig. 10.



A. Bell Sculpt.

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In the ſame figure, let the tube be re-curved from the bottom at C into the ſhape DE, and the hole at C be ſtopt with a cork. Then pour water into the tube to any height, as A*g*, and it will ſpout up in a jet EFG, nearly as high as it is kept in the tube AB, by continuing to pour in as much there as runs through the hole E; which will be the caſe whilſt the ſurface A*g* keeps at the ſame height. And if a little ball of cork G be laid upon the top of the jet, it will be ſupported thereby, and dance upon it. The reaſon why the jet riſes not quite ſo high as the ſurface of the water A*g*, is owing to the reſiſtance it meets with in the open air: for if a tube, either great or ſmall, was ſcrewed upon the pipe at E, the water would riſe in it until the ſurfaces of the water in both tubes were on the ſame level; as will be ſhewn by the next experiment.

The hydroſtatic paradox.

ANY quantity of a fluid, how ſmall ſoever, may be made to balance and ſupport any quantity, how great ſoever. This is deſervedly termed *the hydroſtatical paradox*, which we ſhall firſt ſhew by an experiment, and then account for it upon the principle above-mentioned, namely, that *the preſſure of fluids is directly as their perpendicular height, without any regard to their quantity.*

Let a ſmall glaſs tube DCG, (fig. 4.) open at both ends, and bended at B, be joined to the end of a great one AI at *cd*, where the great one is alſo open; ſo that theſe tubes in their openings may freely communicate with each other. Then pour water through a ſmall-necked funnel into the ſmall tube at H; this water will run through the joining of the tubes at *cd*, and riſe up into the great tube: and if you continue pouring until the ſurface of the water comes to any part, as A, in the great tube, and then leave off, you will ſee that the ſurface of the water in the ſmall tube will be juſt as high at D; ſo that the perpendicular altitude of the water will be the ſame in both tubes, however ſmall the one be in proportion to the other. This ſhews, that the ſmall column DCG balances and ſupports the great column A*cd*; which it could not do if their preſſures were not equal againſt one another in the recurved bottom at B.—If the ſmall tube be made longer, and inclined in the ſituation GEF, the ſurface of the water in it will ſtand at F, on the ſame level with the ſurface A in the great tube; that is, the water will have the ſame perpendicular height in both tubes, although the column in the ſmall tube is longer than that in the great one; the former being oblique, and the latter perpendicular.

Since then the preſſure of fluids is directly as their perpendicular heights, without any regard to their quantities, it appears that whatever the figure or ſize of veſſels be, if they are of equal heights, and if the areas of their bottoms are equal, the preſſures of equal heights of water are equal upon the bottoms of theſe veſſels; even though the one ſhould hold a thouſand or ten thouſand times as much water as would fill the other. To confirm this part of the hydroſtatical paradox by an experiment, let two veſſels be prepared of equal heights, but very unequal contents, ſuch as AB in fig. 5. and AB in fig. 6. Let each veſſel be open at both ends, and their bottoms D*d* D*d* be of equal widths. Let a braſs bottom CC be exactly fitted to each veſſel, not to go into it, but for it to ſtand upon; and let a piece of wet leather be put between each veſſel and its braſs bottom, for the ſake of cloſeneſs. Join each bottom to its veſſel by a hinge D, ſo that it may open like the lid of a box; and let each bottom be kept up to its veſſel by equal weights E and E, hung to lines which go over the pulleys F and F (whoſe blocks are fixed to the ſides of the veſſels at *f*) and the lines tied to hooks at *d* and *d*, fixed in the braſs bottoms oppoſite to the hinges D and D. Things being thus prepared and fitted, hold the veſſel AB (fig. 5.) upright in your hands over a baſon on a table, and cauſe water to be poured into the veſſel ſlowly, till the preſſure of the water bears down its bottom at the ſide *d*, and raiſes the weight E; and then part of the water will run out at *d*. Mark the height at which the ſurface H of the water ſtood in the veſſel, when the bottom began to give way at *d*; and then, holding up the other veſſel AB (fig. 4.) in the ſame manner, cauſe water to be poured into it at H; and you will ſee that when the water riſes to A in this veſſel, juſt as high as it did in the former, its bottom will alſo give way at *d*, and it will loſe part of the water.

The natural reaſon of this ſurpriſing phenomenon is, that ſince all parts of a fluid at equal depths below the ſurface are equally preſſed in all manner of directions, the water immediately below the fixed part B*f* (fig. 4.) will be preſſed as much upward againſt its lower ſurface within the veſſel, by the action of the column A*g*, as it would be by a column of the ſame height, and of any diameter whatever; (as was evident by the experiment with the tube, fig. 3.) and therefore, ſince action and reaction are equal and contrary to each other, the water immediately below the ſurface B*f* will be preſſed as much downward by it, as if it was immediately touched and preſſed by a column of the height *g*A, and of the diameter B*f*: and therefore, the water in the cavity BD*df* will be preſſed as much downward upon its bottom CC, as the bottom of the other veſſel (fig. 5.) is preſſed by all the water above it.

To illuſtrate this a little farther, let a hole be made at *f* (fig. 5.) in the fixed top B*f*, and let a tube G be put into it; then, if water be poured into the tube A, it will (after filling the cavity B*d*) riſe up into the tube G, until it comes to a level with that in the tube A; which is manifeſtly owing to the preſſure of the water in the tube A, upon that in the cavity of the veſſel below it. Conſequently, that part of the top B*f*, in which the hole is now made, would, if corked up, be preſſed upward with a force equal to the weight of all the water which is ſupported in the tube G: and the ſame thing would hold at *g*, if a hole were made there. And ſo if the whole cover or top B*f* were full of holes, and had tubes as high as the middle one A*g* put into them, the water in each tube would riſe to the ſame height as it is kept into the tube A, by pouring more into it, to make up the deficiency that it ſuſtains by ſupplying the others, until they were all full: and then the water in the tube A would ſupport equal heights of water in all the reſt of the tubes. Or, if all the tubes except A, or any other one, were taken away, and a large tube equal in diameter to the whole top B*f* were placed upon it, and cemented to it; and then if water were poured into the tube that was left in either of the holes, it would aſcend through all the reſt of the holes, until it filled the large tube to the ſame height that it ſtands in the ſmall one, after a ſufficient quantity had been poured into it: which ſhews, that the top B*f* was preſſed upward by the water under it, and before any hole was made in it, with a force equal to that wherewith it is now preſſed downward by the weight of all the water above it in the great tube. And therefore, the reaction of the fixed top B*f* muſt be as great, in preſſing the water downward upon the bottom CC, as the whole preſſure of the water in the great tube would have been, if the top had been taken away, and the water in that tube left to preſs directly upon the water in the cavity BD*df*.

The hydroſtatic bellows.

PERHAPS the beſt machine in the world for demonſtrating the upward preſſure of fluids, is the hydroſtatic bellows A (fig. 7.) which conſiſts of two thick oval boards, each about 16 inches broad, and 18 inches long, covered with leather, to open and ſhut like a common bellows, but without valves; only a pipe B, about three feet high, is fixed into the bellows at *e*. Let ſome water be poured into the pipe at *c*, which will run into the bellows, and ſeparate the boards a little. Then lay three weights *b*, *c*, *d*, each weighing 100 pounds, upon the upper board; and pour more water into the pipe B, which will run into the bellows, and raiſe up the board with all the weights upon it; and if the pipe be kept full, until the weights are raiſed as high as the leather which covers the bellows will allow them, the water will remain in the pipe, and ſupport all the weights, even though it ſhould weigh no more than a quarter of a pound, and they 300 pounds: nor will all their force be able to cauſe them to deſcend and force the water out at the top of the pipe.

The reaſon of this will be made evident, by conſidering what has been already ſaid of the reſult of the preſſure of fluids of equal heights without any regard to their quantity. For, if a hole be made in the upper board, and a tube be put into it, the water will riſe in the tube to the ſame height that it does in the pipe; and would riſe as high (by ſupplying the pipe) in as many tubes as the board could contain holes. Now, ſuppoſe only one hole to be made in any part of the board, of an equal diameter with the bore of the pipe B; and that the pipe holds juſt a quarter of a pound of water; if a perſon claps his finger upon the hole, and the pipe be filled with water, he will find his finger to be preſſed upward with a force equal to a quarter of a pound. And as the ſame preſſure is equal upon all equal parts of the board, each part, whoſe area is equal to the area of the whole, will be preſſed upward with a force equal to that of a quarter of a pound: the ſum of all which preſſures againſt the under ſide of an oval board 16 inches broad, and 18 inches long, will amount to 300 pounds; and therefore ſo much weight will be raiſed up and ſupported by a quarter of a pound of water in the pipe.

Hence, if a man ſtands upon the upper board, and blows into the bellows through the pipe B, he will raiſe himſelf upward upon the board: and the ſmaller the bore of the pipe is, the eaſier he will be able to raiſe himſelf. And then, by clapping his finger upon the top of the pipe, he can ſupport himſelf as long as he pleaſes; provided the bellows be air-tight, ſo as not to loſe what is blown into it.

Upon this principle of the upward preſſure of fluids, a piece of lead may be made to ſwim in water, by immerſing it to a proper depth, and keeping the water from getting above it. Let CD (fig. 8.) be a glaſs tube, open at both ends, and EFG a flat piece of lead, exactly fitted to the lower end of the tube, not to go within it, but for it to ſtand upon; with a wet leather between the lead and tube to make cloſe work. Let this leaden bottom be half an inch thick, and held cloſe to the tube by pulling the packthread IHL upward at L with one hand, whilſt the tube is held in the other by the upper end C. In this ſituation, let the tube be immerſed in water in the glaſs veſſel AB, to the depth of ſix inches below the ſurface of the water at K; and then, the leaden bottom EFG will be plunged to the depth of ſomewhat more than eleven times its own thickneſs: holding the tube at that depth, you may let go the thread at L; and the lead will not fall from the tube, but will be kept to it by the upward preſſure of the water below it, occaſioned by the height of the water at K above the level of the lead. For as lead is 11.33 times as heavy as its bulk of water, and is in this experiment immerſed to a depth ſomewhat more than 11.33 times its thickneſs, and no water getting into the tube between it and the lead, the column of water E*abc*G below the lead is preſſed upward againſt it by the water KDEGL all around the tube; which water being a little more than 11.33 times as high as the lead is thick, is ſufficient to balance and ſupport the lead at the depth KE. If a little water be poured into the tube upon the lead, it will increaſe the weight upon the column of water under the lead, and cauſe the lead to fall from the tube to the bottom of the glaſs veſſel, where it will lie in the ſituation *bd*. Or, if the tube be raiſed a little in the water, the lead will fall by its own weight, which will then be too great for the preſſure of the water around the tube upon the column of water below it.

Let two pieces of wood be plained quite flat, ſo as no water may get in between them when they are put together: let one of the pieces, as *bd*, be cemented to the bottom of the veſſel AB (fig. 8.) and the other piece be laid flat and cloſe upon it, and held down to it by a ſtick, whilſt water is poured into the veſſel; then remove the ſtick, and the upper piece of wood will not riſe from the lower one: for, as the upper one is preſſed down both by its own weight and the weight of all the water over it, whilſt the contrary preſſure of the water is kept off by the wood under it, it will lie as ſtill as a ſtone would do in its place. But if it be raiſed ever ſo little at any edge, ſome water will then get under it; which being acted upon by the water above, will immediately preſs it upward; and as it is lighter than its bulk of water, it will riſe, and float upon the ſurface of the water.

All fluids weigh juſt as much in their own element as they do in open air. To prove this by experiment, let as much ſhot be put into a phial, as, when corked, will make it ſink in water: and being thus charged, let it be weighed, firſt in air, and then in water, and the weights in both both caſes wrote down. Then, as the phial hangs ſuſpended in water, and counterpoiſed, pull out the cork, that water may run into it, and it will deſcend, and pull down that end of the beam. This done, put as much weight into the oppoſite ſcale as will reſtore the equipoiſe; which weight will be found to anſwer exactly to the additional weight of the phial when it is again weighed in air, with the water in it.

The velocity with which water ſpouts out at a hole in the ſide or bottom of a veſſel, is as the ſquare root of the depth or diſtance of the hole below the ſurface of the water. For, in order to make double the quantity of a fluid run through one hole as through another of the ſame ſize, it will require four times the preſſure of the other, and therefore muſt be four times the depth of the other below the ſurface of the water: and for the ſame reaſon, three times the quantity running in an equal time through the ſame ſort of hole, muſt run with three times the velocity, which will require nine times the preſſure; and conſequently muſt be nine times as deep below the ſurface of the fluid: and ſo on.—To prove this by an experiment, let two pipes, as C and *g* (fig 9.) of equal ſized bores, be fixed into the ſide of the veſſel AB; the pipe *g* being four times as deep below the ſurface of the water at *b* in the veſſel as the pipe C is: and whilſt theſe pipes run, let water be conſtantly poured into the veſſel, to keep the ſurface ſtill at the ſame height. Then, if a cup that holds a pint be ſo placed as to receive the water that ſpouts from the pipe C, and at the ſame moment a cup that holds a quart be ſo placed as to receive the water that ſpouts from the pipe *g*, both cups will be filled at the ſame time by their reſpective pipes.

The horizontal diſtance, to which a fluid will ſpout from a horizontal pipe, in any part of the ſide of an upright veſſel below the ſurface of the fluid, is equal to twice the length of a perpendicular to the ſide of the veſſel, drawn from the mouth of the pipe to a ſemicircle deſcribed upon the altitude of the fluid: and therefore, the fluid will ſpout to the greateſt diſtance poſſible from a pipe whoſe mouth is at the centre of the ſemicircle; becauſe a perpendicular to its diameter (ſuppoſed parallel to the ſide of the veſſel) drawn from that point, is the longeſt that can poſſibly be drawn from any part of the diameter to the circumference of the ſemicircle. Thus, if the veſſel AB (fig. 9.) be full of water, the horizontal pipe D be in the middle of its ſide, and the ſemicircle N*eacb* be deſcribed upon D as a centre, with the radius or ſemidiameter D*g*N, or D*fb*, the perpendicular D*d* to the diameter ND*b* is the longeſt that can be drawn from any part of the diameter to the circumference N*edcb*. And if the veſſel be kept full, the jet G will ſpout from the pipe D, to the horizontal diſtance NM, which is double the length of the perdendicular D*d*. If two other pipes as C and E, be fixed into the ſide of the veſſel at equal diſtances above and below the pipe D, the perpendiculars C*c* and E*e*, from theſe pipe to the ſemicircle, will be equal; and the jets F and H ſpouting from them will each go to the horizontal diſtance NK; which is double the length of the equal perpendiculars C*c* or D*d*.

Fluids by their preſſure may be conveyed over hills and valleys in bended pipes, to any height not greater than the level of the ſprings from whence they flow. But when they are deſigned to be raiſed higher than the ſprings, forcing engines muſt be uſed; which ſhall be deſcribed when we come to treat of pumps.

A *ſyphon*, generally uſed for decanting liquors, is a bended pipe, whoſe legs are of unequal lengths; and the ſhorteſt leg muſt always be put into the liquor intended to be decanted, that the perpendicular altitude of the column of liquor in the other leg may be longer than the column in the immerſed leg, eſpecially above the ſurface of the water. For, if both columns were equally high in that reſpect, the atmoſphere, which preſſes as much upward as downward, and therefore acts as much upward againſt the column in the leg that hangs without the veſſel, as it acts downward upon the ſurface of the liquor in the veſſel, would hinder the running of the liquor through the ſyphon, even though it were brought over the bended part by ſuction. So that there is nothing left to cauſe the motion of the liquor, but the ſuperior weight of the column in the longer leg, on account of its having the greater perpendicular height.

Let D (fig. 10.) be a cup filled with water to C, and ABC a ſyphon, whoſe ſhorter leg BCF is immerſed in the water from C to F. If the end of the other leg were no lower than the line AC, which is level with the ſurface of the water, the ſyphon would not run, even though the air ſhould be drawn out of it at the mouth A. For although the ſuction would draw ſome water at firſt, yet the water would ſtop at the moment the ſuction ceaſed; becauſe the air would act as much upward againſt the water at A, as it acted downward for it by preſſing on the ſurface at C. But if the leg AB comes down to G, and the air be drawn out at G by ſuction, the water will immediately follow, and continue to run, until the ſurface of the water in the cup comes down to F; becauſe, till then, the perpendicular height of the column BAG will be greater than that of the column CB; and conſequently, its weight will be greater, until the ſurface comes down to F; and then the ſyphon will ſtop, though the leg CF ſhould reach to the bottom of the cup. For which reaſon, the leg that hangs without the cup is always made long enough to reach below the level of its bottom; as from *d* to E: and then, when the ſyphon is emptied of air by ſuction at E, the water immediately follows, and by its continuity brings away the whole from the cup; juſt as pulling one end of a thread will make the whole clue follow.

If the perpendicular height of a ſyphon, from the ſurface of the water to its bended top at B, be more than 33 feet, it will draw no water, even though the other leg were much longer, and the ſyphon quite emptied of air, becauſe the weight of a column of water 33 feet high is equal to the weight of as thick a column of air, reaching from the ſurface of the earth to the top of the atmoſphere; ſo that there will then be an equilibrium; and conſequently, though there would be weight enough of air upon the ſurface C to make the water aſcend in the leg CB almoſt to the height B, if the ſyphon were emptied of air, yet the weight would not be ſufficient to force the water over the bend; and therefore, it could never be brought into the leg BAC.

Tantalus's cup.

Let a hole be made quite through the bottom of the cup A (fig. 11.) and the longer leg of the bended ſyphon BCED he cemented into the hole, ſo that the end D of the ſhorter leg DE may almoſt touch the bottom of the cup within. Then, if water be poured into this cup, it will riſe in the ſhorter leg by its upward preſſure, extruding the air all the way before it through the longer leg: and when the cup is filled above the bend of the ſyphon at F, the preſſure of the water in the cup will force it over the bend of the ſyphon: and it will deſcend in the longer leg CBG, and run through the bottom, until the cup be emptied.

This is generally called *Tantalus's cup*, and the legs of the ſyphon in it are almoſt cloſe together; and a little hollow ſtatue, or figure of a man, is ſometimes put over the ſyphon to conceal it; the bend E being with the neck of the figure as high as the chin. So that poor thirſty *Tantalus* ſtands up to the chin in water, imagining it will riſe a little higher, and he may drink; but inſtead of that, when the water comes up to his chin, it immediately begins to deſcend; and ſo, as he cannot ſtoop to follow it, he is left as much pained with thirſt as ever.

The fountain at command.

The device called *the fountain at command* acts upon the ſame principle with the ſyphon in the cup. Let two veſſels A and B (Plate C. fig. 1.) be joined together by the pipe C which opens into them both. Let A be open at top, B cloſe both at top and bottom (ſave only a ſmall hole at *b* to let the air get out of the veſſel B) and A be of ſuch a ſize as to hold about ſix times as much water as B. Let a ſyphon DEF be ſoldered to the veſſel B, ſo that the part DE*e* may be within the veſſel, and F without it; the end D almoſt touching the bottom of the veſſel, and the end F below the level of D: the veſſel B hanging at A by the pipe C (ſoldered into both) and the whole ſupported by the pillars G and H upon the ſtand I. The bore of the pipe muſt be conſiderably leſs than the bore of the ſyphon.

The whole being thus conſtructed, let the veſſel A be filled with water, which will run through the pipe C, and fill the veſſel B. When B is filled above the top of the ſyphon at E, the water will run through the ſyphon, and be diſcharged at F. But ſince the bore of the ſyphon is larger than the bore of the pipe, the ſyphon will run faſter than the pipe, and will ſoon empty the veſſel B; upon which the water will ceaſe from running through the ſyphon at F, until the pipe C re-fills the veſſel B, and then it will begin to run as before. And thus the ſyphon will continue to run and ſtop alternately, until all the water in the veſſel A has run through the pipe C.—So that after a few trials, one may eaſily gueſs about what time the ſyphon will ſtop, and when it will begin to run: and then to amuſe others, he may call out *ſtop*, or *run*, accordingly.

Upon this principle, we may eaſily account for *intermitting* or *reciprocating ſprings*. Let AA (fig. 2.) be part of a hill, within which there is a cavity BB; and from this cavity a vein or channel running in the direction BCDE. The rain that falls upon the ſide of the hill will ſink and ſtrain through the ſmall pores and crannies G, G, G, G; and fill the cavity H with water. When the water riſes to the level HHC, the vein BCDE will be filled to C, and the water will run through CDF as through a ſyphon; which running will continue until the cavity be emptied, and then it will ſtop until the cavity be filled again.

The common pump.

The *common ſucking pump*, with which we draw water out of wells, is an engine both pneumatic and hydraulic. It conſiſts of a pipe open at both ends, in which is a moveable piſton, bucket, or ſucker, as big as the bore of the pipe in that part wherein it works; and is leathered round, ſo as to fit the bore exactly; and may be moved up and down, without ſuffering any air to come between it and the pipe or pump-barrel.

We ſhall explain the conſtruction both of this and the forcing pump by pictures of glaſs models, in which both the action of the piſtons and motion of the valves are ſeen.

Hold the model DCBL (fig. 3.) upright in the veſſel of water K, the water being deep enough to riſe at leaſt as high as from A to L. The valve *a* on the moveable bucket G, and the valve *b* on the fixed box H, (which box quite fills the bore of the pipe or barrel at H) will each lie cloſe, by its own weight, upon the hole in the bucket and box, until the engine begins to work. The valves are made of braſs, and covered underneath with leather for cloſing the holes the more exactly: and the bucket G is raiſed and depreſſed alternately by the handle E and rod D *d*, the bucket being ſuppoſed at B before the working begins.

Take hold of the handle E, and thereby draw up the bucket from B to C, which will make room for the air in the pump all the way below the bucket to dilate itſelf, by which its ſpring is weakened, and then its force is not equivalent to the weight or preſſure of the outward air upon the water in the veſſel K: and therefore, at the firſt ſtroke, the outward air will preſs up the water through the notched foot A, into the lower pipe, about as far as *e*: this will condenſe the rarefied air in the pipe between *e* and C to the ſame ſtate it was in before; and then, as its ſpring within the pipe is equal to the force or preſſure of the outward air, the water will riſe no higher by the firſt ſtroke; and the valve *b*, which was raiſed a little by the dilation of the air in the pipe, will fall, and ſtop the hole in the box H; and the ſurface of the water will ſtand at *e*. Then, depreſs the piſton or bucket from C to B, and as the air in the part B cannot get back again through the valve *b*, it will (as the bucket deſcends) raiſe the valve *a*, and ſo make its way through the upper part of the barrel *d* into the open air. But upon raiſing the larger bucket G a ſecond time, the air between it and the water in the lower pipe at *e* will be again left at liberty to fill a larger ſpace; and ſo its ſpring being again weakened, the preſſure of the outward air on the water in the veſſel K will force more water up into the lower pipe from *e* to *f*; and when the bucket is at its greateſt height C, the lower valve *b* will fall, and ſtop the hole in the box H as before. At the next ſtroke of the bucket or piſton, the water will riſe through the box H towards B, and then the valve *b*, which was raiſed by it, will fall when the bucket G is at its greateſt height. Upon depreſſing the bucket again, the water cannot be puſhed back through the valve *b*, which keeps cloſe upon the hole whilſt the piſton deſcends. And upon raiſing the piſton again, the outward preſſure of the air will force the water up thro' H, where it will raiſe the valve, and follow the bucket to C. Upon the next depreſſion of the bucket G, it will go down into the water in the barrel B; and as the water cannot be driven back through the now cloſe valve *b*, it will raiſe the valve *a* as the bucket deſcends, and will be lifted up by the bucket when it is next raiſed. And now, the whole ſpace below the bucket being full, the water above it cannot ſink when it is next depreſſed; but upon its depreſſion, the valve *a* will riſe to let the bucket go down; and when it is quite down, the valve *a* will fall by its weight, and ſtop the hole in the bucket. When the bucket is next raiſed, all the water above it will be lifted up, and begin to run off by the pipe F. And thus, by raiſing and depreſſing the bucket alternately, there is ſtill more water raiſed by it; which getting above the pipe F, into the wide top I, will ſupply the pipe, and make it run with a continued ſtream.

So, at every time the bucket is raiſed, the valve *b* riſes, and the valve *a* falls; and at every time the bucket is depreſſed, the valve *b* falls, and *a* riſes.

As it is the preſſure of the air or atmoſphere which cauſes the water to riſe and follow the piſton or bucket G as it is drawn up; and ſince a column of water 33 feet high is of equal weight with as thick a column of the atmoſphere from the earth to the very top of the air; therefore, the perpendicular height of the piſton or bucket from the ſurface of the water in the well muſt always be leſs than 33 feet; otherwiſe the water will never get above the bucket. But, when the height is leſs, the preſſure of the atmoſphere will be greater than the weight of the water in the pump, and will therefore raiſe it above the bucket; and when the water has once got above the bucket, it may be lifted thereby to any height, if the rod D be made long enough, and a ſufficient degree of ſtrength be employed, to raiſe it with the weight of the water above the bucket; without ever lengthening the ſtroke.

The force required to work a pump, will be as the height to which the water is raiſed, and as the ſquare of the diameter of the pump-bore, in that part where the piſton works. So that, if two pumps be of equal heights, and one of them be twice as wide in the bore as the other, the wideſt will raiſe four times as much water as the narroweſt; and will therefore require four times as much ſtrength to work it.

The wideneſs or narrowneſs of the pump, in any other part beſides that in which the piſton works, does not make the pump either more or leſs difficult to work; except what difference may ariſe from the friction of the bore, which is always greater in a narrow bore than in a wide one, becauſe of the greater velocity of the water.

The pump-rod is never raiſed directly by ſuch a handle as E at the top, but by means of a lever, whoſe longer arm (at the end of which the power is applied) generally exceeds the length of the ſhorter arm five or ſix times; and, by that means, gives five or ſix times as much advantage to the power. Upon theſe principles, it will be eaſy to find the dimenſions of a pump that ſhall work with a given force, and draw water from any given depth. But, as theſe calculations have been generally neglected by pump-makers (either for want of ſkill or induſtry) the following table was calculated by the late ingenious Mr Booth for their benefit. In this calculation, he ſuppoſed the handle of the pump to be a lever increaſing the power five times; and had often found that a man can work a pump four inches diameter, and 30 feet high above the bucket, and diſcharge 27½ gallons of water (Engliſh wine meaſure) in a minute. Now, if it be required to find the diameter of a pump, that ſhall raiſe water with the ſame eaſe from any other height above the bucket; look for that height in the firſt column, and over-againſt it in the ſecond you have the diameter or width of the pump; and in the third, you find the quantity of water which a man of ordinary ſtrength can diſcharge in a minute.

Height of the pump above the bucket.	Diameter of the bore where the bucket works.		Water diſcharged in a minute, Engliſh wine-meaſure.	
Feet.	Inches.	100 parts.	Gallons.	Pints.
10	6	.93	81	6
15	5	.65	54	4
20	4	.90	40	8
25	4	.38	32	6
30	4	.00	27	2
35	3	.70	23	3
40	3	.47	20	4
45	3	.26	18	1
50	3	.10	16	3
55	2	.95	14	7
60	2	.83	13	5
65	2	.71	12	4
70	2	.62	11	5
75	2	.53	10	7
80	2	.44	10	2

The forcing-pump.

The *forcing pump* raiſes water through the box H (fig. 4) in the ſame manner as the ſucking-pump does, when the plunger or piſton *g* is lifted up by the rod D*d*. But this plunger has no hole through it, to let the water in the barrel BC get above it when it is depreſſed to B, and the valve *b* (which roſe by the aſcent of the water through the box H when the plunger *g* was drawn up) falls down and ſtops the hole in H, the moment that the plunger is raiſed to its greateſt height. Therefore, as the water between the plunger *g* and box H can neither get through the plunger upon its deſcent, nor back again into the lower part of the pump L*e*, but has a free paſſage by the cavity around H into the pipe MM, which opens into the air-veſſel KK at P; the water is forced through the pipe MM by the deſcent of the plunger, and driven into the air-veſſel; and in running up through the pipe at P, it opens the valve *a*; which ſhuts at the moment the plunger begins to be raiſed, becauſe the action of the water againſt the under ſide of the valve then ceaſes.

The water, being thus forced into the air-veſſel KK by repeated ſtrokes of the plunger, gets above the lower end of the pipe GHI, and then begins to condenſe the air in the veſſel KK. For, as the pipe GH is fixed air-tight into the veſſel below F, and the air has no way to get out of the veſſel but through the mouth of the pipe at I, and cannot get out when the mouth I is covered with water, and is more and more condenſed as the water riſes upon the pipe, the air then begins to act forcibly by its ſpring againſt the ſurface of the water, at H: and this action drives the water up through the pipe IH GF, from whence it ſpouts in a jet S to a great height; and is ſupplied by alternately raiſing and depreſſing of the plunger *g*, which conſtantly forces the water that it raiſes through the valve H, along the pipe MM, into the air-veſſel KK.

The higher that the ſurface of the water H is raiſed in the air-veſſel, the leſs ſpace will the air be condenſed into, which before filled that veſſel; and therefore the force of its ſpring will be ſo much the ſtronger upon the water, and will drive it with the greater force through the pipe at F: and as the ſpring of the air continues whilſt the plunger *g* is riſing, the ſtream or jet S will be uniform, as long as the action of the plunger continues: and when the valve *b* opens, to let the water follow the plunger upward, the valve *a* ſhuts, to hinder the water, which is forced into the air-veſſel, from running back by the pipe MM into the barrel of the pump.

If there was no air-veſſel to this engine, the pipe GHI would be joined to the pipe MMN at P; and then the jet S would ſtop every time the plunger is raiſed, and run only when the plunger is depreſſed.

Mr Newſham's water-engine, for extinguiſhing fire, conſiſts of two forcing pumps, which alternately drive water into a cloſe veſſel of air; and by forcing the water into that veſſel, the air in it is thereby condenſed, and compreſſes the water ſo ſtrongly, that it ruſhes out with great impetuoſity and force through a pipe that comes down into it; and makes a continued uniform ſtream by the condenſation of the air upon its ſurface in the veſſel.

By means of forcing pumps, water may be raiſed to any height above the level of a river or ſpring; and machines may be contrived to work theſe pumps, either by a running ſtream, a fall of water, or by horſes. An inſtance in each ſort will be ſufficient to ſhew the method.

Firſt, by a running ſtream, or a fall of water. Let AA (fig. 5.) be a wheel turned by the fall of water BB; and have any number of cranks (ſuppoſe ſix) as C, D, E, F, G, H, on its axis, according to the ſtrength of the fall of water, and the height to which the water is intended to be raiſed by the engine. As the wheel turns round, theſe cranks move the levers *c*, *d*, *e*, *f*, *g*, *h*, up and down, by the iron rods *i*, *k*, *l*, *m*, *n*, *o*; which alternately raiſe and depreſs the piſtons by the other iron rods *p*, *q*, *r*, *s*, *t*, *u*, *w*, *x*, *y*, in twelve pumps; nine whereof, as L, M, N, O, P, Q, R, S, T, appear in the plate; the other three being hid behind the work at V. And as pipes may go from all theſe pumps, to convey the water (drawn up by them to a ſmall height) into a cloſe ciſtern, from which the main pipe proceeds, the water will be forced into this ciſtern by the deſcent of the piſtons. And as each pipe, going from its reſpective pump into the ciſtern, has a valve at its end in the ciſtern, theſe valves will hinder the return of the water by the pipes; and therefore, when the ciſtern is once full, each piſton upon its deſcent will force the water (conveyed into the ciſtern by a former ſtroke) up the main pipe, to the height the engine was intended to raiſe it: which height depends upon the quantity raiſed, and the power that turns the wheel. When the power upon the wheel is leſſened by any defect of the quantity of water turning it, a proportionable number of the pumps may be laid aſide, by diſengaging their rods from the vibrating levers.

This figure is a repreſentation of the engine erected at Blenheim for the Duke of Marlborough, by the late ingenious Mr Alderſea. The water-wheel is 7½ feet in diameter, according to Mr Switzer's account in his Hydraulics.

When ſuch a machine is placed in a ſtream that runs upon a ſmall declivity, the motion of the levers and action of the pumps will be but ſlow; ſince the wheel muſt go once round for each ſtroke of the pumps. But, when there is a large body of ſlow running water, a cog or ſpur-wheel may be placed upon each ſide of the water-wheel AA, upon its axis, to turn a trundle upon each ſide; the cranks being upon the axis of the trundle. And by proportioning the cog-wheels to the trundles, the motion of the pumps may be made quicker, according to the quantity and ſtrength of the water upon the firſt wheel; which may be as great as the workman pleaſes, according to the length and breadth of the float-boards or wings of the wheel. In this manner, the engine for raiſing water at London-Bridge is conſtructed; in which the water-wheel is 20 feet diameter, and the flots 14 feet long.

A quadruple pump-mill for raiſing water.

The engine is repreſented in Plate 99. fig. 1. In which ABCD is a wheel, turned by water according to the order of the letters. On the horizontal axis are four ſmall wheels, toothed almoſt half round; and the parts of their edges on which there are no teeth are cut down ſo as to be even with the bottoms of the teeth where they ſtand.

The teeth of theſe four wheels take alternately into the teeth of four racks, which hang by two chains over the pullies Q and L; and to the lower ends of theſe racks there are four iron rods fixed, which go down into the four forcing pumps, S, R, M, and N. And, as the wheels turn, the racks and pump-rods are alternately moved up and down.

Thus, ſuppoſe the wheel G has pulled down the rack I, and drawn up the rack K by the chain: as the laſt tooth of G juſt leaves the uppermoſt tooth of I, the firſt tooth of H is ready to take into the lowermoſt tooth of the rack K, and pull it down as far as the teeth go; and then the rack I is pulled upward through the whole ſpace of its teeth, and the wheel G is ready to take hold of it, and pull it down again, and ſo draw up the other.——In the ſame manner, the wheels E and F work the racks O and P.

Theſe four wheels are fixed on the axle of the great wheel in ſuch a manner, with reſpect to the poſitions of their teeth, that whilſt they continue turning round, there is never one inſtant of time in which one or other of the pump rods is not going down and forcing the water. So that, in this engine, there is no occaſion for having a general air-veſſel to all the pumps, to procure a conſtant ſtream of water flowing from the upper end of the main pipe.

From each of theſe pumps, near the loweſt end, in the water, there goes off a pipe, with a valve on its fartheſt end from the pump; and theſe ends of the pipes all enter one cloſe box, into which they deliver the water: and into this box, the lower end of the main conduct pipe is fixed. So that, as the water is forced or puſhed into the box, it is alſo puſhed up the main pipe to the height that it is intended to be raiſed.

A pump-engine to go by horſes.

Where a ſtream or fall of water cannot be had, and gentlemen want to have water raiſed, and brought to their houſes from a rivulet or ſpring; this may be effected by a horſe engine, working three forcing-pumps which ſtand in a reſervoir filled by the ſpring or rivulet: the piſtons being moved up and down in the pumps by means of a triple crank ABC, which, as it is turned round by the trundle G (Plate 100. fig. 6.) raiſes and depreſſes the rods D, E, F. if the wheel has three times as many cogs as the trundle has ſtaves or rounds, the trundle and cranks will make three revolutions for every one of the wheel: and as each crank will fetch a ſtroke in the time it goes round, the three cranks will make nine ſtrokes for every turn of the great wheel.

The cranks ſhould be made of caſt iron, becauſe that will not bend; and they ſhould each make an angle of 120 with both of the others, as at *a*, *b*, *c*; which is (as it were) a view of their radii, in looking endwiſe at the axis: and then there will be always one or other of them going downward, which will puſh the water forward with a continued ſtream into the main pipe. For, when *b* is almoſt at its loweſt ſituation, and is therefore juſt beginning to loſe its action upon the piſton which it moves, *c* is beginning to move downward, which will by its piſton continue the propelling force upon the water: and when *c* is come down to the poſition of *b*, *a* will be in the poſition of *c*.

The more perpendicularly the piſton rods move up and down in the pumps, the freer and better will their ſtrokes be: but a little deviation from the perpendicular will not be material. Therefore, when the pump-rods D, E, and F go down into a deep well, they may be moved directly by the cranks, as is done in a very good horſe-engine of this ſort at the late Sir James Creed's at Greenwich, which forces up water about 64 feet from a well under ground, to a reſervior on the top of his houſe. But when the cranks are only at a ſmall height above the pumps, the piſtons muſt be moved by vibrating levers, as in the above engine at Blenheim: and the longer the levers are, the nearer will the ſtrokes be to a perpendicular.

Let us ſuppoſe, that in ſuch an engine as Sir James Creed's, the great wheel is twelve feet diameter, the trundle four feet, and the radius or length of each crank nine inches, working a piſton in its pump. Let there be three pumps in all, and the bore of each pump be four inches diameter. Then, if the great wheel has three times as many cogs as the trundle has ſtaves, the trundle and cranks will go three times round for each revolution of the horſes and wheel, and the three cranks will make nine ſtrokes of the pumps in that time, each ſtroke being 18 inches (or double the length of the crank) in a four-inch bore. Let the diameter of the horſe-walk be 18 feet, and the perpendicular height to which the water is raiſed above the ſurface of the well be 64 feet.

If the horſes go at the rate of two miles an hour (which is very moderate walking) they will turn the great wheel 187 times round in an hour.

In each turn of the wheel the piſtons make nine ſtrokes in the pumps, which amount to 1683 in an hour.

Each ſtroke raiſes a column of water 18 inches long, and four inches thick, in the pump barrels; which column, upon the deſcent of the piſton, is forced into the main pipe, whoſe perpendicular altitude above the ſurface of the well is 64 feet.

Now, ſince a column of water 18 inches long, and four inches thick, contains 226.18 cubic inches, this number multiplied by 1683 (the ſtrokes in an hour) gives 380661 for the number of cubic inches of water raiſed in an hour.

A gallon, in wine-meaſure, contains 231 cubic inches, by which divide 380661, and it quotes 1468 in round numbers, for the number of gallons raiſed in an hour; which, divided by 63, gives 26½ hogſheads ——If the horſes go faſter, the quantity raiſed will be ſo much the greater.

In this calculation it is ſuppoſed that no water is waſted by the engine. But as no forcing engine can be ſuppoſed to loſe leſs than a fifth part of the calculated quantity of water, between the piſtons and barrels, and by the opening and ſhutting of the valves, the horſes ought to walk almoſt 2½ miles *per* hour to fetch up this loſs.

A column of water four inches thick, and 64 feet high, weighs $349\frac{2}{16}$ pounds averdupoiſe, or $424\frac{5}{12}$ pounds troy; and this weight, together with the friction of the engine, is the reſiſtance that muſt be overcome by the ſtrength of the horſes.

The horſe tackle ſhould be ſo contrived, that the horſes may rather puſh on than drag the levers after them. For if they draw, in going round the walk, the outſide leather-ſtraps will rub againſt their ſides and hams; which will hinder them from drawing at right angles to the levers, and ſo make them pull at a diſadvantage. But if they puſh the levers before their breaſts, inſtead of dragging them, they can always walk at right angles to theſe levers.

It is no ways material what the diameter of the main or conduct pipe be: for the whole reſiſtance of the water therein, againſt the horſes, will be according to the height to which it is raiſed, and the diameter of that part of the pump in which the piſton works; as we have already obſerved. So that by the ſame pump, an equal quantity of water may be raiſed in (and conſequently made to run from) a pipe of a foot diameter, with the ſame eaſe as in a pipe of five or ſix inches; or rather with more eaſe, becauſe its velocity in a large pipe will be leſs than in a ſmall one, and therefore its friction againſt the ſides of the pipe will be leſs alſo.

And the force required to raiſe water depends not upon the length of the pipe, but upon the perpendicular height to which it is raiſed therein above the level of the ſpring. So that the ſame force, which would raiſe water to the height AB (fig. 7.) in the upright pipe *AiklmnopqB*, will raiſe it to the ſame height or level BIH in the oblique pipe AEFGH. For the preſſure of the water at the end A of the latter, is no more than its preſſure againſt the end A of the former.

The weight or preſſure of water at the lower end of a pipe, is always as the ſine of the angle to which the pipe is elevated above the level parallel to the horizon. For, although the water in the upright pipe AB would require a force applied immediately to the lower end A, equal to the weight of all the water in it, to ſupport the water, and a little more to drive it up and out of the pipe; yet if that pipe be inclined from its upright poſition to an angle of 80 degrees (as in A 80), the force required to ſupport or to raiſe the ſame cylinder of water will then be as much leſs as the ſine 80 *b* is leſs than the radius AB; or as the ſine of 80 degrees is leſs than the ſine of 90. And ſo, decreaſing as the ſign of the angle of elevation leſſens, until it arrives at its level AC or place of reſt, where the force of the water is nothing at either end of the pipe. For, although the abſolute weight of the water is the ſame in all poſitions, yet its preſſure at the lower end decreaſes, as the ſine of the angle of elevation decreaſes; as will appear plainly by a farther conſideration of the figure.

Let two pipes, AB and BC, of equal lengths and bores, join each other at A; and let the pipe AB be divided into 100 equal parts, as the ſcale S is; whoſe length is equal to the length of the pipe.—Upon this length, as a radius, deſcribe the quadrant BCD, and divide it into 90 equal parts or degrees.

Let the pipe AC be elevated to 10 degrees upon the quadrant, and then filled with water; then, part of the water that is in it will riſe in the pipe AB, and if it be kept full of water, it will raiſe the water in the pipe AB from A to *i*; that is, to a level *i* 10 with the mouth of the pipe at 10: and the upright line *a* 10, equal to A*i*, will be the ſine of 10 degrees elevation; which being meaſured upon the ſcale S, will be about 17.4 of ſuch parts as the pipe contains 100 in length: and therefore, the force or preſſure of the water at A, in the pipe A 10, will be to the force or preſſure at A in the pipe AB as 17.3 to 100.

Let the ſame pipe be elevated to 20 degrees in the quadrant, and if it be kept full of water, part of that water will run into the pipe AB, and riſe therein to the height A*k*, which is equal to the length of the upright line *b* 20, or to the ſine of 20 degrees elevation; which, being meaſured upon the ſcale S, will be 34.2 of ſuch parts as the pipe contains 100 in length; and therefore the preſſure of the water at A, in the full pipe A 20, will be to its preſſure, if that pipe were raiſed to the perpendicular ſituation AB, as 34.2 to 100.

Sine of	Parts	Sine of	Parts	Sine of	Parts	Sine of	Parts	Sine of	Parts
D. 1	17	D. 19	325	D. 37	602	D. 55	819	D. 73	956
2	35	20	342	38	616	56	829	74	961
3	52	21	358	39	629	57	839	75	966
4	70	22	375	40	643	58	848	76	970
5	87	23	391	41	656	59	857	77	974
6	104	24	407	42	669	60	866	78	978
7	122	25	423	43	682	61	875	79	982
8	139	26	438	44	695	62	883	80	985
9	156	27	454	45	707	63	891	81	988
10	174	28	469	46	719	64	899	82	990
11	191	29	485	47	731	65	906	83	992
12	208	30	500	48	743	66	913	84	994
13	225	31	515	49	755	67	920	85	996
14	242	32	530	50	766	68	927	86	997
15	259	33	545	51	777	69	934	87	998
16	276	34	559	52	788	70	940	88	999
17	292	35	573	53	799	71	945	89	1000
18	309	36	588	54	809	72	951	90	1000

Elevate the pipe to the poſition A 30 on the quadrant; and if it be ſupplied with water, the water will riſe from it into the pipe AB, to the height A*l*, or to the ſame level with the mouth of the pipe at 30. The ſine of this elevation, or of the angle of 30 degrees, is *c* 30; which is juſt equal to half the length of the pipe, or to 50 of ſuch parts of the ſcale as the length of the pipe contains 100. Therefore, the preſſure of the water at A, in a pipe elevated 30 degrees above the horizontal level, will be equal to one half of what it would be, if the ſame pipe ſtood upright in the ſituation AB.

And thus, by elevating the pipe to 40, 50, 60, 70, and 80 degrees on the quadrant, the ſines of theſe elevations will be *d* 40, *e* 50, *f* 60, *g* 70, and *h* 80; which will be equal to the heights A*m*, A*n*, A*o*, A*p*, and A*q*; and theſe heights meaſured upon the ſcale 8 will be 64.3, 76.6, 86.6, 94.0, and 98.5; which expreſs the preſſures at A in all theſe elevations, conſidering the preſſure in the upright pipe AB as 100.

Becauſe it may be of uſe to have the lengths of all the ſines of a quadrant from 0 degrees to 90, we have given the foregoing table, ſhewing the length of the ſine of every degree in ſuch parts as the whole pipe (equal to the radius of the quadrant) contains 1000. Then the ſines will be integral or whole parts in length. But if you ſuppoſe the length of the pipe to be divided only into 100 equal parts, the laſt figure of each part or ſine muſt be cut off as a decimal; and then thoſe which remain at the left hand of this ſeparation will be integral or whole parts.

Thus, if the radius of the quadrant (ſuppoſed to be equal to the length of the pipe AC) be divided into 1000 equal parts, and the elevation be 45 degrees, the ſine of that elevation will be equal to 707 of theſe parts; but if the radius be divided into 100 equal parts, the ſame ſine will be only 70.7 or 70$\frac{7}{10}$ of theſe parts. For, as 1000 is to 707, ſo is 100 to 70.7.

As it is of great importance to all engine makers, to know what quantity and weight of water will be contained in an upright round pipe of a given diameter and height, ſo as, by knowing what weight is to be raiſed, they may proportion their engines to the force which they can offord to work them; we ſhall ſubjoin tables ſhewing the number of cubic inches of water contained in an upright pipe of a round bore, of any diameter from one inch to ſix and a half; and of any height from one foot to two hundred: together with the weight of the ſaid number of cubic inches, both in troy and avoirdoirdupoiſe ounces. The number of cubic inches divided by 231, will reduce the water to gallons in wine-meaſure; and divided by 382, will reduce it to the meaſure of ale-gallons. Alſo, the troy ounces divided by 12, will reduce the weight to troy pounds: and the avoirdupoiſe ounces divided by 16, will reduce the weight to avoirdupoiſe pounds.

And here we muſt repeat it again, that the weight or preſſure of the water acting againſt the power that works the engine muſt always be eſtimated according to the perpendicular height to which it is to be raiſed, without any regard to the length of the conduct pipe, when it has an oblique poſition; and as if the diameter of that pipe were juſt equal to the diameter of that part of the pump in which the piſton works. Thus by the tables on the two following pages, the preſſure of the water againſt an engine whoſe pump is of a 4$\frac{1}{2}$ inch bore, and the perpendicular height of the water in the conduct-pipe is 80 feet, will be equal to 8057 5 troy ounces, and to 8848.2 avoirdupoiſe ounces; which makes 671.4 troy pounds, and 553 avoirdupoiſe.

Example. *Required the number of cubic inches, and the weight of the water, in an upright pipe 278 feet high, and 1$\frac{1}{2}$ inch diameter?*

	Feet.	*Cubic inches.*	*Troy oz.*	*Avoir. oz.*
	200	4241.1	2238.2	2457 8
	70	1484.1	783.3	860.2
	8	169.6	89.5	98.3
Anſw.	278	5895.1	3111.0	3416.3

Here the neareſt ſingle decimal figure is only taken into the account; and the whole, being reduced by diviſion, amounts to 25$\frac{1}{2}$ wine-gallons in meaſure, to 259$\frac{1}{4}$ pounds troy, and 213$\frac{1}{2}$ pounds avoirdupoiſe.

Theſe tables were at firſt calculated to ſix decimal places for the ſake of exactneſs; but in tranſcribing them there are no more than two decimal figures taken into the account, and ſometimes but one; becauſe there is no neceſſity for computing to hundredth parts of an inch or of an ounce in practice.

The fire engine.

The *fire-engine* comes next in order to be explained: but as it would be difficult, even by the beſt plates, to give a particular deſcription of its ſeveral parts, ſo as to make the whole intelligible, we ſhall only explain the principles upon which it is conſtructed.

1. Whatever weight of water is to be raiſed, the pump-rod muſt be loaded with weights ſufficient for that purpoſe, if it be done by a forcing-pump, as is generally the caſe: and the power of the engine muſt be ſufficient for the weight of the rod, in order to bring it up.

2. It is known, that the atmoſphere preſſes upon the ſurface of the earth with a force equal to 15 pounds upon every ſquare inch.

3. When water is heated to a certain degree, the particles thereof repel one another, and conſtitute an elaſtic fluid, which is generally called ſteam or vapour.

4. Hot ſteam is very elaſtic; and when it is cooled by any means, particularly by its being mixed with cold water, its elaſticity is deſtroyed immediately, and it is reduced to water again.

5. If a veſſel be filled with hot ſteam, and then cloſed ſo as to keep out the external air and all other fluids; when that ſteam is by any means condenſed, cooled, or reduced to water, that water will fall to the bottom of the veſſel; and the cavity of the veſſel will be almoſt a perfect vacuum.

6. Whenever a vacuum is made in any veſſel, the air by its weight will endeavour to ruſh into the veſſel, or

to drive in any other body that will give way to its preſſure; as may be eaſily ſeen by a common ſyringe. For, if you ſtop the bottom of a ſyringe, and then draw up the piſton, if it be ſo tight as to drive out all the air before it, and leave a vacuum within the ſyringe, the piſton being let go will be driven down with a great force.

7. The force with which the piſton is drove down, when there is a vacuum under it, will be as the ſquare of the diameter of the bore in the ſyringe. That is to ſay, it will be driven down with four times as much force in a ſyringe of a two-inch bore, as in a ſyringe of one inch: for the areas of circles are always as the ſquares of their diameters.

8. The preſſure of the atmoſphere being to 15 pounds upon every ſquare inch, it will be equal to about 12 pounds upon every circular inch. So that if the bore of the ſyringe be round, and one inch in diameter, the piſton will be preſt down into it by a force nearly equal to 12 pounds: but if the bore be two inches diameter, the piſton will be preſt down with four times that force.

And hence it is eaſy to find with what force the atmoſphere preſſes upon any given number either of ſquare or circular inches.

Theſe being the principles upon which this engine is conſtructed, we ſhall next deſcribe the chief working parts of it: which are, 1. A boiler. 2. A cylinder and piſton. 3. A beam or lever.

The boiler is a large veſſel made of iron or copper; and commonly ſo big as to contain about 2000 gallons.

The cylinder is about 40 inches diameter, bored ſo ſmooth, and its leathered piſton fitting ſo cloſe, that little or no water can get between the piſton and ſides of the cylinder.

Things being thus prepared, the cylinder is placed upright, and the ſhank of the piſton is fixed to one end of the beam, which turns on a centre like a common balance.

The boiler is placed under the cylinder, with a communication between them, which can be opened and ſhut occaſionally.

The boiler is filled about half full of water, and a ſtrong fire is made under it: then, if the communication between the boiler and the cylinder be opened, the cylinder will be filled with hot ſteam; which would drive the piſton quite out at the top of it. But there is a contrivance by which the piſton, when it is near the top of the cylinder, ſhuts the communication at the top of the boiler within.

This is no ſooner ſhut, than another is opened, by which a little cold water is thrown upwards in a jet into the cylinder, which mixing with the hot ſteam, condenſes it immediately; by which means a vacuum is made in the cylinder, and the piſton is preſſed down by the weight of the atmoſphere; and ſo lifts up the loaded pump-rod at the other end of the beam.

HYDROSTICAL TABLES.

1 Inch diameter.				1½ Inches diameter.			
Feet high.	Solidity in cubic inches.	Weight in Troy ounces.	In avoirdupoiſe ounces.	Feet high.	Solidity in cubic inches.	Weight in Troy ounces.	In avoirdupoiſe ounces.
1	9.42	4.97	5.46	1	21.21	11.19	12.29
2	18.85	9.95	10.92	2	42.44	22.38	24.58
3	28.27	14.92	16.38	3	63.62	33.57	36.87
4	37.70	19.89	21.85	4	84.8	44.76	49.16
5	47.12	24.87	27.31	5	106.03	55.95	61.45
6	56.55	29.84	32.77	6	127.23	67.15	73.73
7	65.97	34.82	38.23	7	147.44	78.34	86.02
8	75.40	39.79	43.69	8	169.65	89.53	98.31
9	84.82	44.76	49.16	9	190.85	100.72	110.60
10	94.25	49.74	54.62	10	212.06	111.91	122.89
20	188.49	99.48	109.24	20	424.12	223.82	245.78
30	282.74	149.21	163.86	30	636.17	335.73	368.68
40	376.99	198.95	218.47	40	848.23	447.64	491.57
50	471.24	248.69	273.09	50	1060.29	559.55	614.46
60	565.49	298.43	327.71	60	1272.35	671.46	737.35
70	659.73	348.17	382.33	70	1484.40	783.37	860.24
80	753.98	397.90	436.95	80	1696.46	895.28	983.14
90	843.23	447.64	491.57	90	1908.52	1007.19	1106.03
100	942.48	497.38	546.19	100	2120.58	1119.09	1228.92
200	1884.96	994.76	1092.38	200	4241.15	2238.18	2457.84

2 Inches diameter.				2½ Inches diameter.			
1	37.70	19.89	21.85	1	58.90	31.08	34.14
2	75.40	39.79	43.69	2	117.81	62.17	68.27
3	113.10	59.68	65.54	3	176.71	93.26	102.41
4	150.80	79.58	87.39	4	235.62	124.34	136.55
5	188.50	99.47	109.24	5	294.52	155.43	170.68
6	226.19	119.37	131.08	6	353.43	186.52	204.82
7	263.89	139.26	152.93	7	412.33	217.60	238.96
8	301.59	159.16	174.78	8	471.24	248.69	273.09
9	339.29	179.06	196.63	9	530.14	279.77	307.23
10	376.99	198.95	218.47	10	589.05	310.86	341.37
20	753.98	397.90	436.95	20	1178.10	621.72	682.73
30	1130.97	596.85	665.42	30	1767.15	932.58	1024.10
40	1507.97	795.80	873.90	40	2356.20	1243.44	1365.47
50	1884.96	994.75	1092.37	50	2545.25	1554.30	1706.83
60	2261.95	1193.70	1310.85	60	3534.29	1865.16	2048.20
70	2638.94	1392.65	1529.32	70	4123.34	2176.02	2389.27
80	3015.93	1591.60	1747.80	80	4712.39	2486.88	2730.94
90	3392.92	1790.56	1966.27	90	5301.44	2797.74	3072.30
100	3769.91	1989.51	2184.75	100	5890.49	3108.60	2413.67
200	7539.82	3979.00	4369.50	200	11780.98	6217.20	4827.34

HYDROSTATICAL TABLES.

3 Inches diameter.

Feet high.	Solidity in cubic inches.	Weight in Toy ounces.	In avoir dupoiſe ounces.
1	84.8	44.76	49.16
2	169.6	89.53	98.31
3	254.5	134.29	147.47
4	239.3	179.06	199.63
5	424.1	223.82	245.78
6	508.9	268.58	294.94
7	593.7	313.35	344.10
8	698.6	358.11	393.25
9	763.4	402.87	442.41
10	848.2	447.64	491.57
20	1696.5	895.28	983.14
30	2244 7	1342.92	1474.70
40	3392.9	1790.56	1966.27
50	4241.1	2238.19	2457.84
60	5089.4	2685.83	2949.41
70	5937.6	3133.47	3440.98
80	6785.8	3581.11	3932.55
90	7634.1	4028.75	4424.12
100	8482.3	4476.39	4915.68
200	16964.6	8952.78	9821.36

3½ Inches diameter.

Feet high.	Solidity in cubic inches.	Weight in Troy ounces.	In avoir dupoiſe ounces.
1	115.4	60.9	66.9
2	230.9	121.8	133.8
3	346.4	182.8	200.7
4	461.8	243.7	267.6
5	577.3	304.6	334.5
6	692.7	365.6	401.4
7	808.2	426.5	468.4
8	923.6	487.4	535.3
9	1039.1	548.3	602.2
10	1154.5	609.2	669.1
20	2309.1	1218.6	1338.2
30	3463.6	1827.9	2007.2
40	4618.1	1437.1	2676.3
50	5772.7	3046.4	3345.4
60	6927.2	3655 7	4014.5
70	8081.7	4265.0	4683.6
80	9236.3	4874.3	5352.6
90	10390.8	5483.6	6021.7
100	11545.4	6092.9	6690.8
200	23090.7	12185.7	13381.5

5 Inches diameter.

Feet high.	Solidity in cubic inches.	Weight in Troy ounces.	In avoir dupoiſe ounces.
1	235.6	124.3	136.5
2	471.2	248.7	273.1
3	706.8	373.0	409.6
4	942.5	497.4	546.2
5	1178.1	621.8	682.7
6	1413.7	746.1	819.3
7	1649.3	870.4	955.8
8	1884.9	994.8	1092.4
9	2120.6	1119.1	1228.9
10	2356.2	1243.4	1365.5
20	4712.4	2486.9	2730.9
30	7068.6	3730.3	4096.4
40	9424.8	4973.8	5461.9
50	11781.0	6217.2	6827.3
60	14137.2	7460.6	8192.8
70	16493.4	8704.1	9558.3
80	18849.6	9947.5	10923.7
90	21205.8	11191.0	12289.2
100	23562.0	12434.4	13654.7
200	47124.0	24868.8	27309.3

5½ Inches diameter.

Feet high.	Solidity in cubic inches.	Weight in Troy ounces.	In avoir dupoiſe ounces.
1	285.1	150.5	164.3
2	570.2	300.9	328.5
3	855.3	451.4	492.8
4	1140.4	601.8	657.1
5	1425.5	752.2	921.3
6	1710.6	902.7	985.6
7	1995.7	1053.2	1149.9
8	2280.8	1203.6	1314.2
9	2565.9	1354.1	1478.4
10	2851.0	1504.6	1642.7
20	5702.0	3009.1	3285.4
30	8553.0	4513.7	4928.1
40	11404.0	6018.2	6570.8
50	14255.0	7522.9	8213.5
60	17106.0	9027.4	9856.2
70	19957.0	10531.9	11498.9
80	22808.0	12036.5	13141.6
90	25659.0	13541.1	14784.3
100	28510.0	15045.1	16426.9
200	57020.0	30091.2	32853.9

4 inches diameter.

1	150.8	79.6	87.4
2	301.6	159.2	174.8
3	452.4	238.7	262.2
4	603.2	318.3	349.6
5	754.0	497.9	436.9
6	904.8	477.5	524.3
7	1055.6	557.1	611.7
8	1206.4	636.6	699.1
9	1357.2	716.2	786.5
10	1508.0	795.8	873.9
20	3115.9	1591.6	1747.8
30	4523.9	2387.4	2621.7
40	6631.9	3183.2	3495.6
50	7539.8	3997.0	4369.5
60	9047.8	4774.8	5243.4
70	10555.8	5570.6	6117.3
80	12063.7	6366.4	6991.2
90	13571.7	7162.2	7865.1
100	15079.7	7958.0	8739.1
200	30159.3	15916.0	17478.2

4½ Inches diameter.

1	190.8	100.7	110.6
2	381.7	201.4	221.2
3	572.6	302.2	331.8
4	763.4	402.9	442.4
5	954.3	503.6	553.0
6	1145.1	604.3	663.6
7	1337.9	705.0	774.2
8	1526.8	805.7	884 8
9	1717.7	906.5	995.4
10	1908.5	1007.2	1166 0
20	3817.0	2014.4	2212.1
30	5725.6	3021.6	3818 1
40	7644.1	4028.7	4424.1
50	7542.6	5035.9	5530.1
60	11451.1	6043.1	6636.2
70	13359.6	7050.3	7742.2
80	15268.2	8057.5	8848 2
90	17176.7	9064.7	9954.3
100	19085.2	10071.9	11060.3
200	38170.4	2014 .8	22120.6

6 Inches diameter.

1	339.3	179.0	196.6
2	678.6	358.1	393.3
3	1017.9	537.2	589.9
4	1357.2	716.2	786.5
5	1696.5	895.3	983.1
6	2035.7	1074.3	1179.8
7	2375.0	1253.4	1376.4
8	2714.3	1432.4	1573.0
9	3053.6	1611.5	1769.6
10	3392.9	1790.6	1966.3
20	6785.8	3581.1	3932.5
30	10178.8	5371.7	5898.8
40	13571.7	7162.2	7865.1
50	16964.6	8952.8	9831.4
60	20357.5	10743.3	11797.6
70	23750.5	12533.9	13763.9
80	27143.4	14324 4	15730 2
90	30536.3	16115.0	17696.5
100	33929.2	17905.6	19662.7
200	67858.1	35811.2	39325.4

6½ Inches diameter.

1	398.2	210.1	230.7
2	797.4	420.3	461.4
3	1195.6	630.4	692.1
4	1593.8	840.6	922.8
5	1991.9	1050.8	1153.6
6	2390.1	1260.9	1384.3
7	2788.3	1471.1	1615.0
8	3186.5	1681.2	1845.7
9	3584.7	1891.3	2076.4
10	3982.0	2101.5	2207.1
20	7965.8	4202.9	4614.3
30	11941.8	6304.4	6921.4
40	15931.7	8405.9	9228.6
50	19914.6	10507.4	11535.7
60	23897.6	12608.9	13842.9
70	27880.5	14710.4	16150.0
80	31863.4	16811.8	18457.2
90	35846.3	18913.3	20764.3
100	39829.3	21014.8	23071.5
200	79658.6	42029.6	46143.0

If the cylinder be 42 inches in diameter, the piſton will be preſſed down with a force greater than 20000 pounds, and will conſequently lift up that weight at the oppoſite end of the beam: and as the pump-rod with its plunger is fixed to that end, if the bore where the plunger works were 10 inches diameter, the water would be forced up through a pipe of 180 yards perpendicular height.

But, as the parts of this engine have a good deal of friction, and muſt work with a conſiderable velocity, and there is no ſuch thing as making a perfect vacuum in the cylinder, it is found that no more than 8 pounds of preſſure muſt be allowed for, on every circular inch of the piſton in the cylinder, that it may make about 16 ſtrokes in a minute, about 6 feet each.

Where the boiler is very large, the piſton will make between 20 and 25 ſtrokes in a minute, and each ſtroke 7 or 8 feet; which, in a pump of 9 inches bore, will raiſe upwards of 300 hogſheads of water in an hour.

It is found by experience, that a cylinder 40 inches diameter will work a pump 10 inches diameter and 100 yards long: and hence we can find the diameter and length of a pump that can be worked by any other cylinder.

For the conveniency of thoſe who would make uſe of this engine for raiſing water, we ſhall ſubjoin part of a table calculated by Mr. Beighton, ſhewing how any given quantity of water may be raiſed in an hour, from 48 to 440 hogſheads; at any given depth, from 15 to 100 yards; the machine working at the rate of 16 ſtrokes *per* minute, and each ſtroke being 6 feet long.

One example of the uſe of this table, will make the whole plain. Suppoſe it were required to draw 150 hogſheads *per* hour, at 90 yards depth; in the ſecond column from the right hand, I find the neareſt number, *viz.* 149 hogſheads 40 gallons; againſt which, on the right hand, I find the diameter of the bore of the pump muſt be 7 inches; and in the ſame collateral line, under the given depth 90, I find 27 inches, the diameter of the cylinder fit for that purpoſe.—And ſo for any other.

A Table ſhewing the Power of the Engine for raiſing Water by Fire;
Calculated to the Meaſure of Ale-gallons, at 282 cubic Inches *per* Gallon.

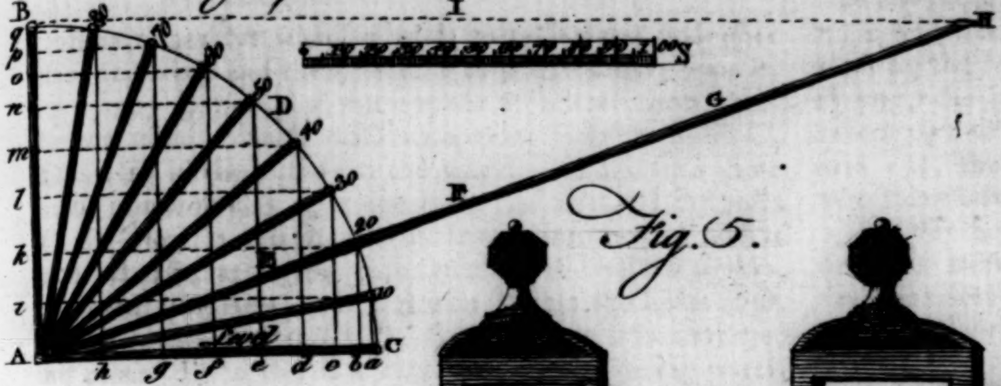
The depth to be drawn in yards.													In one hour.		Diam. of pump.
15	20	25	30	35	40	45	50	60	70	80	90	100	Hogſh.	Gal.	Inches.
Diameter of the Cylinder in Inches.															
18½	21¾	24	26½	28½	30½	32½	34¼	37¼	40	—	—	—	440		12
17	19¾	22	24¾	26¼	28	29¾	31¼	34¼	37	39½	—	—	369	33	11
15½	18	20	22	23¾	25¼	27	28¾	31¼	33¾	36	38¼	40	304	48	10
14	16¼	18	20	21½	23	24¼	25	28	30½	33	35	36½	247	7	9
13½	15¼	17¼	19	20¼	21¾	23	24	26¼	28½	31	32½	35¼	221	15	8½
12½	14½	16½	18½	19	20½	21½	23	25	27	29	30½	32½	195	22	8
12	14	15½	17½	18¾	19¾	21	22	24¼	26	28	29½	31½	182	13	7¾
11	13¾	15	16½	18	19	20	21¼	23¼	25	27	28½	30¼	172	30	7½
10¾	13	14	15½	16¾	18¾	19	20½	22	24	25½	27	28½	149	40	7
10	12	13	14	15½	16¼	18	19	20	22	23	24½	26¼	128	54	6½
9½	11	12	13	14	15½	16	17	19	20½	22	23	24½	110	1	6
	10	11	12	13	14	15	15¾	17	19	20	21	22¼	94	30	5½
		10	11	11¾	13	13¾	14	15½	16¾	18½	19¼	20¼	66	61	5
			10	10	11¼	12	13½	14	15	16	17	18¼	60	60	4½
				9	10	11	11½	12	13½	14	15	16	48	51	4

The Perſian wheel.

Water may be raiſed by means of a ſtream AB (Plate 100. fig. 8.) turning a wheel CDE, according to the order of the letters, with buckets *a,a,a,a, &c.* hung upon the wheel by ſtrong pins *b,b,b,b,* &c. fixed in the ſide of the rim: but the wheel muſt be made as high as the water is intended to be raiſed above the level of that part of the ſtream in which the wheel is placed. As the wheel turns, the buckets on the right hand go down into the water, and are thereby filled; and go up full on the left hand, until they come to the top at K; where they ſtrike againſt the end *n* of the fixed trough M, and are thereby overſet, and empty the water into the trough; from which it may be conveyed in pipes to the place which it is deſigned for: and as each bucket gets over the trough, it falls into a perpendicular poſition again, and goes down empty, until it comes to the water at A, where it is filled as before. On each bucket is a ſpring *r*, which going over the top or crown of the bar *m* (fixed to the trough M) raiſes the bottom of the bucket above above the level of

Plate. C.

Fig. 7.



B
I
H
S
q
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o
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m
l
k
i
A
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d
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10
D
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E

Fig. 1.

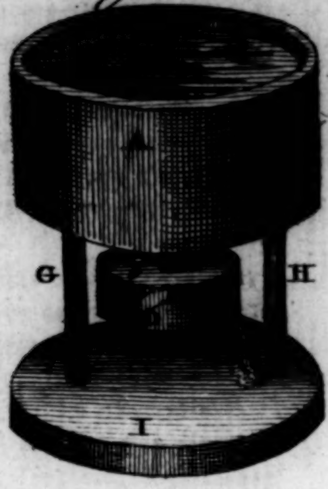
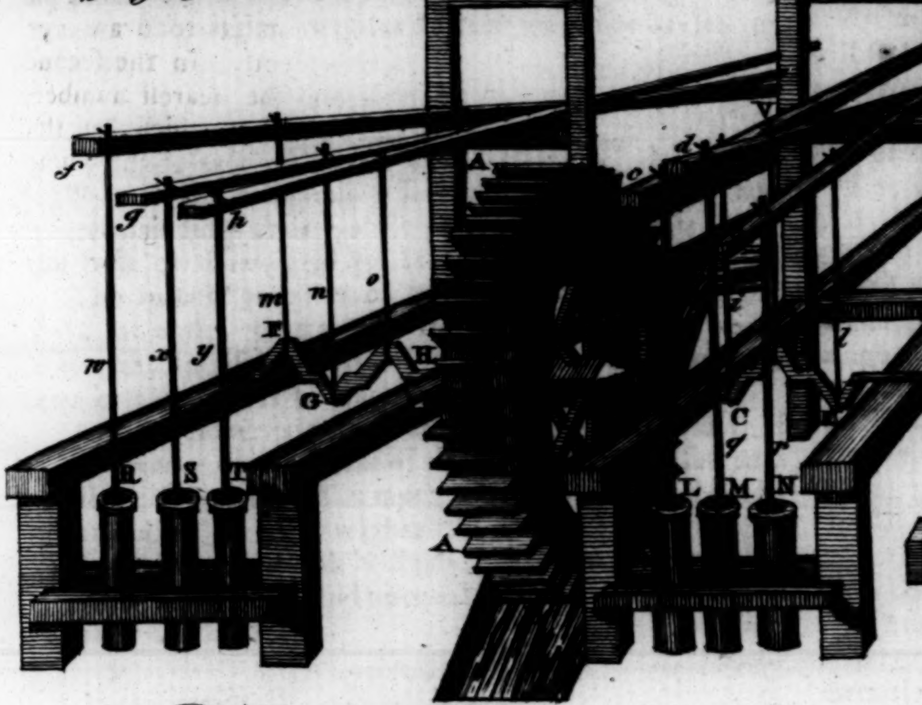


Fig. 5.



f
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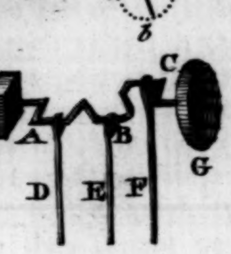
Fig. 6.



a
c
b
C
A
B
G
D
E
F

Fig. 2.

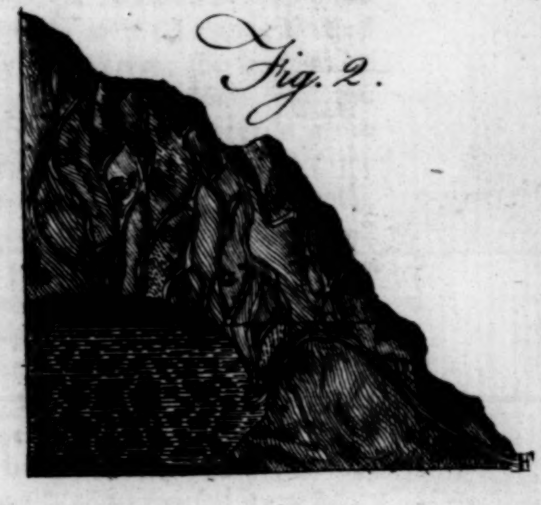
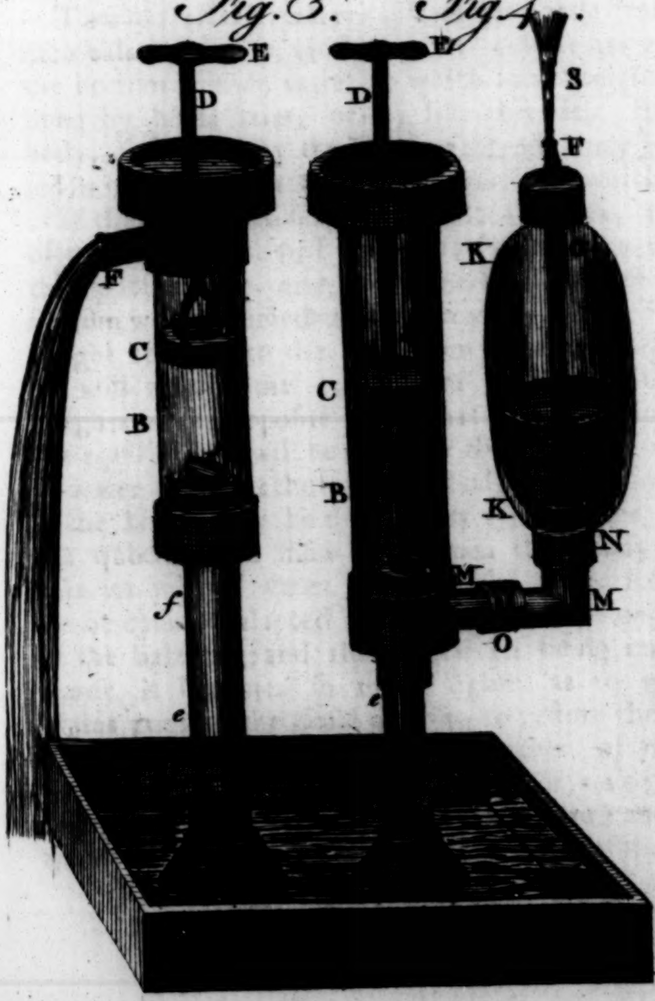


Fig. 3.

Fig. 4.



E
D
F
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e
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e
S
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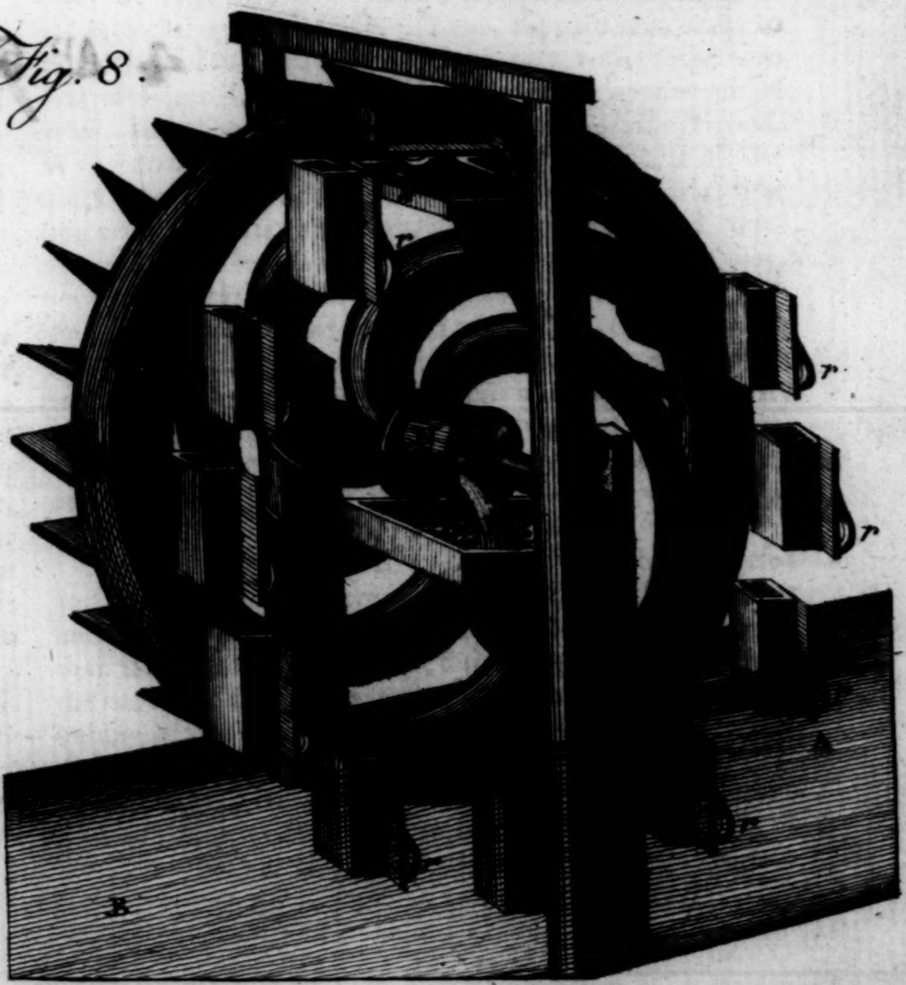
K
K
N
M
M
O

Fig. 8.



A. Bell Sc.

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of its mouth, and ſo cauſes it to empty all its water into the trough.

Sometimes this wheel is made to raiſe water no higher than its axis; and then, inſtead of buckets hung upon it, its ſpokes *c*, *d*, *e*, *f*, *g*, *h* are made of a bent form, and hollow within; theſe hollows opening into the holes C, D, E, F, in the outſide of the wheel, and alſo into thoſe at O in the box N upon the axis. So that, as the holes C, D, *&c.* dip into the water, it runs into them; and as the wheel turns, the water riſes in the hallow ſpokes, *c*, *d*, &c. and runs out in a ſtream P from the holes at O, and falls into the trough Q, from whence it is conveyed by pipes. And this is a very eaſy way of raiſing water, becauſe the engine requires neither men nor horſes to turn it.

Of the ſpecific gravities of bodies.

THE art of weighing different bodies in water, and thereby finding their ſpecific gravities, or weights, bulk for bulk, was invented by Archimedes.

The ſpecific gravities of bodies are as their weights, bulk for bulk: thus a body is ſaid to have two or three times the ſpecific gravity of another, when it contains two or three times as much matter in the ſame ſpace.

A body immerſed in a fluid will ſink to the bottom, if it be heavier than its bulk of the fluid. If it be ſuſpended therein, it will loſe as much of what it weighed in air, as its bulk of the fluid weighs. Hence, all bodies of equal bulk, which would ſink in fluids, loſe equal weights when ſuſpended therein. And unequal bodies loſe in proportion to their bulks.

The hydroſtatic balance.

THE *hydroſtatic balance* differs very little from a common balance that is nicely made: only it has a hook at the bottom of each ſcale, on which ſmall weights may be hung by horſe hairs, or by ſilk threads. So that a body, ſuſpended by the hair or thread, may be immerſed in water without wetting the ſcale from which it hangs.

If the body thus ſuſpended under the ſcale, at one end of the balance, be firſt counterpoiſed in air by weights in the oppoſite ſcale, and then immerſed in water, the equilibrium will be immediately deſtroyed. Then, if as much weight be put into the ſcale from which the body hangs as will reſtore the equilibrium (without altering the weights in the oppoſite ſcale) that weight which reſtores the equilibrium will be equal to the weight of a quantity of water as big as the immerſed body. And if the weight of the body in air be divided by what it loſes in water, the quotient will ſhew how much that body is heavier than its bulk of water. Thus, if a guinea ſuſpended in air be counterbalanced by 129 grains in the oppoſite ſcale of the balance; and then, upon its being immerſed in water, it becomes ſo much lighter as to require 7¼ grains put into the ſcale over it, to reſtore the equilibrium; it ſhews that a quantity of water, of equal bulk with the guinea, weighs 7¼ grains, or 7.25; by which divide 129 (the weight of the guinea in air) and the quotient will be 17.793; which ſhews that the guinea is 17.793 times as heavy as its bulk of bulk of water. And thus any piece of gold may be tried, by weighing it firſt in air, and then in water; and if, upon dividing the weight in air by the loſs in water, the quotient comes out to be 17.793, the gold is good; if the quotient be 18, or between 18 and 19, the gold is very fine; but if it be leſs than 17½, the gold is too much allayed, by being mixed with ſome other metal.

If ſilver be tried in this manner, and found to be 11 times as heavy as water, it is very fine; if it be 10½ times as heavy, it is ſtandard; but if it be of any leſs weight compared with water, it is mixed with ſome lighter metal, ſuch as tin.

By this method the ſpecific gravities of all bodies that will ſink in water may be found. But as to thoſe which are lighter than water, as moſt ſorts of wood are, the following method may be taken, to ſhew how much lighter they are than their reſpective bulks of water.

Let an upright ſtud be fixed into a thick flat piece of braſs, and in this ſtud let a ſmall lever, whoſe arms are equally long, turn upon a fine pin as an axis. Let the thread which hangs from the ſcale of the balance be tied to one end of the lever, and a thread from the body to be weighed tied to the other end. This done, put the braſs and lever into a veſſel: then pour water into the veſſel, and the body will riſe and float upon it, and draw down the end of the balance from which it hangs: then, put as much weight in the oppoſite ſcale as will raiſe that end of the balance, ſo as to pull the body down into the water by means of the lever; and this weight in the ſcale will ſhew how much the body is lighter than its bulk of water.

There are ſome things which cannot be weighed in this manner, ſuch as quickſilver, fragments of diamonds, *&c.* becauſe they cannot be ſuſpended in threads; and muſt therefore be put into a glaſs bucket, hanging by a thread from the hook of one ſcale, and counterpoiſed by weights put into the oppoſite ſcale. Thus, ſuppoſe you want to know the ſpecific gravity of quickſilver, with reſpect to that of water; let the empty bucket be firſt counterpoiſed in air, and then the quickſilver put into it and weighed. Write down the weight of the bucket, and alſo of the quickſilver; which done, empty the bucket, and let it be immerſed in water as it hangs by the thread, and counterpoiſed therein by weights in the oppoſite ſcale: then, pour the quickſilver into the bucket in the water, which will cauſe it to preponderate; and put as much weight into the oppoſite ſcale as will reſtore the balance to an equipoiſe; and this weight will be the weight of a quantity of water equal in bulk to the quickſilver. Laſtly, divide the weight of the quickſilver in air, by the weight of its bulk of water, and the quotient will ſhew how much the quickſilver is heavier than its bulk of water.

If a piece of braſs, glaſs, lead, or ſilver, be immerſed and ſuſpended in different ſorts of fluids, its different loſſes of weight therein will ſhew how much it is heavier than its bulk of the fluid; the fluid being lighteſt, in which the immerſed body loſes leaſt of its aerial weight. A ſolid bubble of glaſs is generally uſed for finding the ſpecific gravities of fluids.

Hence we have an eaſy method of finding the ſpecific gravities both of ſolids and fluids, with regard to the reſpective bulks of common pump water, which is generally made a ſtandard for comparing all the others by.

In conſtructing tables of ſpecific gravities with accuracy, the gravity of water muſt be repreſented by unity or 1.000, where three cyphers are added, to give room for expreſſing the ratios of other gravities in decimal parts, as in the following table.

Take away the decimal point from the numbers in the right hand column, or (which is the ſame) multiply them by 1000, and they will ſhew how many ounces avoirdupoiſe are contained in a cubic foot of each body.

How to find out the quantity of adulteration in metals.

The uſe of the table of ſpecific gravities will beſt appear by an example. Suppoſe a body to be compounded of of gold and ſilver, and it is required to find the quantity of each metal in the compound.

Firſt find the ſpecific gravity of the compound, by weighing it in air and in water, and dividing its aerial weight by what it loſes thereof in water, the quotient will ſhew its ſpecific gravity, or how many times it is heavier than its bulk of water. Then, ſubtract the ſpecific gravity of ſilver (found in the table) from that of the compound, and the ſpecific gravity of the compound from that of gold; the firſt remainder ſhews the bulk of gold, and the latter the bulk of ſilver, in the whole compound: and if theſe remainders be multiplied by the reſpective ſpecific gravities, the products will ſhew the proportion of weights of each metal in the body. Example.

Suppoſe the ſpecific gravity of the compounded body to be 13; that of ſtandard ſilver (by the table) is 10.5, and that of gold 19.63: therefore 10.5 from 13, remains 2.5, the proportional bulk of the gold; and 13 from 19.63, remains 6.63, the proportional bulk of ſilver in the compound. Then, the firſt remainder 2.5, multiplied by 19.63, the ſpecific gravity of gold, produces 49.075 for the proportional weight of gold; and the laſt remainder 6.63 multiplied by 10.5, the ſpecific gravity of ſilver, produces 69.615 for the proportional weight of ſilver in the whole body. So that, for every 49.07 ounces or pounds of gold, there are 69.6 pounds or ounces of ſilver in the body.

Hence it is eaſy to know whether any ſuſpected metal be genuine, or allayed, or counterfeit; by finding how much it is heavier than its bulk of water, and comparing the ſame with the table: if they agree, the metal is good; if they differ, it is allayed or counterfeited.

How to try ſpirituous liquors.

A cubical inch of good brandy, rum, or other proof ſpirits, weighs 235.7 grains; therefore, if a true inch cube of any metal weighs 235.7 grains leſs in ſpirits than in air, it ſhews the ſpirits are proof. If it loſes leſs of its aerial weight in ſpirits, they are above proof: if it loſes more, they are under. For, the better the ſpirits are, they are the lighter; and the worſe, the heavier.

The hydrometer is one of the moſt uſeful inſtruments of the philoſophic kind; for though the hydroſtatical balance be the moſt general inſtrument for finding the

A Table of the ſpecific Gravities of the ſeveral ſolid and fluid Bodies.

A cubic inch of	Troy weight			Avoirdup.		Comparative weight.
	oz.	pw.	gr.	oz.	drams	
Very fine gold	10	7	3.83	1	5.80	19.637
Standard gold	9	19	6.44	10	14.90	18.888
Guinea gold	9	7	17.18	10	4.76	17.793
Moidore gold	9	0	19.84	9	14.71	17.140
Quickſilver	7	7	11.61	8	1.45	14.019
Lead	5	19	17.55	6	9.08	11.325
Fine ſilver	5	16	23.23	6	6.66	11.087
Standard ſilver	5	11	3.36	6	1.54	10.535
Copper	4	13	7.04	5	1.89	8.843
Plate braſs	4	4	9.60	4	10.09	8.000
Steel	4	2	20.12	4	8.70	7.852
Iron	4	0	15.20	4	6.77	7.645
Block tin	3	17	5.68	4	3.79	7.321
Spelter	3	14	12.86	4	1.42	7.065
Lead ore	3	11	17.76	3	14.96	6.800
Glaſs of antimony	2	15	16.89	3	0.89	5.280
German antimony	2	2	4.80	2	5.04	4.000
Copper ore	2	1	11.83	2	4.43	3.775
Diamond	1	15	20.88	1	15.48	3.400
Clear glaſs	1	13	5.58	1	13.16	3.150
Lapis lazuli	1	12	5.27	1	12.27	3.054
Welch aſbeſtos	1	10	17.57	1	10.97	2.913

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HYDROMETERS

Fig. 1.

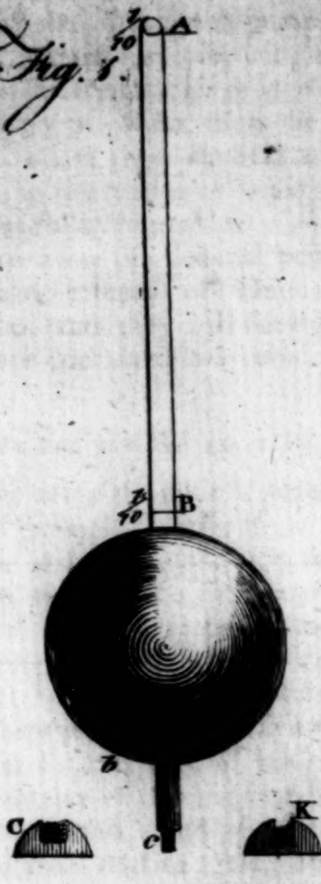
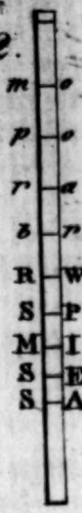

A
B
70
40
b
c
C
K

Fig. 2.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s r
R W
S P
M I
S E
S A

Fig. 3.

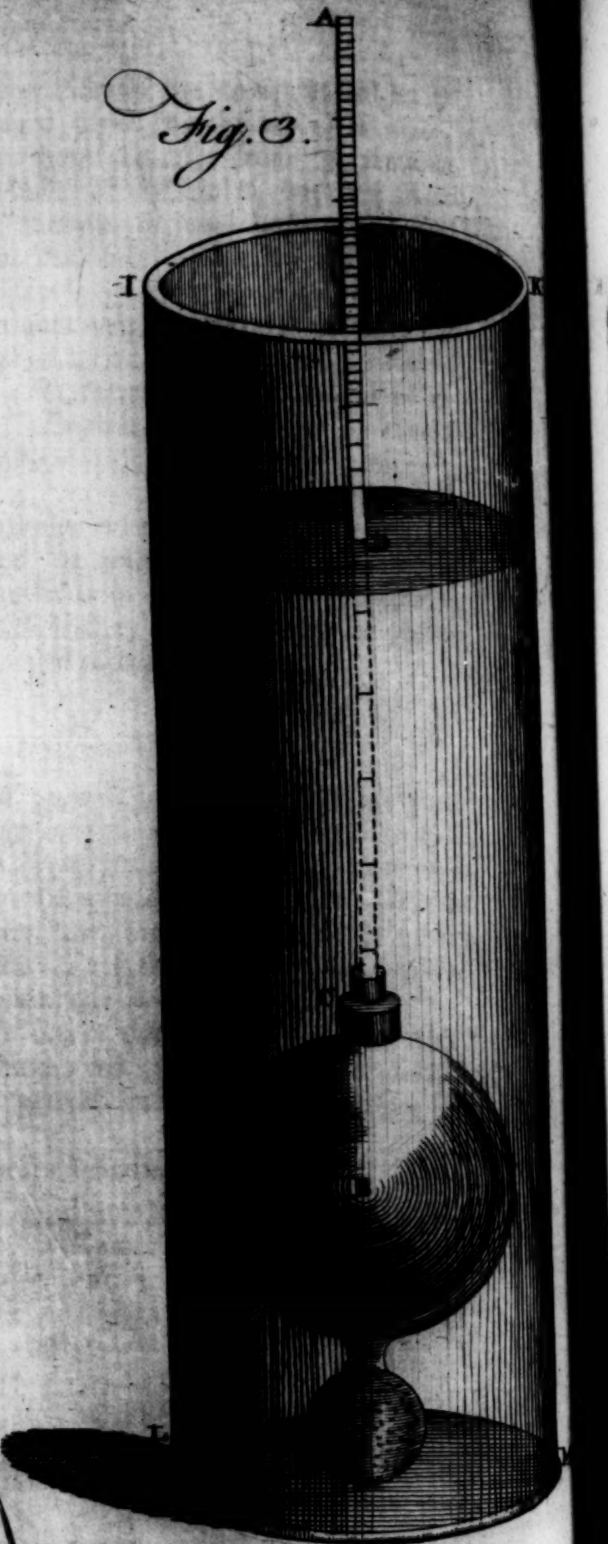
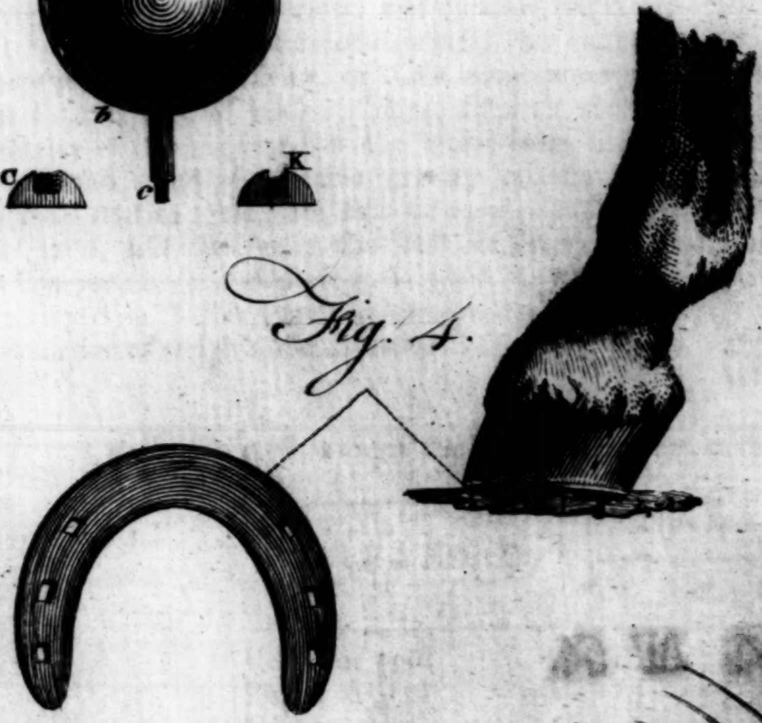


Fig. 4.



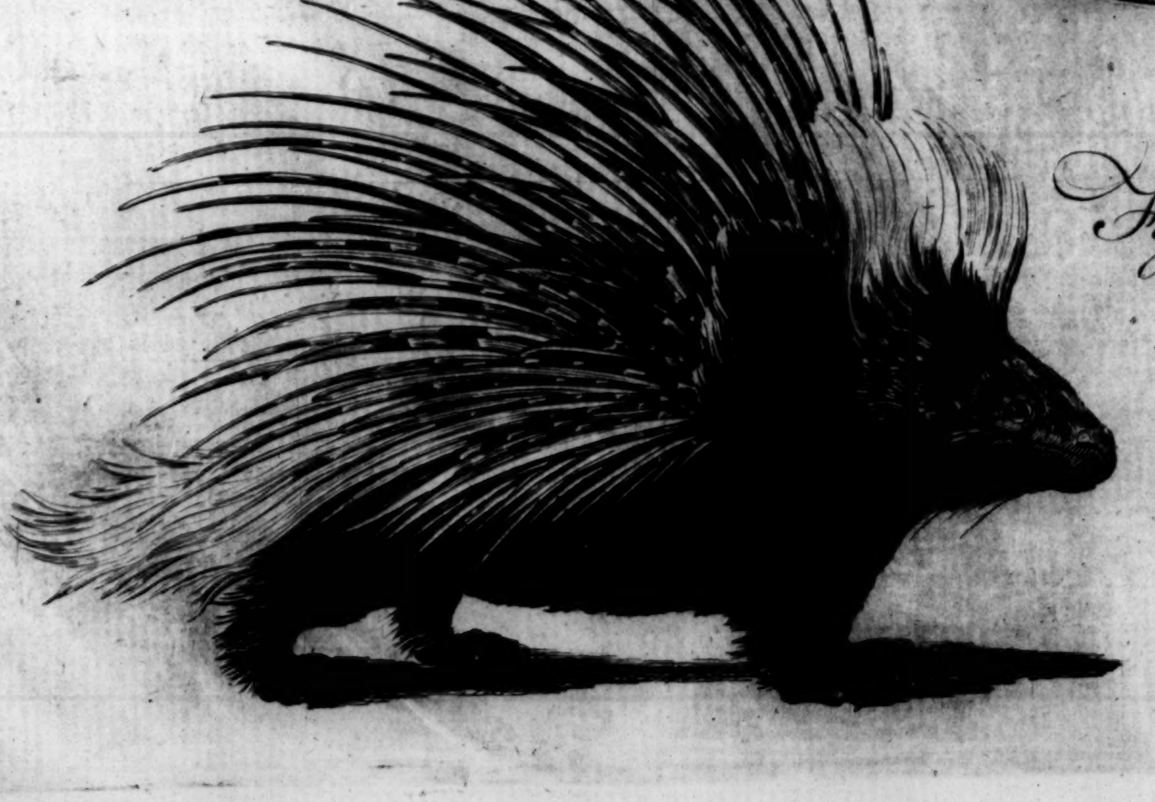


Fig. 5. HYSTRIX
Porcupine

A. Bell

The Table concluded.

A cubic inch of	Troy weight.			Avoirdup.		Comparative weight.
	oz.	pw.	gr.	oz.	drams.	
White marble	1	8	13.41	1	9.06	2.707
Black ditto	1	8	12.65	1	9.02	2 704
Rock cryſtal	1	8	1.00	1	8.61	2 658
Green glaſs	1	7	15.38	1	8.26	2.620
Cornelian ſtone	1	7	1.21	1	7.73	2.568
Flint	1	6	19.63	1	7.53	2.542
Hard paving ſtone	1	5	22.87	1	6.77	2.460
Live ſulphur	1	1	2.40	1	2.52	2.000
Nitre	1	0	1.08	1	1.59	1.900
Alabaſter	0	19	18.74	1	1.35	1.875
Dry ivory	0	19	6.09	1	0.89	1.825
Brimſtone	0	18	23 76	1	0 66	1.800
Alum	0	17	21.92	0	15.72	1.714
Ebony	0	11	18.82	0	10.34	1.117
Human blood	0	11	2.89	0	9.76	1 054
Amber	0	10	20.79	0	9.54	1.030
Cow's milk	0	10	20 79	0	9.54	1.030
Sea water	0	10	20.79	0	9.54	1.030
Pump water	0	10	13.30	0	9.26	1.000
Spring water	0	10	12.94	0	9.25	0 999
Diſtilled water	0	10	11.42	0	9.20	0 993
Red wine	0	10	11.42	0	9.20	0 993
Oil of amber	0	10	7 63	0	9.06	0.978
Proof ſpirits	0	9	19 73	0	8.62	0 931
Dry oak	0	9	18 00	0	8 56	0.925
Olive oil	0	9	15 17	0	8.45	0.913
Pure ſpirits	0	9	3 27	0	8.02	0 866
Spirit of Turpentine	0	9	2.76	0	7 99	0.864
Oil of Turpentine	0	8	8.53	0	7.33	0.772
Dry Crabtree	0	8	1.69	0	7 08	0 765
Saſſafras wood	0	5	2.04	0	4.46	0.482
Cork	0	2	12.77	0	2.21	0.240

ſpecific gravities of all ſorts of bodies, yet the hydrometer is beſt ſuited to find thoſe of fluids in particular, both as to eaſe and expedition.

This inſtrument ſhould be made of copper, ſince ivory imbibes ſpirituous liquours, and thereby alters its gravity; and glaſs is apt to break. The moſt ſimple kind, uſed for finding the ſtrength of ſpirits, conſiſts of a copper-ball B*b* Plate 101. (fig 1. n° 1.) with a braſs wire, AB, $\frac{1}{4}$ of an inch thick, ſoldered into it. The upper part of this wire being filed flat on one ſide, is marked proof at *m*, becauſe it ſinks exactly to this mark in proof-ſpirits. There are other two marks at A and B, to ſhew whether the liquor be $\frac{1}{10}$ above or below proof, according as the hydrometer ſinks to A or emerges to B, when a braſs weight as C or K has been ſcrewed on at the bottom *c*. There are alſo weights to be ſcrewed on, for ſhewing the ſpecific gravities of fluids quite to common water. The round part of the wire above the ball, may be marked ſo as to repreſent river-water when it ſinks to R W, (*ibid* n° 2.) the weight which fits the inſtrument for river-water being ſcrewed on at *c*: alſo when put into ſpring-water, mineral-water, ſea-water, and water of ſalt ſprings, it will emerge or riſe gradually to the marks SP, MI, SE, SA; and, on the contrary, when put into Briſtol-water, rain-water, port-wine, and mountain wine, it will ſucceſſively ſink to the marks, *br*, *ra*, *po*, *mo*.

Another kind, which ſerves to diſtinguiſh the ſpecific differences of fluids to great nicety, conſiſts of a large hollow ball B, (*ibid.* n° 3.) with a ſmaller ball *b* under it, partly filled with quick ſilver or ſmall ſhot, and ſcrewed on to the lower part of the former, in order to render it but little ſpecifically lighter than water: it has alſo a ſmall ſhort neck at C, into which is ſcrewed the graduated braſs-wire AC, which by its weight cauſes the body of the inſtrument to deſcend in the fluid with part of the ſtem.

When this inſtrument is ſwimming in the liquor, contained in the jar ILMK, the part of the fluid diſplaced

placed by it will be equal in bulk to the part of the inſtrument under water, and equal in weight to that of the whole inſtrument. Suppoſe the weight of the whole were 4000 grains, then it is evident we can by this means compare together the different bulks of 4000 grains of various ſorts of fluids. For if the weight A be ſuch as ſhall cauſe the aræometer to ſink in rain-water, till its ſurface comes to the middle point of the ſtem 20; and if, after this, it be immerſed in common ſpring water, and the ſurface is obſerved to ſtand $\frac{1}{10}$ of an inch below the middle point 20; it is evident that the ſame weight of each water differs in bulk only by the magnitude of $\frac{1}{10}$ of an inch in the ſtem.

Now ſuppoſe the ſtem were ten inches long, and weighed 100 grains, then every tenth of an inch would be one grain weight; and ſince the ſtem is of braſs, and braſs is about eight times heavier than water, the ſame bulk of water will be equal to $\frac{1}{8}$ of a grain; and conſequently to the $\frac{1}{8}$ of $\frac{1}{4000}$ part, that is, a 3200dth part of the whole bulk, which is a degree of exactneſs as great as can be deſired. Yet the inſtrument is capable of ſtill greater exactneſs, by making the ſtem or neck conſiſt of a flat thin ſlip of braſs, inſtead of one that is round or cylindrical: by this means we increaſe the ſurface, which is the moſt requiſite thing; and diminiſh the ſolidity, by which the inſtrument is rendered more exact.

In order to adapt this inſtrument to all ſorts of uſes, there ought to be two different ſtems to ſcrew on and off in a ſmall hole at *a*. One ſtem ſhould be ſuch a nice thin ſlip of braſs, or rather of ſteel, like a watch-ſpring ſet ſtraight, as we have juſt mentioned, on one ſide of which ought to be the ſeveral marks or diviſions to which it will ſink in various ſorts of waters, as rain-water, river-water, ſpring-water, ſea-water, ſalt ſpring-water, *&c.* And on the other ſide you mark the diviſion to which it ſinks in various lighter fluids, as hot bath water, Briſtol water, Lincomb water, Chelten water, port-wine, mountain, madeira, and various other ſorts of wine. But in this caſe the weight A on the top muſt be a little leſs than before, when it was uſed for the heavier waters.

But, in caſe of trying the ſtrength of ſpirituous liquors, a common cylindric ſtem will do beſt, becauſe of its ſtrength and ſteadineſs; and this ought to be ſo contrived, that, when immerſed in what is called proof-ſpirit, the ſurface of the ſpirit may be upon the middle point 20; which is eaſily done by duly adjuſting the ſmall weight A on the top, and making the ſtem of ſuch a length, that, when immerſed in water, it may juſt cover the ball, and riſe to *a*; but, when immerſed in pure ſpirit, it may ariſe to the top at A; then by dividing the upper and lower parts *a* 20, A 20, into ten equal parts each, when the inſtrument is immerſed in any ſort of ſpirituous liqour, it will immediately ſhew how much it is above or below proof.

This proof-ſpirit conſiſts of half water and half alcohol or pure ſpirit; that is, ſuch as when poured upon gunpowder, and ſet on fire, will burn all away, and permit the powder to take fire, which it will, and flaſh as in the open air. But if the ſpirit be not ſo highly rectified, there will remain ſome phlegm or water, which will make the powder wet, and unfit to take fire. This proof-ſpirit of any kind weighs ſeven pounds twelve ounces per gallon.

The common method of ſhaking the ſpirits in a vial, and, by raiſing a crown of bubbles, to judge by the manner of their riſing or breaking away whether the ſpirit be proof or near it, is very precarious, and capable of great fallacy. There is no way ſo eaſy, quick, certain, and philoſophical, as this by the aræometer, which will demonſtrate infallibly the difference of bulks, and conſequently ſpecific gravities, in equal weights of ſpirits, to the 30, 40, or 50 thouſandth part of the whole, which is a degree of accuracy beyond which nothing can be deſired.

All bodies expand with heat, and contract with cold; but ſome more and ſome leſs than others: and therefore the ſpecific gravities of bodies are not preciſely the ſame in ſummer as in winter. It has been found, that a cubic inch of good brandy is 10 grains heavier in winter than in ſummer; as much ſpirit of nitre, 20 grains; vinegar 6 grains, and ſpring water 3. Hence it is moſt profitable to buy ſpirits in winter, and ſell them in ſummer, ſince they are always bought and ſold by meaſure. It has been found, that 32 gallons of ſpirits in winter will make 33 in ſummer.

The expanſion of all fluids is proportionable to the degree of heat; that is, with a double or triple heat a fluid will expand two or three times as much.

Upon theſe principles depends the conſtruction of the thermometer, in which the globe or bulb, and part of the tube, are filled with a fluid, which, when joined to the barometer, is ſpirits of wine tinged, that it may be the more eaſily ſeen in the tube. But when thermometers are made by themſelves, quickſilver is generally uſed.

In the thermometer, a ſcale is fitted to the tube, to ſhew the expanſion of the quickſilver, and conſequently the degree of heat. And, as *Farenheit's* ſcale is moſt in eſteem at preſent, we ſhall explain the conſtruction and graduation of thermometers according to that ſcale.

Firſt, let the globe or bulb, and part of the tube, be filled with a fluid; then immerſe the bulb in water juſt freezing, or ſnow juſt thawing; and even with that part in the ſcale where the fluid then ſtands in the tube, place the number 32, to denote the freezing point: then put the bulb under your arm pit, when your body is of a moderate degree of heat, ſo that it may acquire the ſame degree of heat with your ſkin; and when the fluid has riſen as far as it can by that heat, there place the number 97: then divide the ſpace between theſe numbers into 65 equal parts, and continue thoſe diviſions both above 97 and below 32, and number them accordingly.

This may be done in any part of the world; for it is found that the freezing point is always the ſame in all places, and the heat of the human body differs but very little: ſo that the thermometers made in this manner will agree with one another: and the heat of ſeveral bodies will be ſhewn by them, and expreſſed by the number upon the ſcale, thus.

Air, in ſevere cold weather, in our climate, from 15 to 25. Air in winter, from 26 to 42. Air in ſpring and autumn, from 43 to 53. Air at midſummer, from 65 to 68. Extreme heat of the ſummer ſun, from 86 to 100. Butter juſt melting, 95. Alcohol boils with 174 or 175. Brandy with 190. Water 212. Oil of turpentine 550. Tin melts with 408, and lead with 540. Milk freezes about 30, vinegar 28, and blood 27.

A body ſpecifically lighter than a fluid will ſwim upon its ſurface, in ſuch a manner, that a quantity of the fluid equal in bulk with the immerſed part of the body, will be as heavy as the whole body. Hence, the lighter a fluid is, the deeper a body will ſink in it; upon which depends the conſtruction of the hydrometer or water-poiſe.

From this we can eaſily find the weight of a ſhip, or any other body that ſwims in water. For, if we multiply the number of cubic feet which are under the ſurface, by 62.5, the number of pounds in one foot of freſh water; or by 63, the number of pounds in a foot of ſalt water; the product will be the weight of the ſhip, and all that is in it. For, ſince it is the weight of the ſhip that diſplaces the water, it muſt continue to ſink until it has removed as much water as is equal to it in weight; and therefore the part immerſed muſt be equal in bulk to ſuch a portion of the water as is equal to the weight of the whole ſhip.

To prove this by experiment, let a ball of ſome light wood, ſuch as fir or pear-tree, be put into water contained in a glaſs veſſel; and let the veſſel be put into a ſcale at one end of a balance, and counterpoiſed by weights in the oppoſite ſcale: then, marking the height of the water in the veſſel, take out the ball; and fill up the veſſel with water to the ſame height that it ſtood at when the ball was in it; and the ſame weight will counterpoiſe it as before.

From the veſſel's being filled up to the ſame height at which the water ſtood when the ball was in it, it is evident that the quantity poured in is equal in magnitude to the immerſed part of the ball; and from the ſame weight counterpoiſing, it is plain that the water poured in is equal in weight to the whole ball.

In troy weight, 24 grains make a pennyweight, 20 pennyweight make an ounce, and 12 ounces a pound. In avoirdupoiſe weight, 16 drams make an ounce, and 16 ounces a pound. The troy pound contains 5760 grains, and the avoirdupoiſe pound 7000: and hence, the avoirdupoiſe dram weighs 27.34375 grains, and the avoirdupoiſe ounce 437.5.

HYP

HYGROMETER, a machine, or inſtrument whereby to meaſure the degrees of dryneſs, or moiſture of the air, or rather of the atmoſphere.

There are divers ſorts of hygrometers; for whatever body either ſwells or ſhrinks, by dryneſs or moiſture, is capable of being formed into an hygrometer. Such are woods of moſt kinds, particularly aſh, deal, poplar, *&c.* Such alſo is catgut, the beard of a wild oat, *&c.*

HYMEN, in anatomy. See ANATOMY, p. 277.

HYMENÆA, in botany, a genus of the decandria monogynia claſs. The calix conſiſts of five ſegments, and the corolla of five petals; and the pod is filled with a farinaceous pulp. There is but one ſpecies, a native of America.

HYMENÆAL, ſomething belong to marriage, ſo called from hymen.

HYMN, a religious ſong. The hymns ſung in the chriſtian church, as diſtinguiſhed from the pſalms, are pieces of poetry compoſed by pious but not inſpired authors.

HYOIDES, in anatomy. See ANATOMY, p. 166.

HYOSCYAMUS, HEN-BANE, in botany, a genus of the pentandria monogynia claſs. The corolla is obtuſe and funnel-ſhaped; the ſtamina are inclined; and the capſule is operculated, and conſiſts of two cells. There are ſix ſpecies, only one of which, *viz.* the niger, or common hen-bane, is a native of Britain. The leaves, *&c.* of this plant are highly narcotic and poiſonous, and now diſregarded in practice.

HYOTHYROIDES, in anatomy. See ANATOMY, p. 300.

HYP

HYPANTE, or HYPERPANTE, a name given by the Greeks to the feaſt of the preſentation of Jeſus in the temple.

This word, which ſignifies lowly or humble meeting, was given to this feaſt, from the meeting of old Simon and Anna the propheteſs in the temple, when Jeſus was brought thither.

HYPECUM, *wild* CUMIN, in botany, a genus of the tetrandria digynia claſs. The calix conſiſts of two leaves, and the corolla of four petals, the two outermoſt of which are broader, and divided into three ſegments. There are four ſpecies, none of them natives of Britain.

HYPERBATON, in grammar, a figurative conſtruction inverting the natural and proper order of words and ſentences.

HYPERBOLA. See CONIC SECTIONS.

HYPERBOLE, in rhetoric, a figure, whereby the truth and reality of things are exceſſively either enlarged or diminiſhed.

An object uncommon with reſpect to ſize, either very great of its kind or very little, ſtrikes us with ſurpriſe; and this emotion forces upon the mind a momentary conviction that the object is greater or leſs than it is in reality: the ſame effect, preciſely, attends figurative grandeur or littleneſs; and hence the hyperbole, which expreſſes this momentary conviction. A writer, taking advantage of this natural deluſion, enriches his deſcription greatly by the hyperbole: and the reader, even in his cooleſt moments, reliſhes this figure, being ſenſible that it is the operation of nature upon a warm fancy.

It cannot have eſcaped obſervation, that a writer is generally more ſucceſsful in magnifying by a hyperbole than in diminiſhing. The reaſon is, that a minute object contracts the mind, and fetters its powers of imagination; but that the mind, dilated and inflamed with a grand object, moulds objects for its gratification with great facility. Longinus, with reſpect to a diminiſhing hyperbole, cites the following ludicrous thought from a comic poet: "He was owner of a bit of ground not larger than a Lacedemonian letter." But, for the reaſon now given, the hyperbole has by far the greater force in magnifying objects; of which take the following examples:

> For all the land which thou ſeeſt, to thee will I give it, and to thy ſeed for ever. And I will make thy ſeed as the duſt of the earth: ſo that if a man can number the duſt of the earth, then ſhall thy ſeed alſo be numbered. *Geneſis* xiii. 15. 16.

Illa vel intactæ ſegetis per ſumma volaret
Gramina: nec teneras curſu læſiſſet ariſtas.
Æneid. vii. 808.

————Atque imo barathri ter gurgite vaſtos
Sorbet in abruptum fluctus, rurſuſque ſub auras
Erigit alternos, et ſidera verberat unda.
Æneid. iii. 421.

———Horrificis juxta tonat Ætna ruinis,
Interdumque atram prorumpit ad æthera nubem,
Turbine fumantem piceo et candente favilla:
Attollitque globos flammarum, et ſidera lambit.
Æneid. iii. 571.

Speaking of Polyphemus,

———Ipſe arduus, altaque pulſat
Sidera. *Æneid.* iii. 619.

————When he ſpeaks,
The air, a charter'd libertine, is ſtill.
Henry V. *act* 1. *ſc.* 1.

Now ſhield with ſhield, with helmet helmet clos'd,
To armour armour, lance to lance oppos'd,
Hoſt againſt hoſt with ſhadowy ſquadrons drew,
The ſounding darts in iron tempeſts flew,
Victors and vanquiſh'd join promiſcuous cries,
And ſhrilling ſhouts and dying groans ariſe;
With ſtreaming blood the ſlipp'ry fields are dy'd,
And ſlaughter'd heroes ſwell the dreadful tide.
Iliad iv. 508.

Quintilian is ſenſible that this figure is natural: "For," ſays he, "not contented with truth, we naturally incline to augment or diminiſh beyond it; and for that reaſon the hyperbole is familiar even among the vulgar and illiterate:" and he adds, very juſtly, "That the hyperbole is then proper, when the ſubject of itſelf exceeds the common meaſure." From theſe premiſſes, one would not expect the following inference, the only reaſon he can find for juſtifying this figure of ſpeech, "Conceditur enim amplius dicere, quia dici quantum eſt, non poteſt: meliuſque ultra quam citra ſtat oratio." (We are indulged to ſay more than enough, becauſe we cannot ſay enough; and it is better to be above than under.) In the name of wonder, why this ſlight and childiſh reaſoning, when immediately before he had obſerved, that the hyperbole is founded on human nature? we could not reſiſt this perſonal ſtroke of criticiſm; intended not againſt our author, for no human creature is exempt from error, but againſt the blind veneration that is paid to the ancient claſſic writers, without diſtinguiſhing their blemiſhes from their beauties.

Having examined the nature of this figure, and the principle on which it is erected; let us proceed to the rules by which it ought to be governed. And, in the firſt place, it is a capital fault, to introduce an hyperbole in the deſcription of an ordinary object or event; for in ſuch a caſe, it is altogether unnatural, being deſtitute of ſurpriſe, its only foundation. Take the following inſtance, where the ſubject is extremely familiar, *viz.* ſwimming to gain the ſhore after a ſhipwreck,

I ſaw him beat the ſurges under him,
And ride upon their backs; he trod the water;
Whoſe enmity he flung aſide, and breaſted
The ſurge moſt ſwoln that met him: his bold head
'Bove the contentious waves he kept, and oar'd
Himſelf with his good arms, in luſty ſtrokes
To th' *ſhore*, that o'er his wave-borne baſis bow'd,
As ſtooping to relieve him. *Tempeſt, act* 2. *ſc.* 1.

In the next place, it may be gathered from what is ſaid, that an hyperbole can never ſuit the tone of any diſpiriting paſſion: ſorrow in particular will never prompt ſuch a figure; and for that reaſon the following hyperboles muſt be condemned as unnatural:

K. Rich. Aumerle, thou weep'ſt, my tender-hearted couſin!
We'll make foul weather with deſpiſed tears;
Our ſighs, and they, ſhall lodge the ſummer-corn,
And make a dearth in this revolting land.
Richard II. *act* 3. *ſc.* 6.

Draw them to Tyber's bank, and weep your tears
Into the channel, till the loweſt ſtream
Do kiſs the moſt exalted ſhores of all.
Julius Cæſar, act 1. *ſc.* 1.

Thirdly, a writer, if he wiſh to ſucceed, ought always to have the reader in his eye: he ought in particular never to venture a bold thought or expreſſion, till the reader be warmed and prepared. For this reaſon, an hyperbole in the beginning of a work can never be in its place. Example:

Jam pauca aratro jugera regiæ
Moles relinquent. *Horat. Carm. lib* 2. *ode* 15.

In the fourth place, the niceſt point of all, is to aſcertain the natural limits of an hyperbole, beyond which being overſtrained it has a bad effect. Longinus, (chap. iii.) with great propriety of thought, enters a caveat againſt an hyperbole of this kind: he compares it to a bowſtring, which relaxes by overſtraining, and produceth an effect directly oppoſite to what is intended. To aſcertain any preciſe boundary, would be difficult, not impracticable. We ſhall therefore only give a ſpecimen of what may be reckoned overſtrained hyperboles. No fault is more common among writers of inferior rank; and inſtances are found even among thoſe of the fineſt taſte; witneſs the following hyperbole, too bold even for an Hotſpur.

Hotſpur, talking of Mortimer:

In ſingle oppoſition hand to hand,
He did confound the beſt part of an hour
In changing hardiment with great Glendower.
Three times they breath'd, and three times did they drink,
Upon agreement, of ſwift Severn's flood;
Who then affrighted with their bloody looks,
Ran fearfully among the trembling reeds,
And hid his criſp'd head in the hollow bank,
Blood-ſtained with theſe valiant combatants.
Firſt Part Henry IV. *act* 1. *ſc.* 4.

Speaking of Henry V.

England ne'er had a King until his time:
Virtue he had, deſerving to command:
His brandiſh'd ſword did blind men with its beams:
His arms ſpread wider than a dragon's wings:
His ſparkling eyes, replete with awful fire,
More dazzled, and drove back his enemies,
Than mid-day ſun fierce bent againſt their faces.
What ſhould I ſay? his deeds exceed all ſpeech:
He never lifted up his hand, but conquer'd.
Firſt Part Henry VI. *act* 1. *ſc.* 1.

Laſtly, An hyperbole, after it is introduced with all advantages, ought to be comprehended within the feweſt words poſſible: as it cannot be reliſhed but in the hurry and ſwelling of the mind, a leiſurely view diſſolves the charm, and diſcovers the deſcription to be extravagant at leaſt, and perhaps alſo ridiculous This fault is palpable in a ſonnet which paſſeth for one of the moſt complete in the French language: Phillis, in a long and florid deſcription, is made as far to outſhine the ſun as he outſhines the ſtars:

Le ſilence regnoit ſur la terre et ſur l'onde,
L'air devenoit ſerain et l'Olimp vermeil,
Et l'amoureux Zephir affranchi du ſomeil,
Reſſuſcitoit les fleurs d'une haleine feconde.

L'Aurore deployoit l'or de ſa treſſe blonde,
Et ſemoit de rubis le chemin du ſoleil;
Enfin ce Dieu venoit au plus grand appareil
Qu'il ſoit jamais venu pour eclairer le monde:

Quand la jeune Philis au viſage riant,
Sortant de ſon palais plus clair que l'orient,
Fit voir une lumiere et plus vive et plus belle.

Sacre flambeau du jour, n'en ſoiez point jaloux,
Vous parutes alors auſſi peu devant elle,
Que les feux de la nuit avoient fait devant vous.
Malleville.

There is in Chaucer a thought expreſſed in a ſingle line, which ſets a young beauty in a more advantageous light than the whole of this much laboured poem:

Up roſe the ſun, and up roſe Emelie.

HYPERCATALECTIC, in the Greek and Latin poetry, is applied to a verſe, which has one or two ſyllables too much, or beyond the regular and juſt meaſure: as,

Muſæ ſorores ſunt Minervæ.
Alſo,
Muſæ ſorores Palladis lugent.

HYPERICUM, St John's wort, a genus of the polyadelphia polyandria claſs. The calix conſiſts of five ſegments, and the corolla of five petals; and the filaments are numerous, and bound in five bundles. There are twenty-nine ſpecies, eight of them natives of Britain.

HYPERSARCOSIS, in medicine and ſurgery, an exceſs of fleſh, or rather a fleſhy execreſcence, ſuch as thoſe generally ariſing upon the lips of wounds, &c.

HYPHEN, an accent or character, in grammar, implying that two words are to be joined, or connected into one compound word, and marked thus -; as, pre eſtabliſhed, five-leaved, &c.

Hyphens alſo ſerve to connect the ſyllables of ſuch words as are divided by the end of the line.

HYPNOTIC, in the materia medica, ſuch medicines as any way produce ſleep, whether called narcotics, hypnotics, opiates, or ſoporifics.

HYPNUM, in botany, a genus of the cryptogamia muſci claſs. There are forty-two ſpecies, all natives of Britain.

HYPOCAUSTUM, among the Greeks and Romans, a ſubterraneous place, wherein was a furnace to heat the baths.

Another ſort of hypocaſtum was a kind of kiln, to heat their winter parlours.

Among the moderns, it is that place where the fire is kept that warms a ſtove or hot-houſe.

HYPOCHAERIS, in botany a genus of the ſyngeneſia polygamia æqualis claſs. The receptacle is paleaceous; the calix is imbricated; and the pappus is plumoſe. There are four ſpecies, two of them natives of Britain, *viz* the radicata, or long-rooted hawkweed; and the maculata, or ſpotted hawkweed.

HYPOCHONDRIA, in anatomy. See Anatomy, p. 256.

HYPOCHONDRIAC Passion. See Medicine.

HYPOCYSTIS, in pharmacy, an inſpiſſated juice, obtained from the ſeſſile aſarum, much reſembling the true Egyptian acacia.

They gather the fruit, while unripe, and expreſs the juice, which they evaporate over a very gentle fire, to the conſiſtence of an extract, and then form into cakes, and expoſe them to the ſun to dry.

Hypocyſt is an aſtringent, and that of conſiderable power; it is good againſt diarrhœas and hœmorrhages of all kinds, and may be uſed in repellent gargariſms in the manner of the acacia; but it is very rarely met with genuine in our ſhops, the german acacia being uſually ſold under its name.

HYPOGASTRIC, an appellation given to the internal branch of the iliac artery.

HYPOGASTRIUM, in anatomy. See ANATOMY. p. 256.

HYPOPHYLLOCARPODENDRON, in botany. See LEUCODENDRON.

HYPOPYON, in medicine, a collection of purulent matter under the cornea of the eye.

HYPOSTASIS, among divines, ſignifies a perſon or ſubſtance; chiefly uſed in ſpeaking of the perſons of the Trinity.

HYPOTHEC, in Scots law, a right of ſecurity eſtabliſhed by law to creditors upon the goods and effects of their debtors, for payment of certain debts. See LAW, tit. 20. § 13.

HYPOTHENAR, in anatomy. See ANATOMY, p. 200.

HYPOTHENUSE, in geometry, the longeſt ſide of a right-angled triangle, or it is that ſide which ſubtends the right angle.

HYPOTHESIS, in general, denotes ſomething ſuppoſed to be true, or taken for granted, in order to prove or illuſtrate a point in queſtion.

Hypotheſes, however elegant and artful, ought to be firſt proved by repeated obſervations and conſtant experience, before they are received as truths.

HYSSOPUS, in botany, a genus of the didynamia gymnoſpermia claſs. The inferior lip of the corolla has a ſmall crenated ſegment; and the ſtamina are erect and diſtant. There are three ſpecies, none of them natives of Britain. The leaves are ſaid to be good in aſthmas, coughs, and other diſorders of the lungs.

HYSTERICS, or HYSTERIC PASSION. See MEDICINE.

HYSTERON PROTERON, in grammar and rhetoric, a ſpecies of the hyperbaton, wherein the proper order of conſtruction is ſo inverted. as that the part of any ſentence which ſhould naturally come firſt is placed laſt; as in this of Terence, *valet & vivit*, for *vivit & valet;* and in the following of Virgil, *moriamur & in media arma ruamus*, for *in media arma ruamus & moriamur*.

HYSTEROPHORUS. See PARTHENIUM.

HYSTRIX, in zoology, a genus of quadrupeds belonging to the order of glires, the characters of which are theſe: They have two fore-teeth, obliquely divided, both in the upper and under jaw, beſides eight grinders; and the body is covered with quills or prickles. (See Plate CI. fig. 5.) There are four ſpecies, *viz.*

1. The criſtata, or creſted porcupine, has four toes on the fore-feet, five toes on the hind-feet, a creſted head, a ſhort tail, and the upper lip is divided like that of a hare. The length of the body is about two feet, and the height about two feet and a half. The porcupine is covered with prickles, ſome of them nine or ten inches long, and about $\frac{1}{4}$ of an inch thick. Like the hedge-hog, he rolls himſelf up in a globular form, in which poſition he is proof againſt the attacks of the moſt rapacious animals. The prickles are exceedingly ſharp, and each of them has five large black and as many white rings, which ſucceed one another alternately from the root to the point. Theſe quills the animal can erect or let down at pleaſure; when irritated, he beats the ground with his hind-feet, erects his quills, ſhakes his tail, and makes a conſiderable rattling noiſe with his quills.

Moſt authors have aſſerted that the porcupine, when irritated, darts his quills to a conſiderable diſtance againſt the enemy, and that he will kill very large animals by this means. But Mr Buffon, and ſome other late hiſtorians, aſſure that the animal poſſeſſes no ſuch power. Mr Buffon frequently irritated the porcupine, but never ſaw any thing like this darting of his quills. He ſays indeed, that when the creature was much agitated with paſſion, ſome of the quills which adhered but ſlightly to the ſkin, would fall off, particularly from the tail; and this circumſtance, he imagines, has given riſe to the miſtake.

The porcupine, though originally a native of Africa and the Indies, can live and multiply in the more temperate climates of Spain and Italy. Pliny, and every other natural hiſtorian ſince the days of Ariſtotle, tells us that the porcupine, like the bear, conceals itſelf during the winter, and that they bring forth their young in 80 days. But theſe circumſtances remain to this day uncertain. It is remarkable, that although this animal be very common in Italy, no perſon has ever given us a tolerable hiſtory of it. We only know in general, that the porcupine, in a domeſtic ſtate, is not a fierce or ill-natured animal; that with his foreteeth, which are ſtrong and ſharp, he can cut through a ſtrong board; that he eats bread, fruits, roots, *&c.* that he does conſiderable damage when he gets into a garden; that he grows fat, like moſt animals, about the end of ſummer; and that his fleſh is not bad food.

2. The prehenſilis, or cuandu, has four toes on the fore-feet, five on the hind-feet, and a long tail. It is conſiderably leſs than the former ſpecies, being only 17 inches long from the point of the muzzle to the origin of the tail, which is nine inches long; the legs and feet are covered with long browniſh hair; the reſt of the body is covered with quills interſperſed with long hairs; the quills are about five inches long and about $\frac{1}{12}$ of an inch in diameter. He feeds upon birds and ſmall animal. He ſleeps in the day like the hedge-hog, and ſearches for his food in the night. He climbs trees, and ſupports himſelf by twiſting his tail round the branches. He is generally found in the high grounds of America from Braſil to Louiſiana and the ſouthern parts of Canada. His fleſh is eſteemed very good eating.

3. The dorſata, has four toes on the fore-feet, five on the hind-feet, and has quills only on the back, which are ſhort, and almoſt hid among the long hair. He is about two feet long. He is a native of Hudſon's bay. The ſavages eat his fleſh, and make uſe of his ſkin as a fur after taking off the prickles.

4. The macroura, has five toes both on the hind and fore feet; his tail is very long, and the prickles are elevated. He is a native of Aſia the Eaſt Indies.

I.

JACCA, a city and biſhop's ſee of Arragon, in Spain, ſixty miles north of Saragoſſa: W. lon. 50′, and N. lat. 42° 50′.

JACEA. See Centauria.

JACK, in mechanics, a well-known inſtrument of common uſe for raiſing very great weights of any kind.

The common kitchen-jack is a compound engine where the weight is the power applied to overcome the friction of the parts, and the weight with which the ſpit is charged; and a ſteady and uniform motion is obtained by means of the fly.

Jack-flag, in a ſhip, that hoiſted up at the ſprit ſail top-moſt head. See Flag.

Jack-daw, in ornithology. See Corvus.

JACKALL, in zoology. See Canis.

JACOBÆA, in botany. See Senecio.

JACOBITES, a term of reproach beſtowed on the perſons, who, vindicating the doctrines of paſſive obedience and non-reſiſtance with reſpect to the arbitrary proceedings of princes, diſallow of the late revolution, and aſſert the ſuppoſed rights and adhere to the intereſts of the late abdicated king James and his family.

Jacobites, in church-hiſtory, a ſect of Chriſtians in Syria and Meſopotamia; ſo called either from Jacob, a Syrian, who lived in the reign of the emperor Mauricius; or from one Jacob, a monk, who flouriſhed in the year 550.

The Jacobites are of two ſects, ſome following the rites of the Latin church, and others continuing ſeparated from the church of Rome. There is alſo at preſent a diviſion among the latter, who have two rival patriarchs, one of whom reſides at Caramit, and the other at Derzapharan. As to their belief, they hold but one nature in Jeſus Chriſt; with reſpect to purgatory and prayers for the dead, they are of the ſame opinion as the Greeks and other eaſtern Chriſtians: they conſecrate unleavened bread at the euchariſt, and are againſt confeſſion, believing that it is not of divine inſtitution.

JACOBUS, an ancient gold coin worth twenty five ſhillings.

JAFFA, anciently called Joppa, is a port-town of Paleſtine in Aſiatic Turky. ſituated thirty miles north-weſt of Jeruſalem: E. lon. 36°, N. lat. 32° 20′.

JAFNAPATAN, a port-town at the north end of the iſland of Ceylon, in the Eaſt Indies; ſubject to the Dutch: E. lon. 79°, N. lat. 10°.

JAGENDORF, a city of Sileſia, twelve miles north-weſt of Tropaw: E. lon. 17° 6′ N. lat. 50° 8′.

St **JAGO**, the chief of the Cape Verd iſlands, in Africa, 300 miles weſt of Cape Verd; ſubject to Portugal: W. lon. 24°, N lat. 15°.

St. **Jago**, the capital of the iſland of Cuba, 100 miles north-weſt of Jamaica: W. lon. 76°, 30′, N. lat. 20°.

St. **Jago**, the capital of the province of Chili, in ſouth America, ſituated ſix miles weſt of the mountains of Andes, and eighteen eaſt of the Pacific ocean: W. lon. 77°, S. lat. 34°.

Jago de la Vega, or Spaniſh town, the capital of Jamaica, ſituated at the ſouth-eaſt part of the iſland, about ſeven miles north-weſt of Port Paſſage and the bay of Port Royal: E. lon. 76° 30′, N. lat. 18° 20′.

JALAP, in botany. See Mirabilis.

JAMAICA, an iſland of America, ſituated in the Atlantic ocean, between 76° and 79° of weſt longitude, and between 17° and 18° odd minutes north latitude, near 5000 miles ſouth-weſt of England, 100 miles ſouth of the iſland of Cuba, and 350 miles north of Terra Firma. The iſland lies eaſt and weſt, and is about 140 miles long, and 60 broad. The wind ſets on the ſhore almoſt all the day in every part of the iſland, and off the ſhore in the night; it ſometimes hails, but the people there never ſee froſt or ſnow. The produce of the iſland is chiefly ſugar; but there are plantations of coffee, of the cocoa or chocolate tree, of indigo, tobacco, pepper, cotton, woods for dying, and the mahogany and machineel wood, ginger, medicinal drugs and gums. The common diſeaſes of the country are fevers, fluxes, and the dry gripes.

JAMANA, the chief town of a province of Arabia, alſo of the ſame name: E. lon 47° 15′. N. lat 25°.

JAMBA, a city of the hither India, and the capital of the province of the ſame name, ſituated 220 miles north-eaſt of Delli: E. lon. 82°, N. lat. 31°.

JAMBOLIFERA, in botany, a genus of the octandria monogynia claſs. The calix has four teeth, and the corolla four funnel-ſhaped petals; and the ſtigma is ſimple. There is but one ſpecies, a native of India.

IAMBUS, in ancient poetry, a ſimple foot conſiſting of a ſhort and a long ſyllable, as *pios*.

JAMBY, a town on the eaſt ſide of the iſland of Sumatra, in the Eaſt Indies, ſituated in 101° E. lon. and in 1° 30′ S. lat.

JAMES, or *knights of St* James, a military order in Spain, firſt inſtituted about the year 1170, by Ferdinand II. king of Leon and Galicia. The greateſt dignity belonging to this order is grand maſter, which has been united to the crown of Spain The knights are obliged to make proof of their deſcent from families that have been noble for four generations, on both ſides; they muſt alſo make it appear that their ſaid anceſtors have neither been Jews, Saracens, nor Heretics; nor have ever been called into queſtion by the inquiſition. The novices are obliged to ſerve ſix months in the galleys, and to live a month in a monaſtery; they obſerve the rules of St Auſtin, making no vows but of poverty, obedience, and conjugal fidelity.

St **James's day**, a feſtival of the Chriſtian church, obſerved

ſerved on the 25th of July, in honour of St James the greater, ſon of Zebedee.

Epiſtle of St **James**, a canonical book of the New Teſtament, being the firſt of the catholic or general epiſtles; which are ſo called, as not being written to one, but to ſeveral Chriſtian churches.

James-town, once the capital of Virginia in America, and of James-country, ſituated in a peninſula on the north ſide of James, or Pauhatan river, in W. lon. 76° 30′, N. lat. 37° 30′.

JANEIRO, a province of Brazil, in ſouth America, ſituated between 44° and 49° of W. lon. and between the tropic of capricorn and 22° of S. lat.

JANICAW, or **Janowits**, a town of Bohemia, ſituated forty-five miles ſouth-eaſt of Prague.

JANIZARIES, an order of the Turkiſh infantry, reputed the grand ſignior's guards, and the main ſtrength of the Ottoman army.

JANSENISTS, in church-hiſtory, a ſect of the Roman-catholics in France, who followed the opinions of Janſenius, biſhop of Ypres, and doctor of divinity of the univerſities of Louvain and Douay, in relation to grace and predeſtination.

In the year 1640, the two univerſities juſt mentioned, and particularly father Molina and father Leonard Celſus, thought fit to condemn the opinions of the Jeſuits on grace and free-will. This having ſet the controverſy on foot, Janſenius oppoſed to the doctrine of the Jeſuits the ſentiments of St Auguſtine, and wrote a treatiſe on grace, which he entitled Auguſtinus. This treatiſe was attacked by the Jeſuits, who accuſed Janſenius of maintaining dangerous and heretical opinions; and afterwards in 1642, obtained of pope Urban VIII. a formal condemnation of the treatiſe wrote by Janſenius: when the partiſans of Janſenius gave out that this bull was ſpurious, and compoſed by a perſon entirely devoted to the Jeſuits. After the death of Urban VIII. the affair of Janſeniſm began to be more warmly controverted, and gave birth to an infinite number of polemical writings concerning grace; and what occaſioned ſome mirth, was the titles which each party gave to their writings: one writer publiſhed, The torch of St Auguſtin, another found ſnuffers for St Auguſtin's torch, and father Veron formed a gag for the Janſeniſts, *&c.* In the year 1650, ſixty eight biſhops of France ſubſcribed a letter to pope innocent X. to obtain an enquiry into, and condemnation of the five following propoſitions, extracted from Janſenius's Auguſtinus: I. Some of God's commandments are impoſſiole to be obſerved by the righteous, even though they endeavour with all their power to accompliſh them. II. In the ſtate of corrupted nature, we are incapable of reſiſting inward grace. III. Merit and demerit in a ſtate of corrupted nature, does not depend on a liberty which excludes neceſſity, but on a liberty which excludes conſtraint. IV The ſemipelagians admitted the neceſſity of an inward preventing grace for the performance of each particular act, even for the beginning of faith; but they were heretics in maintaining that this grace was of ſuch a nature, that the will of man was able either to reſiſt or obey it. It is ſemipelagianiſm to ſay, that Jeſus Chriſt died, or ſhed his blood, for all mankind in general.

In the year 1652, the pope appointed a congregation for examining into the diſpute in relation to grace. In this congregation Janſenius was condemned, and the bull of condemnation, publiſhed in May 1653, filled all the pulpits in Paris with violent outcries and alarms againſt the hereſy of the Janſeniſts. In the year 1656, pope Alexander VII. iſſued out another bull, in which he condemned the five propoſitions of Janſenius. However, the Janſeniſts affirm, that theſe propoſitions are not to be found in this book; but that ſome of his enemies having cauſed them to be printed on a ſheet, inſerted them in the book, and thereby deceived the pope. At laſt Clement the XI. put an end to the diſpute by his conſtitution of July the 17. 1705; in which, after having recited the conſtitutions of his predeceſſors in relation to this affair, he declares, "That in order to pay a proper obedience to the papal conſtitutions concerning the preſent queſtion, it is neceſſary to receive them with a reſpectful ſilence." The clergy of Paris, the ſame year, approved and accepted this bull, and none dared to oppoſe it.

This is the famous bull *Unigenitus*, ſo called from its beginning with the words *Unigenitus Dei Filius*, &c. which has occaſioned ſo much confuſion in France.

JANUARY, in chronology, the firſt month of the year, ſo called from Janus, one of the ancient Roman deities painted with two faces; one whereof was ſuppoſed to look towards the new year, and the other towards the old.

JAPAN, or *iſlands of* **Japan**, are ſituated between 130° and 144° of E. lon. and between 30° and 40° N. lat.

JAPANNING, the art of varniſhing and drawing figures on wood, *&c.* in the manner as is done by the natives of Japan.

The method of preparing woods for japanning is as follows. 1. Take plaſterer's ſize, diſſolve it over the fire, and mix it with whiting finely powdered till it is of a good body, but not too thick. 2. By means of a ſtrong bruſh, lay your work over with the former mixture; and letting it dry very well, repeat this till the wood is perfectly plain, or the pores and crevices ſufficiently filled up; and when it is thoroughly dry, rub the work over with a wet rag till it is rendered as ſmooth as poſſible: this work is called water-plaining. 3. After this, waſh over the work with the thickeſt of ſeed-lac varniſh till it is very ſmooth, letting it ſtand to dry between every waſhing. 4. In a day or two's time, you may varniſh it over with black, or whatever other colour you deſign; and when it is dry, finiſh it by poliſhing. See the article **Varnish**.

After the ſame manner carved figures are to be primed; alſo frames, cabinets, ſtands, tea-tables, *&c.* ſaving that theſe are not to be poliſhed, and therefore do not require ſo great a body of varniſh; but for the tops of tables, boxes, ſides of cabinets, *&c.* when the wood is ordinary and rough grained, as deal, oak, *&c.* you may uſe common joiners glue diſſolved in water till it is fine and thin, into which put the fineſt ſaw duſt, till it is indifferently thick: then with a bruſh lay your wooden-work over with it, and when it is dry, repeat it ſo often till all the roughneſs and grain of the wood is ſufficiently hidden; and two or three days after let it be ſcraped with a ſcraper, as pear-tree and olive-wood are done, to make it as ſmooth as poſſible: then varniſh it as before directed. This, if well done, might not come behind any other work either for beauty or durability; but, however, thoſe woods that are firm and cloſe-grained are chiefly to be choſen.

Method of taking off japan patterns. 1. Having laid your ground, whether black, or of any other colour, and rendered it fit for drawing; and having your draught or deſign before you on paper, either drawn or printed, do as follows. 2. Rub this draught or print all over the back ſide with whiting or fine chalk, wiping off all that whiting which lies looſe upon the paper; then laying this paper upon the table, or piece of varniſhed-work, with the whited ſide next it upon the very place where you would have that figure made, with a needle not ſharp-pointed, fixed in a wooden handle, and called a tracing-pencil, go over and trace as much of the drawing as you think proper: thus by means of the whiting, you will have the groſs form of the draught, and ſuch other lines as will be a direction to you how to perform what you would have done. 3. Having done this, if you draw in gold-ſize, uſe fine cinnabar mixed with gum-water; and with a ſmall pencil dipt into it, go over all the lines made by the chalk: this will hold it ſo as not to come off. 4. If you work your metals or colours in gum-water, then trace over your deſign with gum-water mixt with gold or braſs duſt; by either of theſe ways when it is dry and finiſhed, *viz.* either in gum-water or gold ſize, you may compleat and finiſh your work.

Method of japanning wood. The wood being prepared as before directed, it is japanned with black, as follows. 1. Take of the thickeſt lac-varniſh, ſix ounces; and lamp black, enough to colour it: with this waſh over your piece three times, letting it dry thoroughly between each time: again, with the ſame varniſh, waſh it over three other ſeveral times, letting it dry as before, and ruſh it ſmooth between each waſhing. 2. Then take the following: Of thickeſt ſeed-lac varniſh, ſix ounces; and venice turpentine, one ounce; waſh over your work with it ſix times, letting it ſtand twelve hours between the three firſt and the three laſt varniſhes. 3. Your work being thus far done, take the following japan-varniſh: Of the fineſt ſeed-lac varniſh, ſix ounces; of lamp black, a ſufficient quantity; mix them, and with that let your work be waſhed twelve times, ſtanding twelve hours betwixt the firſt ſix and the laſt ſix waſhings. 4. Then letting it ſtand to dry for ſix or ſeven days, poliſh it with tripoli and a rag, as before directed: but in poliſhing you muſt work at it only till it is almoſt ſmooth; and then let it ſtand by for two days: afterwards poliſh it again, almoſt enough; then let it ſtand for ſix days, after which finiſh the poliſhing of it; finally, clear it up with oil and lamp-black, by which means you will have a good black japan ſcarce at all inferior to the true japan.

For a white japan. 1. Lay the ground with iſing-glaſs ſize mixed with as much whiting ſcraped into it as will make it of a proper thickneſs; with this whiten your work once over, and being thoroughly dry, do it over again; and in like manner repeat it the third time; after which let it ſtand for twelve hours, covering it from duſt; ruſh it with Dutch ruſhing as near the grain of the wood as is proper. 2. Then taking firſt iſing-glaſs ſize, and flake white, ſo much as will make the ſize of a fair body, mix them well together, and with this go over your work three ſeveral times, letting it dry between each time, and ruſh it as before. 3. Then take white ſtarch boiled in fair water, till it is ſomewhat thick, waſh over the whole work twice with it, blood-warm; letting it dry as before. 4. Letting it ſtand for a day or two, it being firſt waſhed with rectified ſpirit of wine, to clear it from the duſt, dip a pure clean pencil into the fineſt white varniſh, and do over the work ſix or ſeven times; and if this be well done, it will give a finer gloſs than if it were poliſhed: if it be not well done, poliſhing will be neceſſary, for which reaſon you muſt give it five or ſix varniſhes more. In poliſhing you muſt make uſe of the fineſt tripoli; and inſtead of lamp-black and oil, muſt uſe putty and oil, and conclude with white ſtarch mixed with oil.

Common red japan. 1. Take iſing-glaſs ſize, fine vermilion, a ſufficient quantity, as much as is proper; with the former mixture do your work over four times; firſt warming it by the fire, letting it dry each time, and ruſhing it as before. 2. This being done, waſh it over eight times with ordinary ſeed-lac varniſh, and ſet it by for twelve hours: then ruſh it again, but ſlightly, to make it look ſmooth. 3. And, laſtly, for an exquiſite outward covering, waſh it ten times with the beſt lac-ſeed varniſh; let it lie ſeven days to dry, and then poliſh it with tripoli, and clear it up with oil and lamp black.

A deeper red japan may be made by mixing fine ſanguis draconis, in powder, with the varniſh; and a pale red japan may be had by mixing ſo much white lead with it, as to make it of whatever degree of paleneſs you pleaſe.

Blue japan. 1 Take gum-water what quantity you pleaſe, and a ſufficient quantity of white lead; grind them well upon a marble; take iſing-glaſs ſize what quantity you pleaſe, and the fineſt and beſt ſmalt a ſufficient quantity; mix them well together; then add to them of the white lead, ground as before, ſo much as will give it a ſufficient body; mix all together to the conſiſtence of a paint. 2. Do your work over with this mixture three or four times, till you perceive the blue to lie with a good and fair body, letting it dry thoroughly between each time: if your blue is too pale, put more ſmalt among your ſize, without any white lead, and ſo *vice verſa.* 3 Then ruſh it ſmooth, and go over it again with a ſtronger blue; and when it is dry, waſh it three times with the cleareſt iſing glaſs ſize alone, and let it ſtand for two days to dry, covering it. 4. Warm your work gently at the fire, and with a pencil varniſh it over with the fineſt white varniſh, repeating it ſeven or eight times, letting it ſtand to dry two days as before. After which repeat again the waſhes ſeven or eight times in like manner. 5 Let it now ſtand for a week, and then poliſh it as before, and clear it up with lamp-black and oil.

Cheſnut-coloured japan. Take indian red, grind it with iſing-glaſs ſize upon a porphyry-ſtone, till they are as ſoft and as fine as butter: then mix a little white lead, which grind ſtrongly; and, laſtly, lamp-black, in due proportion.

A tortoiſe-ſhell japan. Firſt lay a white ground, as before directed; then with proper colours, as vermilion, auripigment, *&c.* duly mixed with turpentine-varniſh, ſtreak and cloud or ſhadow the white ground with any irregular fancy at pleaſure, in imitation of tortoiſe-ſhell: then let it ſtand to dry, and ſtriking it here and there with reddiſh-yellow varniſh, mixed with a little cinnabar, cloud the work up and down, touching it up alſo with varniſh mixed with lamp or ivory black. Having done this, varniſh it five or ſix times over with the fineſt white varniſh, letting it dry between every waſhing.

Japanning with gold ſize. The ſize being laid over that part only which you intend to gild, as already directed, let it remain there till it is ſo dry, that when you put your finger on it, it be glutinous and clammy, but not ſo moiſt that the particles ſhould come off with your fingers. It is in this temper that the gold is to be applied: then take a piece of waſhing leather, or the like, and wrapping it round your fore finger, dip it in the gold duſt, and rub it where your gold ſize is laid; for it will ſtick no where but on the ſize; and if any gold-duſt lies about your work, bruſh it away with a fine clean varniſhing bruſh. Then, with your pencil, draw that part with gold ſize alſo which is deſigned for your copper, and letting it dry as in the former caſe, cover it over with copper duſt in the ſame manner. Having done this, lay your ſilver ſize; and when it is dry, as before, lay on your ſilver-duſt, as in the two former. But it is to be obſerved, that the metalline colours are to be laid ſucceſſively one after another, letting each be covered and thoroughly dry before you enter upon a diſtinct colour. After all theſe, the other colours which are not metalline are to be laid on with gum-water, reſerving the rock, *&c.* for the laſt part of the work. Let your ſize be of a due conſiſtence, neither too thick nor too thin, that it may run ſmooth and clean. See Size.

Japanning metals with gum-water. Take gum water, put it into a muſſel-ſhell; with which mix ſo much of your metal or colour as may give it a proper conſiſtence, ſo that it may run fine and ſmooth: having prepared and well mxed your metals and colours, lay on your deſign; your gum-water being thoroughly dried, you are to run it over with fine ſeed-lac varniſh, and afterwards poliſh and clear it.

Laying ſpeckles or ſtrewings on japan-work. To do this, either on outſide or inſide boxes, drawers, *&c.* mix your ſpeckles with ordinary lac-varniſh, ſo much as may make it fit to work, but not ſo thick as for colour, and mix them well with a proper bruſh. Warm the work to be done gently by the fire, and with a pencil waſh it over with the former mixture; and when it is dry, repeat it again, and ſo often till your ſpeckles lie as thick and even as you deſire. When it is thoroughly dry, go over and beautify the work three or four times with ſeed-lac varniſh mixt with turpentine, and ſo let it dry, and the work is finiſhed, except you have a mind to poliſh it. But if you poliſh it, you muſt waſh it eight or ten times over with the beſt ſeed-lac varniſh, letting it ſtand to dry every time; and afterwards poliſh it, as before directed. All ſorts of coloured ſpeckles may be thus uſed, except thoſe of ſilver; the laying on of which requires the beſt and fineſt of the lac-varniſh, or the beſt white varniſh, which muſt make it fit for poliſhing; but if you have not a mind to puliſh it, fewer waſhes of the varniſh will be ſufficient.

Japanned and laquered ware of the Eaſt indies, pay duty for every 100 l. groſs value at the ſale 38 l. on importation, and the drawback is 35 l. 12s. 6d. on exportation.

JASMINUM, in botany, a genus of the diandria monogynia claſs. The corolla conſiſts of five ſegments; the berry is tricoccous; and the ſeed is arillated. There are ſix ſpecies, none of them natives of Britain.

JASPER, in natural hiſtory, a genus of ſcrupi, of a complex irregular ſtructure, of great variety of colours, and emulating the appearance of the finer marbles, or ſemipellucid gems.

The great characteriſtic of jaſpers is, that they all readily ſtrike fire with ſteel, and make not the leaſt effervеſcence with aquafortis.

Jaſpers, though commonly reckoned among the precious ſtones, ought undoubtedly to be ranged among the ſcrupi; being only opake cryſtalline maſſes, variouſly debaſed with an earthy admixture; and to this laſt ingredient it is that they owe all their variety of colours, as white, green, red, brown, and bluiſh.

The ſeveral kinds of nephritic ſtone, and the lapus divinus or jade, are all genuine jaſpers; but the hard, bright, green jaſper of the Eaſt Indies, ſeems to be the true kind. It is found in maſſes of various ſizes and ſhapes; but the more uſual ſtandard as to ſize, is between four and ſix inches in diameter; but there are maſſes of it found of a foot or more in diameter, and others no larger than a horſe bean. It is generally ſimple and unmixed; but if it be variegated at all, it is always with white; and this is diſpoſed not in ſtreaks or veins, but in clouds. It is capable of a very fine poliſh; and when the white clouds are well diſpoſed, is very beautiful; and, in pieces not too thick, is tolerably pellucid, when held up againſt the light.

JASPONYX, in natural hiſtory, the pureſt horn coloured onyx, with beautiful green zones, which are compoſed of the genuine matter of the fineſt jaſpers. See Jasper and Onyx.

JASQUES, a port-town of Perſia, ſituated on the gulph of Ormus: E. long. 58°, N. lat. 25°.

JATROPHA, the cassada plant, in botany, a genus of the monœcia monadelphia claſs. The male has no calix; the corolla conſiſts of one funnel ſhaped petal; and the ſtamina are ten. The female has no calix; the corolla conſiſts of five petals; the ſtyli are three, and bifid; the capſule has three cells, and contains but one ſeed. There are ſeven ſpecies, none of them natives of Britain.

JAVA, an iſland of the Eaſt Indies, ſituated between 102° and 113° of E. longitude, and between 5° and

8° of ſouth latitude; being about 700 miles long from eaſt to weſt, and one hundred broad.

JAVELIN, in antiquity, a ſort of ſpear, five feet and an half long; the ſhaft of which was of wood, with a ſteel point.

Every ſoldier, in the Roman armies, had ſeven of theſe; which were very light and ſlender.

JAUNDICE, in medicine. See MEDICINE.

JAW, in anatomy. See ANATOMY, p. 159.

JAWER, a city of Sileſia, capital of the duchy of Jawer, ſituated in 16° 12′ E. long. and 51° 8′ N. lat.

JAZY, a city of European Turky, capital of Moldavia, ſituated on the river Pruth, in E. long. 28° 40′, N. lat. 47° 15.

IBERIS, in botany, a genus of the tetradynamia ſiliculoſa claſs. The corolla is irregular, the two outmoſt petals being largeſt; and the pod is emarginated, and contains many ſeeds. There are twelve ſpecies, only one of which, *viz.* the medicaulis or rock-creſſe, is a native of Britain.

IBEX, in zoology. See CAPRA.

IBIS, in ornithology. See TANTALUS.

ICE, in phyſiology, a ſolid, traſparent, and brittle body, formed of ſome fluid, particularly water, by means of cold. See FROST and FREEZING.

The younger Lemery obſerves, that ice is only a re-eſtabliſhment of the parts of water in their natural ſtate; that the mere abſence of fire is ſufficient to account for this re-eſtabliſhment; and that the fluidity of water is a real fuſion, like that of metals expoſed to the fire; differing only in this, that a greater quantity of fire is neceſſary to the one than the other. Gallileo was the firſt that obſerved ice to be lighter than the water which compoſed it: and hence it happens, that ice floats upon water, its ſpecific gravity being to that of water as eight to nine. This rarefaction of ice is owing to the air-bubbles produced in the water by freezing; and being conſiderably large in proportion to the water frozen, render the body ſo much ſpecifically lighter: and theſe air-bubbles growing large, acquire a great expanſive power, ſo as to burſt the containing veſſels, though ever ſo ſtrong.

ICE-HOUSE, a building contrived to preſerve ice for the uſe of a family in the ſummer-ſeaſon.

Ice-houſes are more generally uſed in warm countries than with us; particularly in Italy, where the meaneſt perſon who rents a houſe, has his vault or cellar for ice.

As to the ſituation, it ought to be placed upon a dry ſpot of ground; becauſe where-ever there is moiſture, the ice will melt: therefore in all ſtrong lands which retain the wet, too much pains cannot be taken to make drains all round them. The place ſhould alſo be elevated, and as much expoſed to the ſun and air as poſſible.

As to the figure of the building, that may be according to the fancy of the owner; but a circular form is moſt proper for the well in which the ice is to be preſerved, which ſhould be of a ſize and depth proportionable to the quantity to be kept; for it is proper to have it large enough to contain ice for two years conſumption, ſo that if a mild winter ſhould happen, in which little or no ice is to be had, there may be a ſtock to ſupply the want. At the bottom of the well, there ſhould be a ſpace of about two feet deep, left to receive any moiſture that may drain from the ice; over this ſpace ſhould be placed a ſtrong wooden grate, and from thence a ſmall drain ſhould be laid under ground, to carry off the wet. The ſides of the well ſhould be built with brick or ſtone, at leaſt two bricks thick; for the thicker it is, the leſs danger there will be of the well being affected by any external cauſe. When the well is brought up within three feet of the ſurface, there ſhould be another outer-arch or wall begun, which ſhould be carried up to the height of the top of the intended arch of the well; and if there be a ſecond arch turned over this wall, it will add to the goodneſs of the houſe: the roof muſt be high enough above the inner arch to admit of a door-way to get out the ice. If the building is to be covered with ſlates or tiles, reeds ſhould be laid conſiderably thick under them, to keep out the ſun and external air; and if theſe reeds are laid the thickneſs of ſix or eight inches, and plaſtered over with lime and hair, there will be no danger of the heat getting through them. The external wall may be built in what form the proprietor pleaſes; and as theſe ice-houſes are placed in gardens, they are ſometimes ſo contrived as to have an handſome alcove-ſeat in front, with a ſmall door behind it, through which a perſon might enter to take out the ice; and a large door on the other ſide, fronting the north, with a porch wide enough for a ſmall cart to back, in order to ſhoot down the ice near the mouth of the well, which need not be more than two feet diameter, and a ſtone ſo contrived as to ſhut it up in the exacteſt manner: all the vacant ſpace above and between this and the large door ſhould be filled up with barley-ſtraw. The building thus finiſhed, ſhould have time to dry before the ice is put into it.

It is to be obſerved, that upon the wooden grate, at the bottom of the well, there ſhould be laid ſome ſmall faggots; and if upon theſe a layer of reeds is placed ſmooth for the ice to lie upon, it will be better than ſtraw, which is commonly uſed. As to the choice of the ice, the thinner it is, the eaſier it may be broken to powder; for the ſmaller it is broken, the better it will unite when put into the well. In putting it in, care muſt be taken to ram it as cloſe as poſſible; and alſo to allow a vacancy of two inches, all round, next the ſide of the well, to give paſſage to any moiſture occaſioned by the melting of ſome of the ice. When the ice is put into the well, if a little ſalt-petre be mixed with it at every ten inches or a foot in thickneſs, it will cauſe it to unite more cloſely into a ſolid maſs.

ICHNEUMON, in zoology. See VIVERRA.

ICHNEUMON is alſo the name of a genus of flies, of the hymenoptera order. It has no tongue; the antennæ have above thirty joints; the abdomen, in moſt of the ſpecies, is petiolated; and it has a ſting in the tail incloſed in a double-valved cylindrical ſheath. There are ſeventy-ſeven ſpecies, principally diſtinguiſhed by their colour.

ICHNOGRAPHY, in perſpective, the view of any thing cut off by a plain parallel to the horizon, juſt at the baſe of it.

Among painters, it ſignifies a deſcription of images, or of ancient ſtatues of marble and copper, of buſts and ſemi-buſts, of paintings in freſco, moſaic works, and ancient pieces of miniature.

ICHOGLANS, the grand ſignior's pages ſerving in the ſeraglio.

Thoſe are the children of Chriſtian parents, either taken in war, purchaſed, or preſents from the viceroys and governors of diſtant provinces: they are the moſt ſprightly, beautiful and well-made that can be met with; and are always reviewed and approved of by the grand ſignior himſelf, before they are admitted into the ſeraglios of Pera, Conſtantinople, or Adrianople, being the three colleges where they are educated, or fitted for employments, according to the opinion the court entertains of them.

ICHOR, properly ſignifies a thin watery humour, like ſerum: but is ſometimes alſo uſed for a thicker kind, flowing from ulcers, called alſo ſanies.

ICHTHYOCOLLA, Isinglass, a preparation from the fiſh known by the name of huſo. See Accipenser.

This is a tough and firm ſubſtance, of a whitiſh colour, and in ſome degree tranſparent; it is light, moderately hard, very flexile, and of ſcarce any ſmell, and very little taſte. We uſually receive it in twiſted pieces of an oblong and rounded figure, and bent in the ſhape of a horſe-ſhoe: this our druggiſts uſually beat and pull to pieces, and ſell it in thin ſhreds like ſkins, which eaſily diſſolve: beſides this kind of round iſinglaſs, we meet with ſome in ſmall thin ſquare cakes, white and very tranſparent; theſe are the fineſt of all. But iſinglaſs, of whatever ſhape, is to be choſen clean, whitiſh, and pellucid.

The method of preparing the ichthyocolla is this: they cut off all the fins of the huſo, cloſe to the fleſh, and take out the bladder, ſtomach, and inteſtines; they waſh theſe very clean, and then cut them in pieces, and throwing them into a large quantity of water, they let them ſteep four and twenty hours, and after this they kindle a fire under the veſſel, and keep the liquor juſt boiling till the greater part of the matters are diſſolved; they then ſtir the whole briſkly about; then ſtrain it through flannels, and ſet the liquor by to cool. When there is a large quantity of fat uſually formed upon it, which is carefully ſkimmed off, and the clear liquor is poured off from the groſſer parts which ſubſide, it is put over the fire again, and gently evaporated and ſkimmed afreſh all the time, till by trials they find, that on letting a ſpoonful of it cool it will harden into the conſiſtence of glue. Great care is taken to keep the fire very gentle, to prevent burning towards the end of this evaporation. They then pour it out upon a large, ſmooth, wooden table; and as it cools, form it into the maſſes we meet with it in, by cutting and rolling it up.

The greateſt quantity of iſinglaſs is made in Ruſſia. We have it principally from Holland, the Dutch contracting for the moſt of it before it is made.

It is an excellent agglutinant and ſtrengthener; and is often preſcribed in jellies and broth, but rarely enters any compoſitions of the regular medicinal form. It is the moſt efficacious as well as the moſt ſafe and innocent of all the ingredients uſed for cleaning wines, upon which account the wine-coopers uſe a much greater quantity of it than the apothecaries.

A very valuable glue is alſo made of this drug, which is a proper form to keep it for the wine-coopers uſe.

ICHTHYOLOGY, the ſcience of fiſhes, or that branch of zoology which treats of fiſhes. See Natural History.

ICHTHYPERIA, in natural hiſtory, a name given by Dr Hill to the bony palates and mouths of fiſhes, uſually met with either foſſile, in ſingle pieces, or in fragments. They are of the ſame ſubſtance with the bufonitæ; and are of very various figures, ſome broad and ſhort, others longer and ſlender; ſome very gibboſe, and others plainly arched. They are likewiſe of various ſizes, from the tenth of an inch to two inches in length, and an inch in breadth.

ICOSAHEDRON, in geometry, a regular ſolid, conſiſting of twenty triangular pyramids, whoſe vertexes meet in the centre of a ſphere, ſuppoſed to circumſcribe it; and therefore, have their height and baſes equal: wherefore the ſolidity of one of thoſe pyramids multiplied by 20, the number of baſes, gives the ſolid content of the icoſahedron.

ICOSANDRIA, in the Linnæan ſyſtem of botany. See Botany, p. 635.

IDA, a mountain in the iſland of Candia or Crete; alſo another in Natolia, or leſſer Aſia, celebrated by the poets for the judgment of Paris on the beauty of the three goddeſſes, Minerva, Juno, and Venus, to the laſt of whom he gave the preference.

IDEA, the reflex perception of objects, after the original perception or impreſſion has been felt by the mind. See Metaphysics.

IDENTITY, denotes that by which a thing is itſelf, and not any thing elſe; in which ſenſe, indentity differs from ſimilitude as well as diverſity. See Metaphysics.

IDES, in the ancient Roman calendar, were eight days in each month; the firſt of which fell on the 15th of March, May, July, and October; and on the 13th day of the other months.

They were reckoned backwards, in the manner already explained under the article Calends.

Thus they called the 14th day of March, May, July, and October; and the 12th of the other months, the *pridie idus*, or the day before the ides; the next preceding day, they called the *tertio idus*; and ſo on, reckoning always backwards, till they come to the nones. See Nones. This method of reckoning time is ſtill retained in the chancery of Rome, and in the calendar of the breviary.

IDIOM, among grammarians, properly ſignifies the peculiar genius of each language, but it is often uſed in a ſynonymous ſenſe with dialect.

IDIOPATHY, in phyſic, a diſorder peculiar to a certain part of the body, and not ariſing from any preceding diſeaſe; in which ſenſe, it is oppoſed to ſympathetic. Thus, an epilepſy is idiopathic, when it happens merely through ſome fault in the brain; and ſympathetic, when it is the conſequence of ſome other diſorder.

IDIOSYNCRASY, among phyſicians, denotes a peculiar temperament of body, whereby it is redered more liable to certain diſorders than perſons of a different conſtitution uſually are.

IDIOT, a perſon that is born a natural fool.

IDOLATRY, or the worſhip of idols, may be diſtinguiſhed into two ſorts. By the firſt, men adore the works of God, the ſun, the moon, the ſtars, angels, dæmons, men and animals: by the ſecond, men worſhip the work of their own hands, as ſtatues, pictures, and the like: and to theſe may be added a third, that by which men have worſhipped the true God under ſenſible figures and repreſentations. This indeed may have been the caſe with reſpect to each of the above kinds of idolatry; and thus the Iſraelites adored God under the figure of a calf.

The ſtars were the firſt objects of idolatrous worſhip; and on account of their beauty, their influence on the productions of the earth, and the regularity of their motions, particularly the ſun and moon, which are conſidered as the moſt glorious and reſplendent images of the Deity: afterwards, as their ſentiments became more corrupted, they began to form images, and to entertain the opinion, that by virtue of conſecration, the gods were called down to inhabit or dwell in their ſtatues. Hence Arnobius takes occaſion to rally the pagans for guarding ſo carefully the ſtatues of their gods, who, if they were really preſent in their images, might ſave their worſhippers the trouble of ſecuring them from thieves and robbers.

As to the adoration which the ancient pagans paid to the ſtatues of their gods, it is certain, that the wiſer and more ſenſible heathens conſidered them only as ſimple repreſentations or figures deſigned to recal to their minds the memory of their gods. This was the opinion of Varro and Seneca: and the ſame ſentiment is clearly laid down in Plato, who mentains, that images are inanimate, and that all the honour paid to them has reſpect to the gods whom they repreſent. But as to the vulgar, they were ſtupid enough to believe the ſtatues themſelves to be gods, and to pay divine worſhip to ſtocks and ſtones.

Soon after the flood, idolatry ſeems to have been the prevailing religion of all the world; for where-ever we caſt our eyes at the time of Abraham, we ſcarcely ſee any thing but falſe worſhip and idolatry. And it appears from ſcripture, that Abraham's forefathers, and even Abraham himſelf, were for a time idolaters.

The Hebrews were indeed expreſsly forbidden to make any repreſentation of God; they were not ſo much as to look upon an idol: and from the time of the Maccabees to the deſtruction of Jeruſalem, the Jews extended this precept to the making the figure of any man: by the law of Moſes, they were obliged to deſtroy all the images they found, and were forbidden to apply any of the gold or ſilver to their own uſe, that no one might receive the leaſt profit from any thing belonging to an idol. Of this the Jews, after they had ſmarted for their idolatry, were ſo ſenſible, that they thought it unlawful to uſe any veſſel that had been employed in ſacrificing to a falſe god, to warm themſelves with the wood of a grove, after it was cut down, or to ſhelter themſelves under its ſhade.

But the preaching of the Chriſtian religion, where-ever it prevailed, entirely rooted out idolatry; as did alſo that of Mahomet, which is built on the worſhip of one God. It muſt not, however, be forgotten, that the proteſtant Chriſtians charge thoſe of the church of Rome with paying an idolatrous kind of worſhip to the pictures or images of ſaints and martyrs: before theſe, they burn lamps and wax-candles; before theſe, they burn incenſe, and kneeling offer up their vows and petitions: they, like the pagans, believe that the ſaint to whom the image is dedicated, preſides in a particular manner about its ſhrine, and works miracles by the intervention of its image; and that if the image was deſtroyed or taken away, the ſaint would no longer perform any miracle in that place.

IDYLLION, in ancient poetry, is only a diminutive of the word [*eidos*,] and properly ſignifies any poem of moderate extent, without conſidering the ſubject. But as the collection of Theocritus's poems were called idyllia, and the paſtoral pieces being by far the beſt in that collection, the term idyllion ſeems to be now appropriated to paſtoral pieces.

JEALOUSY, in general, denotes the fear of a rival; but is more eſpecially underſtood of the ſuſpicion which married people entertain of each other's fidelity and affection.

JEDBURGH, the capital of Tiviotdale or Roxburgh, in Scotland, thirty-ſix miles ſouth-eaſt of Edinburgh: W. long 2° 15′, N. lat. 55° 25′.

JEDDO, the capital city of Japan Proper, ſituated on the eaſt ſide of the iſland: E. long. 141° N. lat. 36°.

The ſplendor of the royal palace and public buildings of this city, in the opinion of thoſe Europeans who have ſeen it, is no where to be equalled. The emperor's palace and gardens, which are in the middle of the city, are five miles in circumference. All the houſes are built upon one floor, and the rooms are only divided by folding ſcreens.

JEER, or Jeer-rope, in a ſhip, is a large rop reeved through double or treble blocks, laſhed at the maſt-head and on the yard, in order to hoiſt or lower the yards.

JEHOVAH, one of the ſcripture-names of God, ſignifying the Being who is ſelf-exiſtent and gives exiſtence to others.

So great a veneration had the Jews for this name, that they left off the cuſtom of pronouncing it, whereby its true pronunciation was forgotten. They call it tetragrammaton, or the name with four letters; and believe, that whoever knows the true pronunciation of it cannot fail to be heard by God.

JEJUNUM, in anatomy. See ANATOMY, p. 260.

JEMPTERLAND, a province of Sweden, bounded by Angermania on the north, by Medelpadia on the eaſt, by Helſingia on the ſouth, and by Norway on the weſt.

JENA, a city of Germany, in the circle of Upper Saxony, and the landgraviate of Thuringia: E. lon. 11° 44', N. lat. 51°.

JENKOPING, a city of Sweden, in the province of Gothland, ſituated ninety miles ſouth-eaſt of Gottenburg: E. long. 14° 30', N. 57° 30'.

JEREMIAH, *The prophecy of*, a canonical book of the Old Teſtament. This divine writer was of the race of the prieſts, the ſon of Hilkiah of Anathoth, in the tribe of Benjamin. He was called to the prophetic office when very young, about the thirteenth of Joſiah, and continued in the diſcharge of it about forty years. He was not carried captive to Babylon with the other Jews, but remained in Judea to lament the deſolation of his country. He was afterwards a priſoner in Egypt with his diſciple Baruch, where it is ſuppoſed he died in a very advanced age. Some of the Chriſtian fathers tell us, he was ſtoned to death by the Jews, for preaching againſt their idolatry; and ſome ſay, he was put to death by Pharaoh Hophra, becauſe of his prophecy againſt him. Part of the prophecy of Jeremiah relates to the time after the captivity of Iſrael, and before that of Judah, from the firſt chapter to the forty-fourth; and part of it was in the time of the latter captivity, from the forty-fourth chapter to the end. The prophet lays open the ſins of Judah with great freedom and boldneſs, and reminds them of the ſevere judgments, which had befallen the ten tribes for the ſame offences. He paſſionately laments their misfortune, and recommends a ſpeedy reformation to them. Afterwards he predicts the grievous calamities that were approaching, particularly the ſeventy years captivity in Chaldæa. He likewiſe foretells their deliverance and happy return, and the recompence which Babylon, Moab, and other enemies of the Jews ſhould meet with in due time. There are likewiſe ſeveral intimations in this prophecy concerning the kingdom of the Meſſiah; alſo ſeveral remarkable viſions, and types, and hiſtorical paſſages relating to thoſe times. The fifty-ſecond chapter does not belong to the prophecy of Jeremiah, which probably was added by Ezra, and contains a narrative of the taking of Jeruſalem, and of what happened during the captivity of the Jews, to the death of Jechonias. St. Jerom has obſerved upon this prophet, that his ſtyle is more eaſy than that of Iſaiah and Hoſea; that he retains ſomething of the ruſticity of the village where he was born; but that he is very learned and majeſtic, and equal to thoſe two prophets in the ſenſe of his prophecy.

JERSEY, an iſland in the Engliſh channel, fifteen miles weſt of the coaſt of Normandy, and eighty miles ſouth of Portland in Dorſetſhire: W. long. 2° 20', N. lat. 49° 20'.

New JERSEY, a province in North America, which may be bounded on the north by a line drawn from the river Delawar to Hudſon's river, which divides it from New-York; by the Atlantic Ocean, on the eaſt; by the ſame ocean on the ſouth; and by Delawar bay and river, which ſeparates it from Penſilvania, on the weſt. It lies between 74° and 76° of W. long. and between 39° and 41° of N. lat. and is about 140 miles in length, and 60 in breadth. It is ſubject to Britain.

JERUSALEM, the capital city of Judea, or Paleſtine, in Aſiatic Turky, ſituated thirty miles eaſt of the Levant, or Mediterranean ſea, and ninety miles ſouth of Damaſcus: E. long. 36°, N. lat. 32°.

It ſtands on a high rock, with ſteep aſcents on every ſide, except on the north; and is ſurrounded with a deep valley, which is again incompaſſed with hills. The city is at preſent three miles in circumference, and has a little altered its ſituation: for mount Calvary, which was formerly without the walls, ſtands now in the middle of the city; and mount Sion, which ſtood near the centre, is now without the walls.

JESI, a city of Italy, in the province of Ancona, and territory of the pope: E. long. 14° 40', N. lat. 43° 45'.

JESSELMERE, the capital of the province of the ſame name in the Eaſt Indies, ſubject to the Mogul: E. long. 73° 20', N. lat. 27°.

JESSO, or YEDSO, a country of Aſia, which lies north of Japan, and is ſaid to extend north-eaſt to the continent of America: E. long. 140°, N. lat. 40°.

JESUAT, a province of India, bounded by Patan on the north, and by Bengal on the ſouth; ſubject to the Mogul.

JESUITES, or the ſociety of Jeſus, a famous religious order in the Romiſh church, founded by Ignatius Loyola, a native of Guipuſcoa in Spain, who in the year 1538 aſſembled ten of his companions at Rome, principally choſen out of the univerſity of Paris, and made a propoſal to them to form a new order; when, after many deliberations, it was agreed to add to the three ordinary vows of chaſtity, poverty, and obedience, a fourth; which was, to go into all countries whither the pope ſhould pleaſe to ſend them, in order to make converts to the Romiſh church. Two years after, pope Paul III. gave them a bull, by which he approved this new order, giving them a power to make ſuch ſtatutes as they ſhould judge convenient: on which, Ignatius was created general of the order; which in a ſhort time ſpread over all the countries of the world, to which Ignatius ſent his companions, while he ſtaid at Rome, from whence he governed the whole ſociety.

The entire ſociety is compoſed of four ſorts of members; novices, ſcholars, ſpiritual and temporal coadjutors, and profeſſed members. The novices continue ſo two years; after which they are admitted to make the three ſimple vows, of chaſtity, poverty, and obedience, in the preſence of their ſuperiors: the ſcholars add ſome ſpiritual exerciſes to their ſtudies. The ſpiritual coadjutors aſſiſt the profeſſed members, and alſo make the three ſimple vows: the temporal coajutors, or lay-brothers, take care of the temporal affairs of the ſociety; and the profeſſed members, which compoſe the body of the ſociety, beſides the three ſimple vows, add a ſpecial vow of obedience to the head of the church in every thing relating to miſſions among idolaters and heretics. They have profeſſed houſes for their profeſſed members and their coadjutors; colleges, in which the ſciences are taught to ſtrangers; and ſeminaries, in which the young Jeſuits go through a courſe of philoſophy and theology. They are governed by a general, who has four aſſiſtants, and who appoints rectors, ſuperiors of houſes, provincials, viſitors, and commiſſaries. The diſcipline of theſe houſes, and eſpecially of the colleges, was regulated by Ignatius himſelf. On account of the groſs doctrines and bad practices of the Jeſuits, the order, within theſe few years, has been ſuppreſſed in moſt Roman-catholic countries, the members baniſhed, and their goods confiſcated.

JET, in natural hiſtory, a ſolid, dry, opake, inflammable ſubſtance, found in large detached maſſes, of a fine and regular ſtructure, having a grain like that of wood, ſplitting more eaſily horizontally than in any other direction, very light, moderately hard, not fuſible, but readily inflammable, and burning a long time with a fine greeniſh flame.

It is of a fine deep black colour, very gloſſy and ſhining, except upon its ſurface, where it has been fouled by accident. When examined by the microſcope, it is found to be compoſed of a number of parallel plates, very thin, and laid cloſely upon one another. It is not ſoluble in, nor makes any efferveſcence with acids. It ſhould be choſen of the deepeſt black, of a moderate hardneſs, very light, and ſuch as will ſplit moſt evenly in an horizontal direction; this being its great characteriſtic, by which it is diſtinguiſhed from the cannel coal, which breaks equally eaſy any way.

Jet is of great uſe to perfumers, and is ſometimes preſcribed in medicine. Dioſcorides tells us, that it is an excellent emollient and diſcutient, and recommends a fumigation of it for diſeaſes of the womb; and among the eaſtern nations, it is ſtill in high repute as a cordial, a ſtrengthener, and prolonger of life.

Every pound of jet pays on importation a duty of 7$\frac{70}{100}$d. and draws back 6$\frac{75}{001}$d. on exportation.

JET D'EAU, a French term, frequently alſo uſed with us, for a fountain that caſts up water to a conſiderable height in the air.

JEWEL, any precious ſtone, or ornament beſet with them. See the articles DIAMOND, RUBY, *&c.*

JEWS, thoſe who profeſs obedience to the laws and religion of Moſes.

When a modern Jew builds an houſe, he muſt leave part of it unfurniſhed, in remembrance that the temple and Jeruſalem now lie deſolate. They lay great ſtreſs upon frequent waſhings. They abſtain from meats prohibited by the Levitical law; for which reaſon, whatever they eat muſt be dreſſed by Jews, and after a manner peculiar to themſelves. Every Jew is obliged to marry, and a man who lives to twenty unmarried, is accounted as actually living in ſin.

The Jews, it is ſaid, were formerly at the diſpoſal of the chief lord where they lived, and likewiſe all their goods. A Jew may be a witneſs by our law, being ſworn on the Old Teſtament, and taking the oaths to the government.

For a farther account of the Jew, ſee the articles CARAITES, CIRCUMCISION, LEVITES, PASSOVER, PHARISEES, RABBINS, SADDUCEES, SANHEDRIM, SYNAGOGUE, TALMUD, *&c.*

JEW'S EARS, in botany, See TREMELLA.

IGLAW, a town of Germany, in the province of Moravia, ſituated on the river Igla, on the frontiers of Bohemia; ſubject to the houſe of Auſtria: E. long. 15° 7′, N. lat. 49° 16′.

IGNAVUS, in zoology. See BRADYPUS.

IGNIS. See FIRE.

IGNIS-FATUUS. See WILL-*with-a-wiſp*.

IGNITION, in chemiſtry, the heating metals red-hot, without melting them.

IGNORANCE, the privation or abſence of knowledge.

The cauſes of ignorance, according to Locke, are chiefly theſe three. 1. Want of ideas. 2. Want of a diſcoverable connection between the ideas we have. 3. Want of tracing and examining our ideas. See METAPHYSICS.

IGUANA, in zoology. See LACERTA.

IHOR, the capital of the province of Ihor, in Malacca, near the ſouth cape of the further peninſula of India, ſubject to the Dutch: E. lon. 103°, N. lat. 3°.

ILCHESTER, a borough-town of Somerſetſhire, fourteen miles ſouth of Wells. It ſends two members to parliament.

ILEX, the HOLM-OAK, or EVER-GREEN OAK, in botany, a genus of the tetrandria-tetragynia claſs. The calix has four teeth; the corolla is rotated; it has no ſtylus; and the berry contains four ſeeds. There are five ſpecies, none of them natives of Britain. The kermes of the ſhops adheres and is gathered off the branches of the ilex aquifolium. The kermes is a round grain about the bulk of a pea. Theſe grains appear full of ſmall reddiſh ovula, or animalcules, of which they are the nidus. The kermes is a grateful mild reſtringent and corroborant.

ILHEOS, or RIO DE ILHEOS, a province of Brazil in ſouth America, ſubject to Portugal. It is bounded by the bay of All-ſaints on the north, and by the Atlantic ocean on the eaſt.

ILIAC PASSION, in medicine. See MEDICINE.

ILIACUS MUSCULUS, in anatomy. See ANATOMY, p. 204.

ILIAD, the name of an ancient epic poem, the firſt and fineſt of thoſe compoſed by Homer.

The poet's deſign in the iliad was to ſhew the Greeks, who were divided into ſeveral little ſtates, how much it was their intereſt to preſerve a harmony and good underſtanding among themſelves: for which end, he ſets before them the calamities that befel their anceſtors from the wrath of Achilles, and his miſunderſtanding with Agamemnon; and the advantages that afterwards accrued to them from their union. The Iliad is divided into twenty-four books, or rhapſodies, which are marked with the letters of the alphabet.

ILIUM, in anatomy. See Anat. p. 260.

ILLENOIS, the inhabitants of a country contiguous to the illenois-lake, in Canada, in north America, which is ſituated between 88° and 93° of W. lon. and between 41° and 46° of N. lat.

ILLER, a river of Germany, which riſing in the mountains of Tyrol, runs north through Swabia, and falls into the Danube at Ulm.

ILMEN, a lake in the province of Great Novogrod, in Ruſſia, in 34° E. lon. and 58° N. lat.

ILMINSTER, a market-town of Somerſetſhire, twenty-four miles ſouth weſt of Wells.

IMAGE, in a religious ſenſe, is an artificial repreſentation or ſimilitude of ſome perſon or thing, uſed either by way of decoration and ornament, or as an object of religious worſhip and veneration; in which laſt ſenſe, it is uſed indifferently with the word idol.

IMAGINATION, a power or faculty of the mind, whereby it conceives and forms ideas of things communicated to it by the outward organs of ſenſe. See Metaphysics.

IMAN, a name applied by the Mahometans to him who is head of the congregations in their moſques; and, by way of eminence, to him who has the ſupreme authority both in reſpect to ſpirituals and temporals.

IMBECILLITY, a languid, infirm ſtate of body; which, being greatly impaired, is not able to perform its uſual exerciſes and functions.

IMBIBING, the action of a dry porous body, that abſorbs or takes up a moiſt or fluid one: thus, ſugar imbibes water; a ſpunge, the moiſture of the air, *&c.*

IMBRICATED, among botaniſts. See Botany, p. 641.

IMENSTAT, a town of Germany, in the circle of Swabia; ſituated in E. lon. 10° 8′. N. lat. 47° 26′.

IMITATION, the acts of doing or ſtriving to copy after, or become like to, another perſon or thing.

Du Bos obſerves, that the principal merit of poems and pictures conſiſts in the imitation of ſuch objects as would have excited real paſſions; and that the paſſions which theſe imitations give riſe to, are only ſuperficial, and not ſo ſtrong as that of the object imitated, and are therefore ſoon effaced. He alſo maintains, that the imitation of tragic objects in poems and pictures, afford moſt pleaſure: we liſten, therefore, with pleaſure to thoſe unhappy men who make a recital of their misfortunes by means of a painter's pencil, or of a poet's verſes; but, as Diogenes Laertius obſerves, it would afflict us extremely, were we to hear them bewailing their ſad diſaſters in perſon.

IMMACULATE, ſomething without ſtain, chiefly applied to the conception of the holy virgin.

IMMATERIAL, ſomething devoid of matter, or that is pure ſpirit: thus God, angels, and the human ſoul, are immaterial beings.

IMMEDIATE, whatever is capable of producing an effect without the intervention of external means; thus we ſay, an immediate cauſe, in oppoſition to a mediate or remote one.

IMMENSITY, an unlimited extenſion, or which no finite and determinate ſpace, repeated ever ſo often, can equal.

IMMERSION, that act by which any thing is plunged into water or other fluid.

It is uſed in chemiſtry for a ſpecies of calcination, when any body is immerſed in a fluid to be corroded; or it is a ſpecies of lotion, as when a ſubſtance is plunged into any fluid in order to deprive it of a bad quality, or communicate to it a good one.

Immersion, in aſtronomy, is when a ſtar or planet is ſo near the ſun with regard to our obſervations, that we cannot ſee it; being, as it were, inveloped and hid in the rays of that luminary. It alſo denotes the beginning of an eclipſe of the moon, or that moment when the moon begins to be darkened, and to enter into the ſhadow of the earth.

IMMORTAL, that which will laſt to all eternity, as having in it no principle of alteration or corruption: thus God and the human ſoul are immortal.

IMMUNITY, a privilege or exemption from ſome office, duty, or impoſition, as an exemption from tolls, *&c.*

Immunity is more particularly underſtood of the liberties granted to cities and communities.

IMPALED, in heraldry; when the coats of a man and his wife who is not an heireſs are borne in the ſame eſcutcheon, they muſt be marſhalled in pale; the huſband's on the right ſide, and the wife's on the left: and this the heralds call baron and feme, two coats impalled.

If a man has had two wives, he may impale his coat in the middle between theirs; and if he has had more than two, they are to be marſhalled on each ſide of his in their proper order.

IMPALPABLE, that whoſe parts are ſo extremely minute that they cannot be diſtinguiſhed by the ſenſes, particularly by that of feeling.

IMPANATION, a term uſed by divines, to ſignify the opinion of the Lutherans with regard to the euchariſt, who believe that the ſpecies of bread and wine remain together with the body of our Saviour after conſecration.

IMPANNELLING, in law, ſignifies the writing down or entering into a parchment, liſt or ſchedule, the names of a jury ſummoned by the ſheriff to appear for ſuch public ſervices as juries are employed in.

IMPARLANCE, in law, a petition in court for a day to conſider or adviſe what anſwer the defendant ſhall make to the plaintiff's action; and is the continuance of the cauſe till another day, or a longer time given by the court.

IMPASTATION, the mixtion of various materials of different colours and conſiſtencies, baked or bound together with ſome cement, and hardened either by the air or by fire.

IMPATIENS, in botany, a genus of the ſyngeneſia monogynia claſs. The calix conſiſts of two leaves, and the corolla of five irregular petals; and the capſule has five valves. There are ſeven ſpecies, only one of which, *viz.* the noli-me-tangere, or touch-me-not, is a native of Britain.

IMPEACHMENT, an accuſation and proſecution for treaſon and other crimes and miſdemeanors.

IMPENETRABILITY, in philoſophy, that property of body, whereby it cannot be pierced by another: thus, a body, which ſo fills a ſpace as to exclude all others, is ſaid to be impenetrable.

IMPERATIVE, one of the moods of a verb, uſed when we would command, intreat, or adviſe: thus, *go, read, take pity, be adviſed,* are imperatives in our language.

IMPERATOR, in Roman antiquity, a title of honour conferred on victorious generals, by their armies, and afterwards confirmed by the ſenate.

IMPERATORIA, MASTER-WORT, in botany, a genus of the pentandria digynia claſs. The fruit is roundiſh, compreſſed, and gibbous in the middle. There is but one ſpecies, a native of Switzerland. The root of this plant, though an excellent aromatic, has only place in the plague water of the Edinburgh pharmacopœia.

IMPERFECT, ſomething that is defective, or that wants ſome of the properties found in other beings of the ſame kind.

IMPERIAL, ſomething belonging to an emperor or empire, as imperial crown, imperial chamber, imperial cities, imperial diet, *&c.*

IMPERSONAL VERB, in grammar, a verb to which the nominative of any certain perſon cannot be prefixed; or, as others define it, a verb deſtitute of the two firſt and primary perſons, as *decet, oportet,* &c.

IMPERVIOUS, a thing not to be pervaded nor paſſed thro', either by reaſon of the cloſeneſs of its pores, or the particular configuration of its parts.

IMPETUS, in mechanics, the force with which one body impels or ſtrikes another. See MECHANICS.

IMPLICATION, in law, is where ſomething is implied, that is not expreſſed by the parties themſelves in their deeds, contracts, and agreements.

IMPORTATION, in commerce, the bringing merchandize into a kingdom from foreign countries; in contradiſtinction to exportation. See EXPORTATION.

We ſhall here give ſome of the principal laws relating to the importation of goods into this kingdom. Goods imported without entry, or paying cuſtoms, are forfeited; and the lord-treaſurer, the barons of the exchequer, or chief magiſtrates of the place where the offence was committed, or next adjoining to it, may grant a warrant to any perſon, who, with the aſſiſtance of a conſtable, may break open doors, cheſts, *&c.* and take thence any prohibited or unaccuſtomed goods; but this is to be done within one month after the offence was committed. But if falſe information is given, the perſon wrongfully accuſed, may recover coſts and damages.

No ſhip or veſſel arriving from beyond ſea is to be above three days in ſailing from Graveſend to the place of diſcharge on the river Thames, unleſs hindered by contrary winds or other impediment. And no ſhip bound for the port of London is to touch or ſtay at any place adjoining to any ſhore, between Graveſend and Cheſter-quay. True entries are to be made of all ſuch ſhips lading, upon oath of the maſter or purſer for that voyage; alſo where ſhe took in her lading, where ſhe was built, how manned, who were the owners, and who the maſter during the voyage. In all out-ports, ſhips are to come directly to the place of unlading, and make true entries as aforeſaid, upon penalty of the forfeiture of 100 l.

After any ſhip is cleared, and the watchmen and tideſmen diſcharged from their attendance, if there be found on board any concealed goods that have not paid the duty inwards, the maſter, or other perſon taking charge of the ſhip, ſhall forfeit 100 l.

Porters, carmen, watermen, *&c.* aſſiſting in landing unaccuſtomed goods, ſhall, on conviction, for the firſt offence, be committed to the next jail till they find ſecurity for their good behaviour; and for their ſecond offence, they are to be committed to priſon for two months, without bail or mainprize, or till they are diſcharged by the court of exchequer, or each of them pay 5 l. to the ſheriff of the county.

No merchant-denizen ſhall cover a ſtranger's goods, but ſhall, by himſelf or agent, ſign one of his bills of every entry, with the mark, number, and contents of every parcel of goods, without which no entry ſhall paſs. And no children of aliens under the age of twenty one years, ſhall have entry made in their names, nor be permitted to trade.

Merchants, trading into the port of London, ſhall have free liberty to lade and unlade their goods at any of the lawful quays between the Tower and London-bridge, from ſun-riſing to ſun-ſetting, from September 10, to March 10; and between ſix o' clock in the morning and ſix in the evening, from March 10, to September 10; giving notice thereof to the reſpective officers, appointed to attend the lading and unlading of goods. And ſuch officers as ſhall refuſe to be preſent ſhall forfeit 5 l. for every default.

To prevent combination between importers, and ſeizers of goods unlawfully imported or exported, none ſhall ſeize them but the officers of the cuſtoms, or ſuch as ſhall be authoriſed ſo to do by the lord treaſurer, under-treaſurer, or a ſpecial commiſſion from his majeſty, under the great privy ſeal.

If any ſeizer of prohibited or unaccuſtomed goods does not make due proſecution thereof, it is lawful for the cuſtom-houſe officers, or others deputed thereto, to make ſeizure of ſuch goods, and they ſhall be, in law, adjudged the firſt true informers and ſeizers, and have the benefit thereof, notwithſtanding any law and ſtatute to the contrary.

All foreign goods permitted to be landed by bills at ſight, bills at view or ſuffrance, ſhall be landed at the moſt convenient quays and wharfs, as the officers of the cuſtoms ſhall direct; and there, or at the king's ſtore-houſe of the reſpective ports, ſhall be meaſured, weighed, numbered, *&c.* by the officers appointed, who ſhall perfect the entry, and ſubſcribe their names to it, and the next day make their report to the cuſtomer, collector, or comptroller; or in default thereof, ſhall forfeit 100 l.

Any merchant who ſhall import goods, ſhall have liberty to break bulk in any lawful port or quay, the maſter or purſer firſt making oath of the true contents of the ſhip's lading. No Engliſh merchant ſhall put on ſhore in Scotland or Ireland, any merchandize of the growth or produce of any of his majeſty's plantations, unleſs the ſame have been firſt landed in England, Wales, or Berwick, and paid the duties with which they are chargeable, under the penalty of forfeiting the ſhip and goods, three fourths to the king, and one fourth to the informer, or he that ſhall ſue for the ſame: but if a ſhip be diſabled, or driven into any port of Ireland, and unable to proceed on her voyage, her goods may be put on ſhore, under the hands of the principal officers of the cuſtoms there reſiding, till the goods can be put on board ſome other veſſel, to be tranſported to ſome part of England or Wales.

Natives of England or Ireland may import into England, directly from Ireland, any hemp, flax, thread, yarn and linen, of the growth and manufacture of Ireland, cuſtom-free; the chief officer ſo importing bringing a certificate from the chief office in Ireland, expreſſing the particulars of the goods, with the names and places of abode of the exporters thence, and of ſuch as have ſworn that the ſaid goods are, bona fide, of the growth and manufacture of that kingdom, and who they are conſigned to in England; and the chief officer ſhall make oath, that the ſaid goods are the ſame that are on board, by virtue of that certificate.

IMPOST, in law, ſignifies in general a tribute or cuſtom, but is more particularly applied to ſignify that tax which the crown receives for merchandizes imported into any port or haven.

Imposts, in architecture, the capitals of pillars, or pilaſters, which ſupport arches.

IMPOSTHUME, in ſurgery, *&c.* See Abscess.

IMPOTENCE, or **Impotency**, in general, denotes want of ſtrength, power, or means to perform any thing.

Divines and philoſophers diſtinguiſh two ſorts of impotency; natural, and moral. The firſt is a want of ſome phyſical principle, neceſſary to an action; or where a being is abſolutely defective, or not free and at liberty to act: the ſecond only imports a great difficulty, as a ſtrong habit to the contrary, a violent paſſion, or the like.

Impotency is, more particularly, uſed for a natural inability to coition. Impotence with reſpect to men, is the ſame as ſterility in women; that is, an inability of propagating the ſpecies. There are many cauſes of impotence; as, a natural defect in the organs of generation, which ſeldom admits of a cure: accidents, or diſeaſes; and in ſuch caſes the impotence may, or may not be remedied, according as theſe are curable or otherwiſe.

IMPREGNATION, the getting a female with child. See Pregnancy.

The term impregnation is alſo uſed, in pharmacy, for communicating the virtues of one medicine to another, whether by mixture, coction, digeſtion, *&c.*

IMPRESSION is applied to the ſpecies of objects, which are ſuppoſed to make ſome mark or impreſſion on the ſenſes, the mind, and the memory.

The peripatetics aſſert, that bodies emit ſpecies reſembling them, which are conveyed to the common ſenſorium, and they are rendered intelligible by the active intellect; and when thus ſpiritualized, are called expreſſions, or expreſs ſpecies, as being expreſſed from the others.

Impression alſo denotes the edition of a book, regarding the mechanical part only; whereas edition, beſides this, takes in the care of the editor, who corrected or augmented the copy, adding notes, *&c.* to render the work more uſeful.

IMPROBATION, in Scots law, the name of that action brought for ſetting any deed or writing aſide upon the head of forgery. See Law, tit. 33.

IMPROPRIATION, a parſonage or eccleſiaſtical living, the profits of which are in the hands of a layman; in which ſenſe, it ſtands diſtinguiſhed from appropriation, which is where the profits of a benefice are in the hands of a biſhop, college, *&c.* though theſe terms are now often uſed promiſcuouſly.

IMPULSE, in machanics. See Mechanics.

IMPURITY, in the law of Moſes, is any legal defilement. Of theſe there were ſeveral ſorts; ſome were voluntary, as the touching a dead body, or any animal that died of itſelf, or any creature that was eſteemed unclean; or the touching things holy, by one who was not clean, or was not a prieſt; the touching one who had a leproſy, one who had a gonorrhœa, or who was polluted by a dead carcaſe, *&c.* Sometimes theſe impurities were involuntary, as when any one inadvertently touched bones, or a ſepulchre, or any thing polluted; or fell into ſuch diſeaſes as pollute, as the leproſy, *&c.*

IMPUTATION, in general, the charging ſomething to the account of one, which belonged to another: thus, the aſſertors of original ſin maintain, that Adam's ſin is imputed to all his poſterity.

In the ſame ſenſe, the righteouſneſs and merits of Chriſt are imputed to true believers.

INACCESSIBLE, ſomething that cannot be come at, or approached, by reaſon of intervening obſtacles, as a river, rock, *&c.* It is chiefly uſed in ſpeaking of heights and diſtances. See Geometry.

INALIENABLE, that which cannot be legally alienated or made over to another: thus the dominions of the king, the revenues of the church, the eſtates of a minor, *&c.* are inalienable, otherwiſe than with a reſerve of the right of redemption.

INANIMATE, a body that has either loſt its ſoul, or that is not of a nature capable of having any.

INANITION, among phyſicians, denotes the ſtate of the ſtomach when empty, in oppoſition to repletion.

INARCHING, in gardening, is a method of grafting, commonly called grafting by approach, and is uſed when the ſtock intended to graft on, and the tree from which the graft is to be taken, ſtand ſo near, or can be brought ſo near, that they may be joined together.

INAUGURATION, the coronation of an emperor or king, or the conſecration of a prelate: ſo called from the ceremonies uſed by the Romans, when they were received into the college of augurs.

INCA, or Ynca, a name given by the natives of Peru to their kings and the princes of the blood. Pedro de Cieça, in his Chronicle of Peru, gives the origin of the incas, and ſays, that that country was, for a long time, the theatre of all manner of crimes, of war, diſſention, and the moſt dreadful diſorders, till at laſt two brothers appeared, one of whom was called Mangocapa; of this perſon, the Peruvians relate many wonderful ſtories. He built the city of Cuſco, made laws, eſtabliſhed order and harmony by his wiſe regulations; and he and his deſcendents took the name of inca, which ſignifies king or great lord. Theſe incas became ſo powerful, that they rendered themſelves maſters of all the country from Paſto to Chili, and from the river Maule on the ſouth, to the river Angaſmago on the north; theſe two rivers forming the bounds of their empire, which extended above thirteen hundred leagues in length. This they enjoyed till the diviſions between inca Guaſcar and Atabalipa; which the Spaniards laying hold of, made themſelves maſters of the country, and deſtroyed the empire of the incas.

INCAMERATION, a term uſed in the chancery of Rome, for the uniting of lands, revenues, or other rights, to the pope's domain.

INCANTATION, denotes certain ceremonies, accompanied with a formula of words, and ſuppoſed to be capable of raiſing devils, ſpirits, *&c.* See Charm, *&c.*

INCAPACITY, in the canon-law, is of two kinds: 1. The want of a diſpenſation for age in a minor, for legitimation in a baſtard, and the like: this renders the proviſion of a benefice void in its original. 2. Crimes and heinous offences, which annul proviſions at firſt valid.

INCARNATION, in theology, the act whereby the ſecond perſon of the holy Trinity aſſumed the human nature, *viz.* a true body and reaſonable ſoul, in order to accompliſh the redemption of fallen mankind.

INCARNATIVES, in ſurgery, medicines which aſſiſt nature in filling up wounds or ulcers with fleſh; or rather remove the obſtructions thereto.

INCENSE, or Frank-incense, in the materia medica, *&c.* a dry reſinous ſubſtance, known among authors by the names thus and olibanum.

Incenſe is a rich perfume, with which the ancient pagans, and the Roman Catholics ſtill, perfume their temples, altars, *&c.*

The burning of incenſe made part of the daily ſervice of the ancient Jewiſh church. The prieſts drew lots to know who ſhould offer it; the deſtined perſon took a large ſilver diſh, in which was a cenſer full of incenſe; and being accompanied by another prieſt, carrying ſome live coals from the altar, went into the temple. There, in order to give notice to the people, they ſtruck upon an inſtrument of braſs placed between the temple and the altar; and being returned to the altar, he who brought the fire left it there, and went away. Then the offerer of incenſe having ſaid a prayer or two, waited the ſignal, which was the burning of the holocauſt; immediately upon which he ſet fire to the incenſe, the whole multitude continuing all the time in prayer. The quantity of incenſe offered each day, was half a pound in the morning, and as much at night.

One reaſon of this continual burning of incenſe might be, that the multitude of victims that were continually offered up, would have made the temple ſmell like a ſlaughter-houſe, and conſequently have inſpired the comers rather with diſguſt and averſion, than awe and and reverence, had it not been overpowered by the agreeable fragrance of thoſe perfumes.

INCEST, the crime of venereal commerce between perſons who are related in a degree wherein marriage is prohibited by the law of the country.

INCH, a well known meaſure of length; being the twelfth part of a foot, and equal to three barley-corns in length.

INCIDENCE, denotes the direction in which one body ſtrikes on another. See Optics and Mechanics.

INCIDENT Diligence, in Scots law, a warrant granted by a lord ordinary in the court of ſeſſion, for citing witneſſes for proving any point, or for production of any writing neceſſary for preparing the cauſe for a final determination, or before it goes to a general proof.

INCISIVE, an appellation given to whatever cuts or divides: thus, the fore-teeth are called dentes inciſivi, or cutters; and medicines of an attenuating nature, incidents, or inciſive medicines.

INCLE, a kind of tape made of linen yarn.

INCLINATION, is a word frequently uſed by mathematicians, and ſignifies the mutual approach, tendency, or leaning of two lines or two planes towards each other, ſo as to make an angle.

INCLINED plane, in mechanics, one that makes an oblique angle with the horizon. See Mechanics.

INCLOSURE, in huſbandry, the fence or hedge made to incloſe lands.

INCOGNITO, or incog, is applied to a perſon that is in any place where he would not be known: but it is more particularly applied to princes, or great men, who enter towns, or walk the ſtreets, without their ordinary train or the uſual marks of their diſtinction and quality.

INCOMBUSTIBLE, ſomething that cannot be burnt, or conſumed by fire. See Asbestus.

INCOMMENSURABLE, a term in geometry, uſed where two lines, when compared to each other, have no common meaſure, how ſmall ſoever, that will exactly meaſure them both. And in general, two quantities are ſaid to be incommenſurable, when no third quantity can be found that is an aliquot part of both.

Incommensurable numbers are ſuch as have no common diviſor that will divide them both equally.

INCOMPATIBLE, that which cannot ſubſiſt with another, without deſtroying it: thus cold and heat are incompatible in the ſame ſubject, the ſtrongeſt overcoming and expelling the weakeſt.

INCORPORATION, in pharmacy, is much the ſame as impaſtation, being a reduction of dry ſubſtances to the conſiſtence of a paſte, by the admixture of ſome fluid; thus pills, boles, troches, and plaſters are made by incorporation. Another incorporation is, when things of different conſiſtences, are by digeſtion reduced to one common conſiſtence.

INCORPOREAL, a thing, or ſubſtance, which has no body; as God, angels, and the ſoul of man.

INCORRUPTIBLE, that which cannot be corrupted.

INCRASSATING, in pharmacy, *&c.* the rendering fluids thicker by the mixture of other ſubſtances leſs fluid, or by the evaporation of the thinner parts.

INCUBATION, the action of a hen, or other fowl brooding on her eggs.

INCUBUS, or NIGHT-MARE, in medicine. See MEDICINE.

INCUMBENT, a clerk, or miniſter who is reſident on his benefice: he is called incumbent, becauſe he does, or at leaſt ought, to bend his whole ſtudy to diſcharge the cure of his church.

INCURVATION *of the rays of light*, their bending out of a rectilinear ſtraight courſe, occaſioned by refraction. See OPTICS.

INCUS, in anatomy. See ANATOMY, p. 296.

INDEFINITE, that which has no certain bounds, or to which the human mind cannot affix any.

INDEFINITE, in grammar, is underſtood of nouns, pronouns, verbs, participles, articles, *&c.* which are left in an uncertain indeterminate ſenſe, and not fixed to any particular time, thing, or other circumſtance.

INDELIBLE, ſomething that cannot be cancelled, or effaced.

INDEMNITY, in law, the ſaving harmleſs; or, a writing to ſecure one from all damage and danger that may enſue from any act.

INDENTED, in heraldry, is when the out-line of an ordinary is notched like the teeth of a ſaw. See Plate CII. fig. 1.

INDEPENDENTS, a ſect of Proteſtants in Britain and Holland, ſo called from their independency on other churches, and their maintaining that each church or congregation has ſufficient power to act and perform every thing relating to religious government within itſelf, and is no way ſubject or accountable to other churches or their deputies.

They therefore diſallow parochial and provincial ſubordination, and form all their congregations upon a ſcheme of co-ordinancy. But though they do not think it neceſſary to aſſemble ſynods; yet if any be held, they look on their reſolutions as prudential councils, but not as deciſions to which they are obliged to conform.

INDETERMINATE, in general, an appellation given to whatever is not certain, fixed, and limited; in which ſenſe, it is the ſame with indefinite.

INDEX, in arithmetic and algebra, ſhews to what power any quantity is involved, and is otherwiſe called exponent.

INDIA PROPER, or HITHER INDIA, a large peninſula in Aſia, bounded on the north by Uſbec Tartary, and Thibet; on the eaſt, by another part of Thibet, the kingdom of Aſem, Ava, and Pegu; on the ſouth, by the bay of Bengal, and the Indian ocean; and by the ſame ocean and Perſia on the weſt: ſituated between 66° and 92° of eaſt longitude, and between 7° and 40° of north latitude; being about 2000 miles in length from north to ſouth, and 1500 miles in breadth from eaſt to weſt where broadeſt; though the ſouthern part of the peninſula is not 300 miles broad. All the country within theſe limits is either ſubject or tributary to the great Mogul. It is frequently called Indoſtan, a name ſuppoſed to be derived from the river Indus, on its weſtern frontiers: it is alſo called the Mogulſtan, from the imperial family now upon the throne, who trace their pedigree from Tamerlane a Mogul Tartar.

The produce of this country, and what the Europeans import from thence, is chiefly chints, callicoes, muſlins, ſome ſilk, pepper, and diamonds, which are purchaſed by moſt nations with ſilver; but the Dutch frequently barter ſpices for them, which makes the India trade doubly advantageous to them.

INDIA, beyond the Ganges, is a country bounded by Thibet and Boutan on the north; by China, Tonquin, and Cochin-China on the eaſt; by the Indian ocean on the ſouth; and by the hither India, the bay of Bengal, and the ſtraits of Malacca, on the weſt: it is ſituated between 92° and 104° of eaſt longitude, and between the equator and 30 degrees of north latitude: being near 2000 miles in length from north to ſouth, but of a very unequal breadth; in which limits are comprehended the kingdoms of Aſem, Ava, Pegu, Laos, Siam, Cambodia, and Malacca, governed by as many Indian princes; only the Dutch have uſurped the dominion of Malacca. In this country there are a vaſt number of elephants, and conſequently a great deal of ivory; our merchants alſo meet with gold and precious ſtones, canes, opium, and ſuch other articles as are uſually found within the tropics.

INDIAN BERRY. See COCCULUS.

INDICATION, in phyſic, whatever ſerves to direct the phyſician how to act.

INDICATIVE, in grammar, the firſt mood, or manner, of conjugating a verb, by which we ſimply affirm, deny, or aſk ſomething; as, *amant*, they love; *non amant*, they do not love; *amantne*, do they love?

INDICTION, in chronology, a cycle of fifteen years.

INDICTMENT, in Scots law, the name of the ſummons or libel upon which criminals are cited before the court of Juſticiary to ſtand trial.

INDIES, Eaſt and Weſt. See INDIA and AMERICA.

INDIGESTION, in medicine, a crudity, or want of due coction, either in the food, an humour of the body, or an excrement.

INDIGETES, a name which the ancients gave to ſome of their gods.

INDIGO, in botany. See INDIGOFERA.

INDIGOFERA, in botany, a genus of the diadelphia decandria claſs. The calix is plain; the ſuperior margins of the alæ are connivent, and of the ſame ſhape with the vexillum; and the pod is ſtrait. There are ſix ſpecies, all of them natives of the Indies. The tinctoria, anil, or indigo, grows about two feet high, with roundiſh leaves.

As to the indigo blue, it is a fecular, or ſettling, made by means of water and oil-olive out of the leaves of the anil, or indigo plant; there is a difference between that made by the leaves only, and that which is made of the leaves and ſmall branches. The choiceſt of the former ſort is that which bears the ſurname of Serquiſſe, from a village of that name ſome leagues from Surat in the Eaſt-Indies. It is made alſo about Biana and Coſſa near Agra; and alſo in the kingdom of Golconda. In making the feculæ of anil, in order to make indigo of it, they cut the herb with a ſickle, when the leaves begin to fall upon touching them; and after they have ſtripped them from the branches, they put them into a ſufficient quantity of water in a veſſel called the ſteeping vat; and let them infuſe there thirty or thirty-five hours; after which they turn the cock, in order to let the water run off, which is become of a green colour inclining towards blue, into a veſſel of the nature of a churn, where it is worked by means of a roller or turner of wood, the ends of which are pointed and faced with iron: this they work till the water abounds with a lather; then they caſt into it a little oil of olive, that is, one pound into ſuch a quantity of the liquor as will yield ſeventy pounds of indigo, ſuch as is ſaleable; and as ſoon as the ſaid oil is thrown in, the lather ſeparates into two parts, ſo that you may obſerve a quantity curdled as milk is when ready to break; then they ceaſe working, and let it ſtand to ſettle; which when it has done ſome time, they open the pipe or cock of the veſſel, in order to let the water clear off, that the feculæ which is ſubſided may remain behind at the bottom of the veſſel like the lees of wine. Then taking it out, they put it into ſtraining bags of cloth, to ſeparate what water was left; after which they convey it into cheſts or boxes that are ſhallow, to dry it; and being dried, it is what we call indigo.

Chuſe the indigo of Serquiſſe in flat cakes, of a moderate thickneſs, neither too ſoft nor too hard, of a deep violet colour, light, and ſuch as ſwims on water, and when broken has no white ſpots in it; and laſtly, ſuch as is copperiſh or reddiſh on being rubbed with one's nail, and has the leaſt duſt and broken pieces in it.

The other ſort of indigo is alſo the feculæ made from the anil; and differs nothing from the former, but as it is made of the whole plant, ſtalk and leaf; the beſt of which kind is that which bears the name Guatimala, that comes from the Weſt Indies. In chuſing this indigo, it ſhould be as near the other kind as can be; but the ſureſt proof of its goodneſs is its burning upon the fire like wax, and leaving only a little aſhes behind. The ſecond ſort of indigo is that of St Domingo, differing nothing from the Guatimala, only that it is not of ſo lively a colour; the third is the Jamaica indigo; the fourth is that of the Leeward iſlands; all which are better or worſe, according as they are more or leſs neat and pure.

The uſe of the indigo is for the the dyer and landreſſes, ſerving the laſt to put among their linen. The painters uſe it to grind with white for painting in blue; for if it is uſed alone and neat, it turns black; ground with yellow, it makes a green; ſome confectioners and apothecaries prepoſterouſly uſe this to colour ſugars with which to make conſerves and ſyrup of violets, by adding ſome orice.

INDIVIDUAL, in logic, a particular being of any ſpecies, or that which cannot be divided into two or more beings equal or alike.

The uſual diviſion in logic is made unto genera or genus's, thoſe genera into ſpecies, and thoſe ſpecies into individuals.

INDIVISIBLE, among metaphyſicians. A thing is ſaid to be abſolutely indiviſible, that is, a ſimple being, and conſiſts of no parts into which it may be divided. Thus God is indiviſible in all reſpects, as is alſo the human mind, not having extenſion or other properties of body.

INDIVISIBLES, in geometry, the elements or principles into which any body or figure may be ultimately reſolved; which elements are ſuppoſed infinitely ſmall: thus a line may be ſaid to conſiſt of points, a ſurface of parallel lines, and a ſolid of parallel and ſimilar ſurfaces.

INDORSEMENT, in law, any thing written on the back of a deed, as a receipt for money received.

There is likewiſe an indorſement, by way of aſſignment, on bills of exchange and notes of hand; which is done by writing a perſon's name on the back thereof. See Bill.

INDUCTION, in law, is putting a clerk or clergyman in poſſeſſion of a benefice or living to which he is collated, or preſented.

INDULGENCES, in the Romiſh church, are a remiſſion of the puniſhment due to ſins, granted by the church, and ſuppoſed to ſave the ſinner from Purgatory. Clement VI. in his decretal, which is generally received by the church of Rome, declares, that our Saviour has left an infinite treaſure of merits, ariſing from his own ſufferings, beſides thoſe of the bleſſed virgin and the ſaints; and that the paſtors and guides of the church, and more eſpecially the popes, who are the ſovereign diſpoſers of this treaſure, have authority to apply it to the living by virtue of the keys, and to the dead by way of ſuffrage, to diſcharge them from their reſpective proportions of puniſhment, by taking juſt ſo much merit out of this general treaſure as they conceive the debt requires, and offering it to God.

The power of granting indulgences has been greatly abuſed in the church of Rome. It was one of the chief things which the council of Conſtance laid to the charge of John XXIII. in 1415, that he impowered his legates to abſolve penitents from all ſorts of crimes, upon the payment of ſums proportionable to their guilt. Pope Leo X. in order to carry on the magnificent ſtructure of St. Peter's at Rome, publiſhed indulgences, and a plenary remiſſion to all ſuch as ſhould contribute money towards it. Finding the project take, he gave his ſiſter, the princeſs of Cibo, the benefit of the indulgences of Saxony and the neighbouring parts, and farmed out thoſe of other countries to the higheſt bidders, who, to make the beſt of their bargains, procured the ableſt preachers to cry up the value of the ware. "Happy times for ſinners! ſays a modern writer, "their crimes were rated, and the remiſſion of them "ſet up by auction. The apoſtolic chancery taxed "ſins at a pretty reaſonable rate. It coſt but ninety "livres and a few ducats, for crimes which people on "this ſide the Alps puniſhed with death."

It was this great abuſe of indulgences that contributed not a little to the firſt reformation of religion in Germany, where Martin Luther began firſt to declaim againſt the preachers of indulgences, and afterwards againſt indulgences themſelves: but ſince that time the popes have been more ſparing in the exerciſe of this power: however, they ſtill carry on a great trade with them to the Indies, where they are purchaſed at two rials a-piece, and ſometimes more.

The pope likewiſe grants indulgences to perſons at the point of death; that is, he grants them, by a brief, power to chuſe what confeſſor they pleaſe, who is authorized thereby to abſolve them from all their ſins in general.

INDULT, in the church of Rome, the power of preſenting to benefices granted to certain perſons by the pope. Of this kind is the indult of kings and ſovereign princes in the Romiſh communion, and that of the parliament of Paris granted by ſeveral popes. By the concordat for the abolition of the pragmatic ſanction, made between Francis I. and Leo X. in 1516, the French king has the power of nominating to biſhoprics, and other conſiſtorial benefices, within his realm. At the ſame time, by a particular bull, the pope granted him the privilege of nominating to the churches of Britany and Provence. In 1648 pope Alexander VIII. and in 1668 Clement IX. granted the king an indult for the biſhoprics of Metz, Toul, and Verdun, which had been yielded to him by the treaty of Munſter; and in 1668 the ſame pope Clement IX. granted him an indult for the benefices in the counties of Rouſillon, Artois, and the Netherlands. The cardinals likewiſe have an indult granted them by agreement between pope Paul IV. and the ſacred college in 1555, which is always confirmed by the popes at the time of their election. By this treaty the cardinals have the free diſpoſal of all the benefices depending on them, and are impowered likewiſe to beſtow a benefice in commendam.

INDULTO, a duty, tax, or cuſtom, paid to the king of Spain for all ſuch commodities as are imported from the Weſt Indies in the galleons.

INDUS, a large river of Aſia, which riſes in the mountains which ſeparate Tartary from India, and diſcharges itſelf into the India ocean.

INERTIA *of matter*, in philoſophy, is defined by Sir Iſaac Newton to be a paſſive principle by which bodies perſiſt in their motion or reſt, receive motion in proportion to the force impreſſing it, and reſiſt as much as they are reſiſted. It is alſo defined by the ſame author to be a power implanted in all matter, whereby it reſiſts any change endeavoured to be made in its ſtate. See Mechanics.

INFALLIBLE, ſomething that cannot err, or be deceived.

One of the great controverſies between the Proteſtants and Papiſts, is the infallibility which the latter attribute to the pope; though, in fact, they themſelves are not agreed on that head, ſome placing this pretended infallibility in the pope and a general council.

INFAMY, in law, is a term which extends to forgery, perjury, groſs cheats, *&c.* by which a perſon is rendered incapable of being a witneſs or juror, even tho' he is pardoned for his crimes.

INFANT, denotes a young child. See Midwifery, and Medicine.

INFANTE, and Infanta, all the ſons and daughters of the kings of Spain and Portugal, except the eldeſt; the princes being called infantes, and the princeſſes infantas.

INFANTRY, in military affairs, denotes the whole body of foot-ſoldiers.

INFECTION, among phyſicians. See Contagion.

INFEFTMENT, in Scots law, the ſolemnity of the delivery of an heretable ſubject to the purchaſer. See Law, tit. 10.

INFINITE, that which has neither beginning nor end: in which ſenſe God alone is infinite.

Infinite is alſo uſed to ſignify that which has had a beginning, but will have no end, as angels and human ſouls. This makes what the ſchoolmen call *infinitum a parte poſt;* as, on the contrary, by *infinitum a parte ante*, they mean that which has an end but had no beginning.

Infinite quantities. The very idea of magnitudes infinitely great, or ſuch as exceed any aſſignable quantities, does include a negation of limits: yet if we nearly examine this notion, we ſhall find that ſuch magnitudes are not equal among themſelves, but that there are really, beſides infinite length and infinite area, three ſeveral ſort of infinite ſolidity; all of which are *quantitates ſui generis*, and that thoſe of each ſpecies are in given proportions.

Infinite length, or a line infinitely long, is to be conſidered either as beginning at a point, and ſo infinitely extended one way, or elſe both ways from the ſame point; in which caſe the one, which is a beginning infinity, is the one half of the whole, which is the ſum of the beginning and ceaſing infinity; or, as may be ſaid, of infinity *a parte ante* and *a parte poſt*, which is analogous to eternity in time and duration, in which there is always as much to follow as is paſt, from any point or moment of time; nor doth the addition or ſubduction of finite length, or ſpace of time, alter the caſe either in infinity or eternity, ſince both the one or the other cannot be any part of the whole.

INFINITESIMALS, among mathematicians, are defined to be infinitely ſmall quantities.

In the method of infiniteſimals, the element, by which any quantity increaſes or decreaſes, is ſuppoſed to be infinitely ſmall, and is generally expreſſed by two or more terms, ſome of which are infinitely leſs than the reſt, which being neglected as of no importance, the remaining terms form what is called the difference of the propoſed quantity. The terms that are neglected in this manner, as infinitely leſs than the other terms of the element, are the very ſame which ariſe in conſequence of the acceleration, or retardation, of the generating motion, during the infinitely ſmall time in which the element is generated; ſo that the remaining terms expreſs the elements that would have been produced in that time, if the generating motion had continued uniform: therefore thoſe differences are accurately in the ſame ratio to each other as the generating motions or fluxions. And hence, though in this method infiniteſimal parts of the elements are neglected, the concluſions are accurately true without even an infinitely ſmall error, and agree preciſely with thoſe that are deduced by the method by fluxions. See FLUXIONS.

INFIRMARY, a kind of hoſpital, where the weak and ſickly are properly taken care of.

INFLAMMABILITY, that property of bodies which diſpoſes them to kindle, or catch fire. See FIRE.

INFLAMMATION. See MEDICINE and SURGERY.

INFLECTION, or *Point of* INFLECTION, in the higher geometry, is a point where a curve begins to bend a contrary way.

INFLECTION, in grammar, the variation of nouns and verbs, by declenſion and conjugation.

INFLUENCE, a quality ſuppoſed to flow from the heavenly bodies, either with their light or heat; to which aſtrologers idly aſcribe all ſublunary events.

INFORMATION, in law, is nearly the ſame in the crown-office, as what in other courts is called a declaration. It is ſometimes brought by the king, or his attorney general, or the clerk of the crown-office; and at other times by a private perſon, who informs or ſues, as well for the king as himſelf, upon the breach of ſome popular ſtatute, in which a penalty is given to the party that will ſue for it.

INFRACTION, a term chiefly uſed to ſignify the violation of a treaty.

INFRA-SCAPULARIS, in anatomy. See ANATOMY, p. 196.

INFRA-SPINATUS, in anatomy. See ANATOMY, p. 195.

INFULA, in antiquity, a broad kind of fillet, made of white wool, which the prieſts uſed to tie round their heads.

INFUNDIBULIFORM, in botany, an appellation given to ſuch monopetalous or one-leaved flowers, as reſemble a funnel in ſhape, or which have a narrow tube at one end, and gradually widen towards the limb or mouth.

INFUSION, in pharmacy, a method of obtaining the virtues of plants, roots, *&c.* by ſteeping them in a hot or cold liquid.

Hot infuſions are made by pouring boiling water, or any other menſtruum, on the drugs whoſe virtues we would extract: thus, in order to obtain the common infuſion of ſena, take the leaves of ſena, an ounce and a half; of cryſtals of tartar, three drams; of the leſſer cardamom-ſeeds huſked, two drams: boil the cryſtals of tartar in a pint of water, till they are diſſolved; then pour the water, while boiling hot, upon the ſena and the reſt; and when the liquor is cold, ſtrain it off.

INGELSHEIM, a town of Germany, in the palatinate of the Rhine, eight miles ſouth-weſt of Mentz, E. long. 7° 40′, N. lat. 50°.

INGLUVIES, the crop or craw of graniverous birds, ſerving for the immediate reception of the food, where it is macerated for ſome time, before it is tranſmitted to the true ſtomach.

INGOLSTAT, a town of Germany, in the circle of Bavaria, ſituated on the river Danube, thirty miles weſt of Ratiſbon: E. long. 11° 30′, and N. lat. 48° 45′.

INGOT, a maſs of gold or ſilver, melted down and caſt in a mould, but not coined or wrought.

INGRAFTING, in gardening. See GARDENING.

INGRESS, in aſtronomy, ſignifies the ſun's entering the firſt ſcruple of one of the four cardinal ſigns, eſpecially Aries.

INGRIA, a province of Ruſſia, bounded by the lake Ladoga, the river Nieva, and the gulph of Finland on the north, by Novogorod on the eaſt and ſouth, and by Livonia on the weſt.

INGROSSER, one who buys up great quantities of any commodity, before it comes to market, in order to raiſe the price.

INGUEN, in anatomy, the ſame with what is otherwiſe called groin, or pubes.

INHERITANCE, a perpetual right or intereſt in lands, inveſted in a perſon and his heirs.

INHIBITION, in Scots law, a diligence obtained at the ſuit of a creditor againſt his debtor, prohibiting him from ſelling or contracting debts upon his eſtate to the creditor's prejudice. See LAW, tit. 18.

INHUMATION, in chemiſtry, a method of digeſting ſubſtances by burying the veſſel in which they are contained in horſe-dung or earth.

INJECTION, the forcibly throwing certain liquid medicines into the body, by means of a ſyringe, tube, clyſter-pipe, or the like.

Anatomical INJECTION, the filling the veſſels with ſome coloured ſubſtance, in order to make their figures and ramifications viſible.

For this purpoſe, a fine red injection is prepared thus: pour a pint of oil of turpentine on three ounces of vermilion, ſtir them well together, and then ſtrain all through a fine linen-cloth. If a green injection is wanted, diſtilled verdigreaſe may be uſed inſtead of the vermilion.

A coarſe injection may be made of one pound of tallow, five ounces of white-wax, three ounces of oil of olives, melted together, and adding two ounces of venice-turpentine; and when this is diſſolved, three ounces of vermilion or verdigreaſe are to be throughly mixed with the other ingredients, and the whole ſtrained through a linen cloth.

INJURY, any wrong done to a man's perſon, reputation, or goods.

INK, a black liquor generally made of an infuſion of galls, copperas, and a little gum arabic.

To make a very good ink for writing: take three ounces of good galls, reduced to powder; which infuſe in three pints of river or rain-water, ſetting it in the ſun or a gentle heat, for two days; then take common copperas, or green vitriol, three ounces; powder it, put it into the infuſion, and ſet it in the ſun for two days more; laſtly, ſhake it well, and add an ounce of good gum arabic.

To make the London powder-ink: take ten ounces of the cleareſt nut-galls, which reduce to a fine powder; then add two ounces of white copperas, four ounces of Roman vitriol, and of gum arabic or ſandarach an ounce; pound and ſift them very fine. This powder, though whitiſh itſelf, will, when put into water, turn it to a good black ink: an ounce of the powder ſerves to make a pint of ink.

To make a ſhining ink: take gum arabic and Roman vitriol, of each an ounce; galls well bruiſed, a pound; put them into rape-vinegar, or vinegar made of clear ſmall beer; ſet them in a warm place, ſtir them often till the liquor becomes black, and then add to a gallon of this preparation an ounce of ivory-black, and a quarter of a pint of ſeed-lac varniſh.

To make a ſhining Japan or China ink: take an ounce of lamp-black, and clarify it in an earthen pipkin to take out the droſs; two drams of indigo; half a dram of peach black; one dram of black endive, burnt; reduce them to a very fine powder, and then take a moiety of fig-leaf water, another part of milk, and a very little gum arabic; and mixing all the ingredients well together, make them up for uſe.

Printing **INK** is made by boiling or burning linſeed-oil till it is pretty thick, adding a little roſin to it while hot, and then mixing this varniſh with lamp-black.

INK is alſo an appellation given to any coloured liquor, uſed in the ſame manner as the atramentum or black ink; as red, green, blue, yellow, *&c.* inks.

Red ink is made thus: take wine-vinegar a pint; raſpings of brazil, one ounce; alum, half an ounce; boil them gently, and add five drams of gum arabic: diſſolve the gum, ſtrain the ingredients, and keep the liquid for uſe.

Green ink is made by boiling verdigreaſe with argol in fair water, and adding a little gum arabic.

Blue ink is made by grinding indigo with honey and the white of eggs, and making it fluid with water.

Yellow ink is made by an infuſion of ſaffron in water, with a little alum and gum arabic.

Sympathetic **INK**, a liquor with which a perſon may write, without the letters appearing, till ſome means be taken to render them legible.

Of this kind are the glutinous juices of plants, or any other thick and viſcid fluids, provided they have no remarkable colours themſelves; for being written on white paper, nothing will appear, till ſome fine powder of any coloured earth is thrown over the paper, whereby the letters become legible: the reaſon of this is evident, as the powder ſticks only to the letters formed by the inviſible but viſcid liquor.

Another ſort of ſympathetic inks are made of infuſions, the matter of which eaſily burns to a charcoal: thus if a ſcruple of ſal armoniac be diſſolved in two ounces of fair water, letters written therewith will be inviſible till held before the fire; for the ſal armoniac being burnt to a charcoal, by a heat not ſtrong enough to ſcorch the paper, the letters are thereby rendered viſible.

Another ſort of ſympathetic ink is made of a ſolution of lead in vinegar, and a lixivium of lime and orpiment; for if a letter be written with the former, nothing will appear: but to conceal the affair ſtill more, ſome different ſubject may be written above it, with a black ink made of burnt cork and gum-water; then, if a pice of cotton, wetted with the ſaid lixivium, be rubbed over the paper, the ſentence that was viſible will diſappear, and the inviſible one before written with the ſolution of lead will be ſeen in its place very black and ſtrong.

INN, a place appointed for the entertainment and relief of travellers.

INNS *of Court*, are colleges in London, for the ſtudy of the laws of England, with all conveniencies for the lodging and entertainment of the profeſſors and ſtudents.

The four principal inns of court are the Inner-temple, Middle-temple, Lincoln's inn, and Gray's inn; the other inns are the two ſerjeant's inns; and the others, which are leſs conſiderable, are Clifford's inn, Symond's inn, Clement's inn, Lion's inn, Furnival's inn, Staple's inn, Thavie's inn, Barnard's inn, and New-inn. Theſe are moſtly taken up by attorneys, ſolicitors, *&c.* but they belong to the inns of court, who ſend yearly ſome of their barriſters to read to them.

INN, in geography, a large river which riſes in a mountain of the Alps, in the country of the Griſons, runs north-eaſt through Tyrol and Bavaria, and diſcharges itſelf into the Danube.

INNATE IDEAS, thoſe ſuppoſed to be ſtamped on the mind from the firſt moment of its exiſtence, and which it conſtantly brings into the world with it: a doctrine, which Mr. Locke has abundantly refuted.

INNERKEITHING, a port-town of Scotland, in the county of Fife, ſituated on the north ſhore of the frith of Forth, ten miles north-weſt of Edinburgh.

INNISKILLING, a ſtrong town of Ireland, in the province of Ulſter, and county of Fermanagh: W. long. 7° 50′, and N. lat. 54° 20′.

INNOCENTS DAY, a feſtival of the Chriſtian church, obſerved on December 28, in memory of the maſſacre of the innocent children by the command of Herod king of Judea; who being alarmed at hearing that an infant was born king of the Jews, and imagining that his own kingdom was in danger, ſent orders to have all the children ſlain that were in Bethlehem and the adjacent country.

The Greek church in their calendar, and the Abyſſinians of Ethiopia in their offices, commemorate fourteen thouſand infants on this occaſion.

INNOMINATA ossa, in anatomy. See Anatomy, p. 171.

INOCULATION, in medicine, the art of tranſplanting a diſtemper from one ſubject to another, by inciſion, particularly uſed for engrafting the ſmall pox. See Medicine.

INOSCULATION, in anatomy. See Anastomasis.

INQUEST, in Scots law, the ſame with jury.

INQUISITION, in the church of Rome, a tribunal in ſeveral Roman-catholic countries, erected by the popes for the examination and puniſhment of heretics.

This court was founded in the twelfth century by father Dominic and his followers, who were ſent by pope Innocent III. with orders to excite the catholic princes and people to extirpate heretics, to ſearch into their number and quality, and to tranſmit a faithful account thereof to Rome. Hence they were called inquiſitors; and this gave birth to the formidable tribunal of the inquiſition, which was received in all Italy, and the dominions of Spain, except the kingdom of Naples and the Low Countries.

This diabolical tribunal takes cognizance of hereſy, Judaiſm, Mahometaniſm, Sodomy, and polygamy; and the people ſtand in ſo much fear of it, that parents deliver up their children, huſbands their wives, and maſters their ſervants, to its officers, without daring in the leaſt to murmur. The priſoners are kept for a long time, till they themſelves turn their own accuſers, and declare the cauſe of their impriſonment; for they are neither told their crime, nor confronted with witneſſes. As ſoon as they are impriſoned, their friends go into mourning, and ſpeak of them as dead, not daring to ſolicit their pardon, leſt they ſhould be brought in as accomplices. When there is no ſhadow of proof againſt the pretended criminal, he is diſcharged, after ſuffering the moſt cruel tortures, a tedious and dreadful impriſonment, and the loſs of the greateſt part of his effects. The ſentence againſt the priſoners is pronounced publicly, and with extraordinary ſolemnity. In Portugal they erect a theatre capable of holding three thouſand perſons, in which they place a rich altar, and raiſe ſeats on each ſide in the form of an amphitheatre. There the priſoners are placed, and over-againſt them is a high chair, whither they are called, one by one, to hear their doom, from one of the inquiſitors.

Theſe unhappy people know what they are to ſuffer, by the cloaths they wear that day. Thoſe who appear in their own cloaths, are diſcharged upon payment of a fine: thoſe who have a ſanto benito, or ſtrait yellow coat without ſleeves, charged with St. Andrew's croſs, have their lives, but forfeit all their effects: thoſe who have the reſemblance of flames, made of red ſerge, ſewed upon their ſanto benito, without any croſs, are pardoned, but threatened to be burnt if ever they relapſe: but thoſe who, beſides theſe flames, have on their ſanto benito their own picture, ſurrounded with figures of devils, are condemned to expire in the flames. The inquiſitors, who are eccleſiaſtics, do not pronounce the ſentence of death; but form and read an act, in which they ſay, that the criminal being convicted of ſuch a crime, by his own confeſſion, is with much reluctance delivered to the ſecular power to be puniſhed according to his demerits: and this writing they give to the ſeven judges, who attend at the right ſide of the altar, who immediately paſs ſentence. For the concluſion of this horrid ſcene, ſee Act *of faith*.

INSCRIBED, in geometry. A figure is ſaid to be inſcribed in another, when all its angles touch the ſide or planes of the other figure.

INSCRIPTION, a title or writing carved, engraved, or affixed to any thing, to give a more diſtinct knowledge of it, or to tranſmit ſome important truth to poſterity.

The inſcriptions mentioned by Herodotus and Diodorus Siculus, ſufficiently ſhew that this was the firſt method of conveying inſtruction to mankind, and tranſmitting the knowledge of hiſtory and ſciences to poſterity: thus the ancients engraved upon pillars both the principles of ſciences, and the hiſtory of the world. Piſiſtratus carved precepts of huſbandry on pillars of ſtone; and the treaties of confederacy between the Romans and Jews, were engraved on plates of braſs. Hence, antiquarians have been very curious in examining the inſcriptions on ancient ruins, coins, medals, *&c.*

INSECTS, in zoology, a numerous claſs of animals. See Natural History.

INSERTION, in anatomy, the cloſe conjunction of the veſſels, tendons, fibres, and membranes of the body with ſome other parts.

INSIPID, an appellation given to things without taſte.

INSOLATION, in chemiſtry, the ſuffering matters to ſtand and digeſt in the heat of the ſun, inſtead of that of a furnace.

INSOLVENT, a term applied to perſons unable to pay their debts.

INSPIRATION, among divines, implies the conveying of certain extraordinary and ſupernatural notices or motions into the ſoul.

INSPISSATING, in pharmacy, an operation whereby a liquor is brought to a thicker conſiſtence, by evaporating the thicker parts.

INSPRUCK, a city of Germany, in the circle of Auſtria, capital of the county of Tyrol, ſituated on the river Inn, in E. long. 11° 26′, N. lat. 47° 12′.

INSTALLMENT, the inſtating or eſtabliſhing a perſon in ſome dignity.

INSTANT, ſuch a part of duration wherein we perceive no ſucceſſion; or it is that which takes up the time only of one idea in our minds.

INSTAURATION, the re eſtabliſhment or reſtauration of a religion, a church, or the like, to its former ſtate.

INSTEP, in the manege, is that part of a horſe's hind leg which reaches from the ham to the paſtern-joint.

INSTINCT, an appellation given to the ſagacity and natural inclinations of brutes, which ſupplies the place of reaſon in mankind.

INSTITUTES, in literary hiſtory, a book containing the elements of the Roman law, and conſtitutes the laſt part of the civil-law.

The Inſtitutes are divided into four books, and contain an abridgment of the whole body of the civil law; being deſigned for the uſe of ſtudents.

INSTITUTE, in Scots law. When by diſpoſition, or deed of entail, a number of perſons are called to the ſucceſſion of an eſtate one after another, the perſon firſt named is called the inſtitute, and the others ſubſtitutes. See LAW, tit. 27.

INSTITUTION, in general, ſignifies the eſtabliſhing or founding ſomething.

In the canon and common law, it ſignifies the inveſting a clerk with the ſpiritualities of a rectory, &c. which is done by the biſhop, who uſes the formula, "I inſtitute you rector of ſuch a church, with cure of "ſouls, and receive your care and mine."

INSTRUMENT, in general, whatever is ſubſervient to a cauſe in producing any effect.

A common caſe of mathematical inſtruments contains ſeveral compaſſes, a ſector, ſcale, drawing-pen, and protractor.

Notorial INSTRUMENT, in Scots law, any fact certified in writing, under the hand of a notary-public. See LAW, tit 21.

INSULATED, in architecture, an appellation given to ſuch columns as ſtand alone, or free from any contiguous wall, &c. like an iſland in the ſea; whence the name.

INSURANCE, in law and commerce, a contract or agreement whereby one or more perſons, called inſurers, aſſurers, &c. oblige themſelves to anſwer for the loſs of a ſhip, houſe, goods, &c. in conſideration of a premium paid by the proprietors of the things inſured.

Inſurances are of various kinds, as on ſhips or parts of ſhips, on merchandize ſingly, and on ſhips and goods jointly: and theſe are again branched out to run either for a time ſtipulated, or to one ſingle port, or out and home, with liberty to touch at the different places mentioned in the policy. Inſurances may likewiſe be made on goods ſent by land, or by hoys, &c. on rivers; and this is frequently done, more eſpecially on jewels, and other things of great value.

The principal offices for the inſurance of ſhips and merchandize in London, are the Royal-exchange aſſurance, and the London aſſurance, both of which are eſtabliſhed by act of parliament. Theſe offices alſo inſure houſes and other buildings, goods, wares, and merchandize, from loſs or damage by fire; and the former of them alſo aſſure lives.

The Royal-exchange inſurance, on a brick or ſtone building, inſures any ſum not exceeding 200 l. at 5s. *per ann.* and any larger ſum not exceeding 1000 l. after the rate of 2 s. 6 d. *per cent. per ann.* Above 1000 l. and not exceeding 2000 l. at 3 s. *per cent.* Above 2000 l. and not exceeding 3000 l. at 4 s. *per cent.* On goods and merchandize, the property of the aſſured, within any brick or ſtone building, or on the goods and building together, this office inſures any ſum not exceeding 300 l. for 7 s 6 d. *per ann.* and larger ſums after the rates above-mentioned: but timber or plaſter-buildings, or goods or merchandize therein, pay 8 s. *per ann.* for 200 l. and after the rate of 4 s. *per cent.* for any greater ſum not exceeding 1000 l. and 5 s. *per cent.* for all inſurances above 1000 l. and not exceeding 2000 l. On a timber or plaſter-building with goods and merchandize together, any ſum, not exceeding 300 l. may be inſured for 12 s. *per ann.* and larger ſums at the above rates. The goods belonging to hazardous trades, as diſtillers, chemiſts, apothecaries, colour-men, tallow-chandlers, oilmen, innholders, &c. depoſited in brick houſes, pay 8 s. *per ann.* for inſuring 200 l. and after the rate of 4 s. *per cent.* for any greater ſum not exceeding 1000 l; and above 1000 l. and not exceeding 2000 l. 5 s. *per cent.* but when the houſes and goods are put together, the price of inſurance is 4 s. *per cent. per ann.* without any other charge except the policies.

The Friendly Society inſurance, has ſome very extraordinary regulations; the principal of which is, that every one of the aſſured becomes a member of the ſociety; and when any loſs happens, contributes in proportion to the ſum he has inſured, to make good the damage; on which account he pays only 1s. 4d. *per cent. per ann.* premium, and 6s. 8d. *per cent.* as a caution; but what is unexpended of the 6s. 8d. is returned to the party inſured at the end of ſeven years.

We have alſo inſurances for lives, in virtue of which, when the perſon inſured dies, a ſum of money becomes payable to the perſon on whoſe behalf the policy of inſurance was granted. The principal inſurance-office of this kind, is that of the Amicable Society for a perpetual aſſurance, kept in Serjeant's inn, Fleet-ſtreet, London.

In this office, after paying the charges of the policy, and 10s. entrance-money, each perſon pays 5 l. *per annum*, by quarterly payments; and from theſe payments the dividends, which uſually amount to 100 l. and upwards, are to ariſe. All perſons admitted are to be between the ages of twelve and forty-five, and in a good ſtate of health. Any perſon is allowed to have two or three inſurances or numbers on the ſame life, whereby ſuch perſon will be intitled to a claim on each number ſo inſured; and every claimant is impowered to put in a new life, in the room of one deceaſed, within twelve kalendar months next after the end of the current year. By becoming members of this ſociety, clergymen, phyſicians, lawyers, tradeſmen, and all whoſe income ceaſes at the time of their death, may, in all probability, leave to their families a claim of not leſs than 100 l. for every 5 l. anually paid in.

INTAGLIOS, precious ſtones on which are engraved the heads of great men, inſcriptions, and the like; ſuch as we frequently ſee ſet in rings, ſeals, &c.

INTEGER, in arithmetick, a whole number, in contradiſtinction to a fraction.

INTERCALARY, an appellation given to the odd day inſerted in leap-year; which was ſo called from *calo*, *calare*, to proclaim, it being proclaimed by the prieſts with a loud voice.

INTERCOLUMNIATION, in architecture, denotes the ſpace between two columns, which is always to be proportioned to the height and bulk of the columns. See ARCHITECTURE.

INTERCOSTAL, in anatomy, an appellation given to ſuch muſcles, nerves, arteries and veins as lie between the ribs. See ANATOMY, Part II.

INTERDICT, an eccleſiaſtical cenſure, by which the church of Rome forbids the performance of divine ſervice in a kingdom, province, town, *&c.*

INTERDICTION, in Scots law, a legal reſtraint laid upon weak or profuſe perſons from ſigning any deed to their own prejudice, without the conſent of curators or interdictors. See SCOTS LAW, tit. 7.

INTEREST, is the premium or money paid for the loan or uſe of money; and is diſtinguiſhed into two kinds, ſimple and compound.

Simple intereſt is that which is paid for the principal, or ſum lent, at a certain rate or allowance made by law, or agreement of parties, whereby ſo much as 5 l. or 6 l. or any other ſum, is paid for 100 l. lent out for one year; and more or leſs proportionally for greater or leſſer ſums, and for more or leſs time. For example, if it is 5 l. to 100 l. for one year, it is 2 l. 10 s. for half a year, and 10 l. for two years: alſo 10 l. for one year of 200 l. and 5 l. for half a year; and ſo on, for other ſums and times. Thus, as the law, or agreement of parties, fixes a certain ratio, or, as we call it, rate of intereſt, which is ſo much on the 100 l. for one year; from this we can eaſily find the proportional intereſt on 1 l. for one year, being plainly the $\frac{1}{100}$ part of the intereſt of 100 l. ſo if this is 5 l. that is .05 l. if this is 6 l. that is .06 l. and if this is 5 l. 10 s. or 5.5 l. that is .055 l. Wherefore, if we underſtand the rate of intereſt to be the intereſt of 1 l. for one year, the more common queſtions about ſimple intereſt will relate to theſe four things, *viz.* any principal ſum, its intereſt, the time in which it gives that intereſt, and the rate, or intereſt of 1 l. for one year; according to which, that principal, intereſt, and time, are adjuſted to one another.

From which we have four problems; in the rules whereof we ſuppoſe the principal and intereſt expreſſed in the denomination of pounds, by reducing what is leſs than 1 l. to a decimal of 1 l. and the time to be expreſſed in years, and decimal parts of one year.

Prob I. Having any principal, ſum, and time, with the rates of intereſt given, to find the intereſt of that ſum for that time and rate.

Rule: Multiply the principal rate, and time, continually into one another; the product is the intereſt ſought.

Obſerve, if we expreſs the principal by p, the intereſt by n, the time by t, and the rate by r, then this rule is thus repreſented, $n=tpr$.

Example: The rate of intereſt being .05 l. what is the intereſt of 85 l. for 4 years and 3 quarters, or 4.75 years?

Anſwer. 20 l. 3 s. 9 d. = 20.1875 l. = 85 × 4.75 × .05.

Which is thus performed:

$$\begin{array}{r} 85=p \\ 4.75=t \\ \hline 425 \\ 595 \\ 340 \\ \hline 403.75 \\ .05=r \\ \hline 20.1875 \text{ pounds.} \end{array}$$

Which decimal is reduced by multiplying it by 20, 12, and 4: thus,

$$\begin{array}{r} .1875 \\ 20 \\ \hline 3.7500 \text{ ſhillings} \\ 12 \\ \hline 15000 \\ 7500 \\ \hline 9.0000 \text{ pence} \end{array}$$

Prob. II. Having the rate, principal and intereſt, to find the time.

Rule: Divide the intereſt by the product of the rate and principal, the quote is the time: thus, $t=\frac{n}{rp}$.

Example: The rate .05 l. principal 85 l. intereſt 20 l. 3 s. 9 d. or 20.1875 l. the time is 4.75 years, or 4 ¾ years. Thus, $4.75=\frac{20.1875}{85\times .05}$, or $\frac{20.1875}{4.25}$.

Demonſtration: This rule is deduced from the former; thus, ſince $n=trp$, then dividing both ſides by rp, it is $\frac{n}{rp}=t$.

Prob. III. Having the principal, intereſt, and time, to find the rate.

Rule: Divide the intereſt by the product of principal and time, the quote is the rate: thus, $\frac{n}{tp}=r$.

Example: $n=20.1875$ l. $t=4.75$ years, $p=85$ l. then is $r=.05$ l. $=\frac{20.1875}{4.75\times 85}$, or $\frac{20.1875}{403.75}$.

Demonſtration: Since $n=trp$, divide both by tp; it is $\frac{n}{tp}=r$.

Prob. IV. Having the rate, time and intereſt, to find the principal.

Rule: Divide the intereſt by the product of rate and time, the quote is the principal; thus, $\frac{n}{tr}=p$.

Example: $n=20.1875$ l. $t=4.75$ years, $r=.05$ l. then is $p=85$ l. $=\frac{20.1875}{4.75\times 05}$, or $\frac{20.1875}{.2375}$.

Demonſtration: Since $n=trp$, divide both ſides by tr, the quote is $\frac{n}{tr}=p$.

Scholium: If the intereſt of any ſum for any time is added to the principal, this total or ſum is called the amount, (*viz.* of the principal and its intereſt for that time.) And then from theſe four things, *viz.* the amount, which we call a, the principal, the time, and rate, ariſe four problems; for having any three of theſe, the fourth may always be found. Thus,

Prob. V. Having the principal, time, and rate, to find the amount.

Rule: Find the intereſt by prob. I. add it to the principal, the ſum is the amount.

Thus, by prob. I. the intereſt is ptr: therefore the amount is $a=ptr+p$. The reaſon is evident.

Note: Becauſe $ptr=rt\times p$, and $p=1\times p$; therefore $rtp+p=\overline{rt+1}\times p=a$. And ſo the rule may be expreſſed thus; To the product of the rate and time add unity, and multiply the ſum by the principal, the product is the amount.

Example: What is the amount of 246l. principal in 2 years and ½, or 2.5 years, the rate of intereſt being .05l? Anſwer 246l.+30.75l.=276l. 15s. for the intereſt is=246×.05×2.5=30.75l. Or thus; .05×2.5=.125l. to which add 1, it is 1+.125l. which multiplied by 276, produces 276.75l.

Prob. VI. Given the principal, amount, and time, to find the rate.

Rule: Take the difference betwixt the principal and amount, and divide it by the product of the time and principal, the quote is the rate: thus, $r=\frac{a-p}{tp}$.

Example: Suppoſe $a=276.75$ l. $p.=246$, $t=2.5$ years; then is $r=.05$ l.$=\frac{276.75-246}{2.5\times 246}=\frac{30.75}{615}$.

Demonſtration: Since by prob. V. $a=trp+p$, take p from both ſides, it is $a-p=trp$; then divide both by tp, it is $\frac{a-p}{tp}=r$.

Prob. VII. Given the amount, principal, and rate, to find the time.

Rule: Take the difference of the amount and principal, and divide it by the product of the principal and rate, the quote is the time: thus $t=\frac{a-p}{rp}$.

Example: Suppoſe $a=276.75$ l. $p=246$ l. $r=.05$; then is $t=2.5$ years$=\frac{276.75\text{ l.}-246}{246\times .05}=\frac{30.75}{12.3}$.

Demonſtration: In the laſt problem, $a-p$ was equal to trp; and dividing both by rp, it is $\frac{a-p}{rp}=t$.

Prob. VIII. Given the amount, rate, and time, to find the principal.

Rule: Add 1 to the product of the rate and time, and by that ſum divide the amount, the quote is the principal: thus, $p=\frac{a}{rt+1}$.

Example: $a=276.75$ l. $r=.05$ l. $t=2.5$ years; then is $p=246=\frac{276.75}{2.5\times .05+1}=\frac{276.75}{1.125}$.

Demonſtration: By prob. V. it is $a=\overline{rt+1}\times p$; therefore dividing both ſides by $\overline{rt+1}$, it is $\frac{a}{rt+1}=p$.

Compound **INTEREST**, is that which is paid for any principal ſum, and the ſimple intereſt due upon it for any time, accumulated into one principal ſum. Example: if 100l. is lent out for one year at 6l. and if at the end of that year the 6l. due of intereſt be added to the principal, and the ſum 106l. be conſidered as a new principal bearing intereſt for the next year (or whatever leſs time it remains unpaid) this is called compound intereſt, becauſe there is intereſt upon intereſt, which may go on by adding this ſecond year's intereſt of 106l. to the principal 106l. and making the whole a principal for the next year.

Now, although it be not lawful to let out money at compound intereſt, yet in purchaſing of annuities or penſions, *&c.* and taking leaſes in reverſion, it is very uſual to allow compound intereſt to the purchaſer for his ready money; and therefore, it is very neceſſary to underſtand it.

Let therefore, as before, p=the principal put to intereſt; t=the time of its continuance; a=the amount of the principal and intereſt; R=the amount of 1l. and its intereſt for one year, at any given rate, which may be thus found.

Viz. 100 : 106 : : 1 : 1,06=the amount of 1l. at 6 *per cent.* Or 100 : 105 : : 1 : 1,05=the amount of 1l. at 5 *per cent.* And ſo on, for any other aſſigned rate of intereſt.

Then if

R =amount of 1l. for 1 year, at any rate.
R^2=amount of 1l. for 2 years.
R^3=amount of 1l. for 3 years.
R^4=amount of 1l. for 4 years.
R^5=amount of 1l. for 5 years.

Here $t=5$. For $1 : R :: R : RR :: RR : RRR :: RRR :: R^4 : R^4 :: R^5$: *&c.* in a geometrical progreſſion continued; that is, as 1l. : is to the amount of 1l. at 1 years's end : : ſo is that amount : to the amount of 1l. at 2 years end, *&c.* Whence it is plain, that compound intereſt is grounded upon a ſeries of terms, increaſing in geometrical proportion continued; wherein t (*viz.* the number of years) does always aſſign the index of the laſt and higheſt term, *viz.* the power of R, which is R^t.

Again, as $1 : R^t :: p : pR^t=a$ the amount of p for the time, that R^t=the amount of 1l. That is, as 1l. : is to the amount of 1l. for any given time : : ſo is any propoſed principal, or ſum : to its amount for the ſame time.

From what has been ſaid, we preſume, the reaſon of the followings theorems will be very eaſily underſtood.

Theorem I. $pR^t=a$, as above.

From hence the two following theorems are eaſily deduced.

Theorem II. $\frac{a}{R^t}=p$.

Theorem III. $\frac{a}{p}=R^t$.

By theſe three theorems, all queſtions about compound intereſt may be truly reſolved by the pen only, *viz.* without tables: though not ſo readily as by the help of tables calculated on purpoſe.

Example I. What will 256l. 10s. amount to in 7 years, at 5 *per cent. per annum*, compound intereſt?

Here is given $p=256\ 5$, $t=7$, and $R=1.05$, which being involved until its index $=t$ (*viz.* 7) will become $R^7=1.40710$. Then $1.40710\times 256.5=360.92115$ $=a=$ 360l. 18 s. 5 d. which is the anſwer required.

Example II. What principal or ſum of money muſt be put out to raiſe a ſtock of 360l. 18s. 5d. in ſeven years, at 5 *per cent. per annum*, compound intereſt.

Here is given $a=360.92115$, $R=5.07$ and $t=7$ to find p by theorem II. Thus $R^t=1.40710$ (360.92115 $=a$) $256.5=p$. That is, $p=$ 256l. 10s. which is the ſum or principal required.

Example III. In what time will 256l. 10s. raiſe a ſtock of (or amount to) 360l. 18s. 5d. allowing 5 *per cent. per annum*, compound intereſt?

Here is given $p=256\ 5$, $a=360.92115$, $R=1.05$. To find t by theorem III. $R^t=\frac{a}{p}=\frac{360.92115}{256}=$ 1.40710. which being continually divided by $R=1.05$ until nothing remain, the number of thoſe diviſions will be $=7=t$.

Thus 1.05) 1.40710 (1,3400, and 1.05) (1.3400) 1.2762, and 1.05(1.2762) 1.2155, and ſo on until it becomes 1.05) 1.05 (1. which will be at the ſeventh diviſion.

Therefore it will be $t=7$, the number of years required by the queſtion.

INTERJECTION, in grammar, an indeclinable part of ſpeech, ſignifying ſome paſſion or emotion of the mind. See Grammar.

INTERIM, a name given to a formulary, or kind of confeſſion of the articles of faith, obtruded upon the Proteſtants after Luther's death by the emperor Charles V. when he had defeated their forces; ſo called becauſe it was only to take place in the interim (mean time) till a general council ſhould have decided all points in diſpute between the Proteſtants and Romaniſts. It retained moſt of the doctrines and ceremonies of the Romaniſts, excepting that of marriage, which was allowed to prieſts, and communion to the laity under both kinds. Moſt of the Proteſtants rejected it. There were two other interims, one of Leipſic, the other of Franconia.

INTERLOCUTOR, in Scots law. The ſentence or judgment of a court of law, is commonly called an interlocutor before decree is extracted.

INTERLOPERS, are properly thoſe who, without due authority, hinder the trade of a company or corporation lawfully eſtabliſhed, by dealing in the ſame way.

INTERLUDE, an entertainment exhibited on the theatre between the acts of a play, to amuſe the ſpectators while the actors take breath and ſhift their dreſs, or to give time of changing the ſcenes and decorations.

INTERMITTENT, or intermitting fevers, ſuch fevers as go off and ſoon return again, in oppoſition to thoſe which are continual. See Medicine.

INTEROSSEUS, in anatomy. See Anatomy, p. 202.

INTERPOLATION, among critics, denotes a ſpurious paſſage inſerted into the writings of ſome ancient author.

INTERREGNUM, the time during which the throne is vacant in elective kingdoms; for in ſuch as are hereditary, like ours, there is no ſuch thing as an interregnum.

INTERREX, the magiſtrate who governs during an interregnum.

INTERMENT. See Burial.

INTERROGATION, or *Point of* Interrogation, in grammar, a character of this form (?) ſerving to denote a queſtion.

INTERVAL, in muſic, the difference between two ſounds, in reſpect of acute and grave; or, that imaginary ſpace terminated by two ſounds, differing in acuteneſs or gravity.

INTESTATE, in law, a perſon that dies without making a will.

INTESTINES, in anatomy. See Anatomy, p. 259.

INTESTINAL, ſomething belonging to or ſeated in the inteſtines.

INTRIGUE, or Intreague, an aſſemblage of events or circumſtances, occurring in an affair, and perplexing the perſons concerned in it.

In this ſenſe, it is uſed to ſignify the nodus or plot of a play or romance; or that point wherein the principal characters are moſt embarraſſed, through the artifice and oppoſition of certain perſons, or the unfortunate falling out of certain accidents and circumſtances.

INTRINSIC, a term applied to the inner, real, and genuine values, properties, *&c.* of any thing, in oppoſition to their extrinſic or apparent values, *&c.*

INTRUSION, in Scots law. See Ejection.

INTUITION, among logicians, the act whereby the mind perceives the agreement or diſagreement of two ideas, immediately by themſelves, without the intervention of any other; in which caſe, the mind perceives the truth as the eye doth the light, only by being directed towards it.

INVECTED, in heraldry, denotes a thing fluted or furrowed.

Invected is juſt the reverſe of ingrailed, in which the points are turned outward to the field; whereas in invected they are turned inward to the ordinary, and the ſmall ſemicircles outward to the field. See Plate CII. fig. 2.

INVECTIVE, in rhetoric, differs from reproof, as the latter proceeds from a friend, and is intended for the good of the perſon reproved; whereas the invective is the work of an enemy, and entirely deſigned to vex and give uneaſineſs to the perſon againſt whom it is directed.

INVENTION, denotes the act of finding any thing new, or even the thing thus found.

INVERARY, a parliament town of Scotland, in the county of Argyle, of which it is the capital, ſituated in Lochfin, forty-five miles north-weſt of Glaſgow: W. long. 5°, N. lat 36° 28′.

INVERNESS, a parliament and port-town of Scotland, the capital of the county of Inverneſs, ſituated at the mouth of the river Neſs: W. long. 4° N. lat. 57° 46′.

INVERSE, is applied to a manner of working the rule of three. See ARITHMETICK, p. 383.

INVERURY, a parliament town of Scotland, in the county of Aberdeen, ſituated on the river Don, ten miles weſt of Aberdeen.

INVESTIGATION, properly denotes the ſearching or finding any thing out by the tracts or prints of the feet; whence mathematicians, ſchoolmen, and grammarians, come to uſe the term in their reſpective reſearches.

INVESTITURE, in Scots law, the writings which conſtitute a proper feudal right. See LAW, tit. 10.

INULA, in botany, a genus of the ſyngeneſia polygamia ſuperflua claſs. The receptacle is naked; the pappus is ſimple; and the antheræ terminate at the baſe in two briſtles. There are 22 ſpecies, 4 of them natives of Britain, *viz.* the helenium, or elecampane; the dyſenterica, or middle flea-bane; the pulicaria, or ſmall flea-bane; and the erithmoides, or golden ſampire. The root of the elecampane is ſaid to excite urine, and looſen the belly.

INVOCATION, in theology, the act of adoring God, and eſpecially of addreſſing him in prayer for his aſſiſtance and protection.

INVOICE, an account in writing of the particulars of merchandiſe, with their value, cuſtom, charges, *&c.* tranſmitted by one merchant to another in a diſtant country. See BOOK-KEEPING, p. 618.

INVOLUCRUM, among botaniſts. See BOTANY, p. 637.

INVOLUTION, in algebra See ALGEBRA, p. 84.

JOACHIMITES, in church-hiſtory, the diſciples of Joachim a ciſtertian monk, who was an abbot of Flora in Calabria, and a great pretender to inſpiration.

The Joachimites were particularly fond of certain ternaries: the Father, they ſaid, operated from the beginning till the coming of the Son; the Son, from that time to theirs, which was the year 1260; and from that time the Holy Spirit was to operate in his turn. They alſo divided every thing relating to men, to doctrine, and the manner of living, into three claſſes, according to the three perſons in the Trinity.

JOANNA, one of the iſlands of Comoro, ſituated between the north-weſt part of Madagaſcar and Zanguebar, in Africa: E. long. 45°, S. lat. 12°.

JOB, or *Book of* JOB, a canonical book of the Old Teſtament, containing a narrative of a ſeries of misfortunes which happened to a man whoſe name was Job, as a trial of his virtue and patience; together with the conferences he had with his cruel friends, on the ſubject of his misfortunes, and the manner in which he was reſtored to eaſe and happineſs. This book is filled with thoſe noble, bold, and figurative expreſſions, which conſtitute the very ſoul of poetry.

Many of the Jewiſh rabbins pretend that this relation is altogether a fiction: others think it a ſimple narrative of a matter of fact, juſt as it happened: while a third ſort of critics acknowledge, that the groundwork of the ſtory is true, but that it is wrote in a poetical ſtrain, and decorated with peculiar circumſtances, to render the narration more profitable and entertaining.

The time is not ſet down in which Job lived. Some have thought that he was much ancienter than Moſes, becauſe the law is never cited by Job or his friends, and becauſe it is related that Job himſelf offered ſacrifices. Some imagine that this book was wrote by himſelf; others ſay, that Job wrote it originally in Syriac or Arabic, and that Moſes tranſlated it into Hebrew: but the rabbins generally pronounce Moſes to be the author of it, and many Chriſtian writers are of the ſame opinion.

JOBBER, in law, a perſon that buys and ſells cattle for others. Hence ſtock jobbers are perſons who buy and ſell ſtocks for other perſons

IOGUIS, among the Eaſt-Indians, a kind of hermits, who generally ſtand under trees, or near their pagods. Some of them go ſtark naked, holding their arms acroſs over their heads, and continue in that poſture all their lives: others lie on the ground, with one leg higher than the other, and their arms raiſed above their head; and theſe wretched penitents inſenſibly loſe the uſe of their arms and legs: ſome confine themſelves in cages, ſet on the top of a thick ſtake, fixed in the ground; and theſe cages are ſo ſmall, that they put the penitent to prodigious torture: ſome holding a ſabre in one hand, and a kind of ſhield in the other, go up a kind of crane, where hooking themſelves to an iron, which runs a conſiderable way into their backs, they ſpring forward into the air, flouriſhing their ſabres, and launching out into extravagant praiſes of their idols: and others plunge into the Ganges, in hopes of being devoured by a crocodile, fancying that by this means they ſhall obtain the happineſs of the next life.

Theſe miſerable wretches are conſidered by the Indians as perfect models of piety and holineſs: they are followed by perſons of both ſexes, who make a vow of devoting themſelves to their ſervice, and are wholely employed in ſoothing their voluntary ſufferings by offering them alms and refreſhments. They call the pious to their devotions by ringing a little bell; and when they hold their ſpiritual converſations, they ſit cloſe in a ring, and ſet up a banner, made of ſeveral pieces of ſtuff, faſtened at the end of a ſtick.

JOHN, or *Goſpel of St.* JOHN, a canonical book of the New Teſtament, containing a recital of the life, actions, doctrine, and death of our Saviour Jeſus Chriſt, written by St John the apoſtle and evangeliſt.

St. John wrote his Goſpel at Epheſus, after his return from the iſle of Patmos, at the deſire of the Chriſtians of Aſia. St Jerom ſays, he would not undertake it, but on condition they ſhall appoint a public faſt, to implore the aſſiſtance of God; and that the faſt being ended, St. John, filled with the Holy Ghoſt, broke out into theſe words, "In the beginning was "the word," *&c.* The ancients aſſign two reaſons for this undertaking: the firſt is, becauſe, in the other three goſpels, there was wanting the hiſtory of the beginning of Jeſus Chriſt's preaching, till the impriſonment of John the Baptiſt; which, therefore, he applied himſelf particularly to relate. The ſecond reaſon was, in order to remove the errors of the Cerinthians, Ebionites, and other ſects.

St. JOHN's DAY, the name of two Chriſtian feſtivals, one obſerved on June 24, kept in commemoration of the wonderful circumſtances attending the birth of St. John the Baptiſt; and the other on Dec. 27, in honour of St. John the Evangeliſt.

St. JOHN's WORT. See HYPERICUM.

St. JOHN's, in geography, one of the Philippine iſlands, ſituated in 126° E. lon. and 7° N. lat.

St. JOHN's, is alſo an iſland in the bay of St. Lawrence, ſituated north of New Scotland: W. lon. 65°, N. lat. 47°.

JOINERY, the art of working in wood, or of fitting various pieces of timber together.

It is called by the French *menuiſerie*, *q. d.* ſmall work, to diſtinguiſh it from carpentry, which is employed about large and leſs curious works.

JOINT, in general, denotes the juncture of two or more things.

The joints of the human body are called by anatomiſts articulations. See ANATOMY, p. 148.

JOINTURE, in law, generally ſignifies a ſettlement of lands and tenements, made on a woman in conſideration of marriage.

JOINVILLE, a town of Champaign, in France, ſituated on the river Marne: E. lon. 5° 15′, and N. lat. 48° 27′.

JOISTS, or JOYSTS, in architecture, thoſe pieces of timber framed into the girders and ſummers, on which the boards of the floor are laid.

JONAH, or *Prophecy of* JONAH, a canonical book of the Old Teſtament; in which it is related, that Jonah was ordered to go and prophecy the deſtruction of the Ninevites; but that diſobediently attempting a voyage another way, he was diſcovered by the riſing of a ſudden tempeſt, and caſt into the ſea; where he was ſwallowed up by a whale, which, having lodged him three days and three nights in his belly, diſgorged him upon the ſhore; whereupon being ſenſible of his paſt danger and ſurpriſing deliverance, he betook himſelf to the journey and embaſſy to which he was appointed; and arriving at Nineveh, the metropolis of Aſſyria, he, according to his commiſſion, boldly laid open to the inhabitants their ſins and miſcarriages, and proclaimed their ſudden overthrow; upon which the whole city, by prayer and faſting, and a ſpeedy repentance, happily averted the divine vengeance, and eſcaped the threatened ruin.

IONIA, anciently was a province of the Leſſer Aſia, or Natolia, bounded by Etolia on the north, Lydia on the eaſt, Caria on the ſouth, and the Archipelago on the weſt.

IONIC ORDER. See ARCHITECTURE, p. 352.

IONIC DIALECT, in grammar, a manner of ſpeaking peculiar to the people of Ionia.

IONIC SECT was the firſt of the ancient ſects of philoſophers; the others were the Italic and Eleatic. The founder of this ſect was Thales, who, being a native of Miletus in Ionia, occaſioned his followers to aſſume the appellation of Ionic: Thales was ſucceeded by Anaximander, and he by Anaximenes, both of Miletus; Anaxagoras Clazomenius ſucceeded them, and removed his ſchool from Aſia to Athens, where Socrates was his ſcholar. It was the diſtinguiſhing tenet of this ſect, that water was the principle of all natural things.

JONK, or JONQUE, in naval affairs, is a kind of ſmall ſhip, very common in the Eaſt Indies: theſe veſſels are about the bigneſs of our fly-boats; and differ in the form of their building, according to the different methods of naval architecture uſed by the nations to which they belong. Their ſails are frequently made of mats, and their anchors are made of wood.

JOSHUA, a canonical book of the Old Teſtament, containing a hiſtory of the wars and tranſactions of the perſon whoſe name it bears. This book may be divided into three parts; the firſt of which is a hiſtory of the conqueſt of the land of Canaan; the ſecond, which begins at the twelfth chapter, is a deſcription of that country, and the diviſion of it among the tribes; and the third, compriſed in the two laſt chapters, contains the renewal of the covenant he cauſed the Iſraelites to make, and the death of their victorious leader and governor. The whole comprehends a term of ſeventeen, or, according to others, of twenty-ſeven years.

JOURNAL, or DAY-BOOK. See BOOK-KEEPING, p. 583.

JOURNAL, at ſea. See NAVIGATION.

JOURNAL is alſo a name common for weekly eſſays, news-papers, *&c.* as the Gray's Inn Journal, the Weſtminſter Journal, the Edinburgh Weekly Journal, *&c.*

JOURNEYMAN, properly one who works by the day only; but it is now uſed for any one who works under a maſter, either by the day, the year, or the piece.

IPECACUANHA, in the materia medica, a Weſt-indian root, of which there are two kinds, diſtinguiſhed by their colour, and brought from different places, but both poſſeſſing the ſame virtues, though in a different degree. The one is grey, and brought from Peru; the other is brown, and is brought from the Brazils: and theſe are indifferently ſent into Europe under the general name of ipecacuanha.

Theſe two ſorts have been by ſome ſuppoſed to be the roots of two different plants: but this is a miſtake; the only difference is, that one grows in a different place, and in a richer and moiſter ſoil, and is better ſupplied with juices than the other.

Ipecacuanha is an excellent, mild, and ſafe emetic; it is alſo a noble reſtringent; and, given in doſes too ſmall to vomit, is the greateſt of all remedies for a dyſentery. Small doſes of ipecacuanha, are an excellent remedy in diarrhœas of a more ſimple kind; and in the fluor albus we hardly know a better medicine.

IPOMÆA, in botany, a genus of the pentandria monogynia claſs. The corolla is funnel ſhaped: the ſtylus is globular; and the capſule has three cells. There are eighteen ſpecies, none of them natives of Britain.

IPSWICH, a borough and port town of Suffolk, ſituated on the river Orwel, twenty-four miles ſouth eaſt of Bury.

It ſends two members to parliament.

IRELAND, an iſland of the Atlantic ocean, ſubject to Great Britain, ſituated between 5° an 10° W. long. and between 51° and 56° N. lat. being bounded by the Northern ocean on the north, by St. George's channel, which divides it from Great Britain, on the eaſt, and by the Atlantic and Weſtern ocean on the the ſouth and weſt. This country is two hundred and fifty miles long, and one hundred and fifty broad; diſtant from Holyhead in north Wales fifty miles, and from Galloway in Scotland fifteen miles. It is divided into four large provinces, *viz.* Ulſter on the north, Leinſter on the eaſt, Munſter on the ſouth, and Connaught on the weſt.

IRIS, the Rainbow. See Optics.

Iris, in anatomy. See Anatomy, p. 289.

Iris, the flower-de luce, in botany, a genus of the triandria monogynia claſs. The corolla conſiſts of ſix diviſions, alternately reflected: the ſtigmata have the appearance of petals. There are twenty-two ſpecies, only two of which are natives of Britain, *viz.* the pſeudacorus, or yellow flower-de-luce; and the fœtidiſſima, or ſtinking gladdon. The root is cathartic, and recommended in dropſies.

IRON. See Chemistry, p. 82.

Iron-sick, in the ſea-language, is ſaid of a ſhip or boat, when her bolts or nails are ſo eaten with ruſt, and ſo worn away, that they occaſion hollows in the planks, whereby the veſſel is rendered leaky.

Iron-wort, in botany. See Sideritis.

IRONY, in rhetoric, is when a perſon ſpeaks contrary to his thoughts, in order to add force to his diſcourſe; whence Quintilian calls it diverſiloquium.

IROQUOIS, the name of five nations in North America, in alliance with the Britiſh colonies. They are bounded by Canada on the north, by the Britiſh plantations of New-York and Penſilvania on the eaſt and ſouth, and by the lake Ontario on the weſt.

IRRADIATION, the act of emitting ſubtile effluvia, like the rays of the ſun, every way.

IRTIS, a great river, which runs from north to ſouth through Ruſſia, falls into the river Oby, and makes part of the boundary between Aſia and Europe.

IRWIN, a port-town of Scotland, in the bailiwic of Cunningham, ſituated at the mouth of the river Irwin, on the frith of Clyde: W. long. 4° 40′, N. lat. 55° 35′.

ISABELLA, a fortreſs of the Auſtrian Netherlands, ſituated on the weſt ſide of the river Schield, oppoſite to Antwerp: in E. long. 4° 10′, N. lat. 51° 15′.

ISAIAH, or *Prophecy of* Isaiah, a canonical book of the Old Teſtament. Iſaiah is the firſt of the four greater prophets, the other three being Jeremiah, Ezekiel, and Daniel. This prophet was of royal blood, his father Amos being brother to Azariah king of Judah. The ſtyle of this prophet is noble, ſublime and florid. Grotius calls him the Demoſthenes of the Hebrews. He had the advantage, above the other prophets, of improving his diction by converſing with men of the greateſt parts and elocution; and this added a ſublimity, force, and majeſty to what he ſaid. He impartially reproved the vices of the age in which he lived, and openly diſplayed the judgments of God that were hanging over the Jewiſh nation; at the ſame time denouncing vengeance on the Aſſyrians, Egyptians, Ethiopians, Moabites, Edomites, Syrians, and Arabians, who were inſtrumental in inflicting thoſe judgments. He foretold the deliverance of the Jews from their captivity in Babylon, by the hands of Cyrus king of Perſia, an hundred years before it came to paſs; but the moſt remarkable of his predictions are thoſe concerning the Meſſiah, in which he not only foretold his coming in the fleſh, but all the great and memorable circumſtances of his life and death.

ISATIS, in botany, a genus of the tetradynamia ſiliquoſa claſs. The pod is lanceolated, has two valves, and contains but one ſeed. There are four ſpecies, only one of which, *viz.* the tinctoria, or woad, is a native of Britain. It is uſed by the dyers. See Botany, p. 634.

ISCHÆMUM, schoenanth, in botany, a genus of the polygamia monœcia claſs. The calix of the hermaphrodite is a glume containing two flowers; the corolla conſiſts of two valves; it has three ſtamina, two ſtyli, and one ſeed. The calix, *&c.* of the male are the ſame with thoſe of the hermaphrodite. There are two ſpecies, both natives of the Eaſt Indies.

ISCHIUM, in anatomy. See Anat. p. 172.

ISCHURY, in medicine, a diſeaſe conſiſting in an entire ſuppreſſion of urine. See Medicine.

ISENACH, a town of Germany in the circle of Upper Saxony, ſituated in E. long. 10° 12′, N. lat. 51°.

ISENARTS, a town of Germany, in the circle of Auſtria, and dukedom of Stiria, ſituated thirty five miles north-weſt of Gratz.

ISERNIA, a town of Naples, in the province of Moliſe, ſituated in E. long. 15° 15′, N. lat. 41° 36′.

ISH, in Scots law, ſignifies *expiry*: thus we ſay, The iſh of a leaſe. It ſignifies alſo *to go out*: thus we ſay, Free iſh and entry from and to any place.

ISIA, feaſts and ſacrifices anciently ſolemniſed in honour of the goddeſs Iſis.

The Iſia were full of abominable impurities, and for that reaſon thoſe who were initiated were obliged to take an oath of ſecrecy: they held for nine days ſucceſſively; but were ſo abominable, that the ſenate aboliſhed them at Rome, under the conſulſhip of Piſo and Gabinius.

ISINGLASS. See Ichthyocolla.

ISLAND, a tract of dry land, encompaſſed with water; in which ſenſe it ſtands contradiſtinguiſhed from continent, or terra firma.

Isle de dieu, an iſland in the bay of Biſcay, on the coaſt of France, ſituated fourteen miles weſt of the coaſt of Poitou.

Isle *of France*, a province of that kingdom, in which the capital city of Paris is ſituated, being bounded by Picardy on the north, by Champain on the eaſt, by Orleans on the ſouth, and by Normandy on the weſt.

ISNARDIA, in botany, a genus of the tetrandria monogynia claſs. It has no corolla; the calix conſiſts of four diviſions; and the capſul has four cells. There is but one ſpecies, a native of France.

ISNY, a free imperial city of Germany, in the circle of Swabia, ſituated in E. long. 10°, N. lat. 47° 36′.

ISOCHRONAL, is applied to ſuch vibrations of a pendulum, as are performed in the ſame ſpace of time as all the vibrations or ſwings of the ſame pendulum are, whether the arches it deſcribes be longer or ſhorter.

ISOCHRONAL LINE, that in which a heavy body is ſuppoſed to deſcend without any acceleration.

ISOLA, a port-town and biſhop's ſee of the hither Calabria, fifteen miles ſouth of St Severino.

ISOPERIMETRICAL FIGURES, in geometry, are ſuch as have equal perimeters or circumferences.

ISOPYRUM, in botany, a genus of the polyandria polygynia claſs. It has no calix; the petals are five or more; the nectarium is bilabiated, and tubular; and the capſule contains many ſeeds. There are three ſpecies, none of them natives of Britain.

ISOCELES TRIANGLE, in geometry, one that has two equal ſides.

ISPAHAN, or SPAHAWN, the capital city of Eyrac Agem, and of all Perſia: it is of an oval form, and twelve miles in circumference: E. lon. 50°, N. lat. 32° 30′.

ISPIDA, in ornithology. See ALCEDO.

ISSUES, in ſurgery, are little ulcers made deſignedly by the ſurgeon in various parts of the body, and kept open by the patient, for the preſervation or recovery of his health. See SURGERY.

ISTHMIA, or ISTHMIAN GAMES, one of the four ſolemn games which were celebrated every fifth year in Greece; ſo called from the Corinthian iſthmus, where they were kept.

ISTHMUS, in geography, a narrow neck of land, that joins two continents, or joins a peninſula to the terra firma, and ſeparates two ſeas.

ISTRIA, a peninſula in the north-part of the gulph of Venice, bounded by Carniola on the north; and on the ſouth, eaſt, and weſt, by the ſea.

ITALIAN, the language ſpoken in Italy.

ITALY, a country ſituated between ſeven and nineteen degrees eaſt long. and between thirty-eight and forty-ſeven degrees north latitude, bounded by Switzerland, and the Alps, which ſeparate it from Germany, on the north; by the gulph of Venice, on the eaſt; by the Mediterranean ſea, on the ſouth; and by the ſame ſea and the Alps, which ſeparate it from France, on the weſt; and if we include Savoy, which lies indeed on the weſt ſide of the Alps, between Italy and France, we muſt extend it a degree farther weſt: this is uſually deſcribed, however, with Italy, as it is contiguous to Piedmont, and has the ſame ſovereign, being a province of the king of Sardinia's dominions. Italy is ſaid to reſemble a boot, and is in length from north-weſt to ſouth-eaſt 600 miles; the breadth is very unequal; in the north, which may be called the top of the boot, it is about 400 miles broad from eaſt to weſt; in the calf of the leg, or middle, it is about 120 miles broad; and towards the ſouth, about the inſtep, eighty miles broad; and comprehends the following countries or ſubdiviſions. 1. In the north are the duchies of Savoy, Piedmont, and Montſerrat; the territories of Genoa; the duchies of Milan, Mantua, Parma, Modena, and the territories of Venice. 2. In the middle of Italy, are the duchy of Tuſcany, the pope's dominions, and the ſtate of Lucca. 3. And in the ſouth is the kingdom of Naples.

ITCH, a cutaneous diſeaſe, ariſing from a corruption of a ſerous lymphatic matter, ſometimes attended with mild, ſometimes with more obſtinate and dangerous ſymptoms. See MEDICINE.

JUBILEE, a time of public and ſolemn feſtivity among the ancient Hebrews.

This was kept every fiftieth year: it began about autumnal equinox, and was proclaimed by the ſound of trumpet throughout all the country. At this time all ſlaves were releaſed, all debts annihilated, and all lands, houſes, wives, and children, however alienated, were reſtored to their firſt owners. During this whole year all kind of agriculture was forbidden, and the poor had the benefit of the harveſt, vintage, and other productions of the earth, in the ſame manner as in the ſabbatic or ſeventh year. As this was deſigned to put the Iſraelites in mind of their Egyptian ſervitude, and to prevent their impoſing the like upon their brethren, it was not obſerved by the Gentile proſelytes.

The Chriſtians, in imitation of the Jews, have likewiſe eſtabliſhed jubilees, which began in the time of pope Boniface VIII. in the year 1300, and are now practiſed every twenty-five years; but theſe relate only to the pretended forgiveneſs of ſins, and the indulgences granted by the church of Rome; together with the privilege of performing a thouſand frolics in maſquerade.

JUCATAN, or YUCATAN, a peninſula of Mexico, ſituated between 89° and 94° W. long. and between 16° and 21° N. lat.

JUDAISM, the religious doctrines and rites of the Jews. See JEWS.

JUDE, or *the general epiſtle of* JUDE, a canonical book of the New Teſtament, written againſt the heretics, who, by their diſorderly lives and impious doctrines, corrupted the faith and good morals of the Chriſtians. St. Jude draws them in lively colours, as men given up to their paſſions, full of vanity, conducting themſelves by worldly wiſdom, and not by the ſpirit of God.

JUDEA. See PALESTINE.

JUDENBURGH, a city of Stiria, in Germany: E. long. 15°, N lat. 47° 22′.

JUDGE, a chief magiſtrate of the law, appointed to hear cauſes, to explain the laws, and to paſs ſentence.

Book of JUDGES, a canonical book of the Old Teſtament, ſo called from its relating the ſtate of the Iſraelites under the adminiſtration of many illuſtrious perſons who were called judges, from their being both the civil and military governors of the people, and who were raiſed up by God upon ſpecial occaſions, after the death of Joſhua, till the time of their making a king. In the time of this peculiar polity, there were ſeveral remarkable occurrences, which are recorded in this book. It acquaints us with the groſs impiety of a new generation which ſprung up after the death of Joſhua,

ſhua, and gives us a ſhort view of the diſpenſations of heaven towards this people, ſometimes relieving and delivering them, and at others ſeverely chaſtiſing them by the hands of their enemies.

JUDGMENT, among logicians, a faculty or rather act of the human ſoul, whereby it compares its ideas, and perceives their agreement or diſagreement.

Judgement, in law, the ſentence of the judges upon a ſuit, *&c.*

JUDOIGNE, a town of the Auſtrian Netherlands, in the province of Brabant, ſituated on the river Gheet, thirteen miles ſouth-eaſt of Louvain, and ſixteen north of Namur.

IVES, or St. Ives, a borough and port-town of Cornwal, ſituated on the Iriſh channel: it ſends two members to parliament: W. long. 6°, N. lat. 50° 18′.

JUGERUM, in Roman antiquity, a ſquare of 120 Roman feet; its proportion to the Engliſh acre being as 10000 to 16097.

JUGULAR, in anatomy, an appellation given to two veins of the neck, which ariſe from the ſubclavians. See Anatomy, part IV.

IVICA, or Yvica, the capital of an iſland of the ſame name, fifty miles eaſt of Valencia in Spain: E. long. 1°, N. lat. 39°.

JUICE, denotes the ſap of vegetables, or the liquors of animals.

JUJUBES, in the materia medica, the name of a fruit of the pulpy kind, produced on a tree which Linnæus makes a ſpecies of rhamnus. See Rhamnus.

The jujubes have been made a general ingredient in pectoral decoctions; but they are now ſeldom uſed on theſe occaſions, and are ſcarce at all heard of in preſcription, or to be met with in our ſhops.

JULEP, in pharmacy, a medicine compoſed of ſome proper liquor, and a ſyrup or ſugar of extemporaneous preparation, without decoction, deſigned for the concoction or alteration of the humours, or reſtoring the ſtrength.

JULIAN, or St. Julian, a harbour on the coaſt of Patagonia, in South America, where ſhips bound to the ſouth ſeas uſually touch: W. long. 74°, N. lat. 48° 15′.

Julian period, in chronology. See Astronomy, p. 489.

JULIERS, the capital of the duchy of the ſame name, ſituated on the river Roer, twenty miles weſt of Cologn, and as many eaſt of Maeſtricht: E. long. 6°, N. lat. 50° 55′.

JULPHA, or *Old* Julpha, once the capital of Armenia, but now in ruins, the inhabitants being tranſplanted to a town within a mile of Iſpahan, called New Julpha, and there they carry on a foreign trade with all countries in Aſia. The ſituation of Old Julpha was in E. long. 46°, N. lat. 39°.

JULY, in chronology, the ſeventh month of the year, ſo called in honour of Julius Cæſar; before whoſe time it was known by the name of quintilis, as being the fifth month of the old Roman year.

JUNCUS, the rush, in botany, a genus of the hexandria monogynia claſs. The calix has ſix leaves; it has no corolla; and the berry is dry, and contains but one ſeed. There are 19 ſpecies, twelve of them natives of Britain.

JUNGERMANNIA, a genus of the cryptogamia algæ claſs. Of which there are 29 ſpecies, all natives of Britain.

JUNIPERUS, in botany, a genus of the diœcia monadelphia claſs. The male has no corolla, but has three ſtamina; the calix of the female conſiſts of three parts; it has three petals, and three ſtyli; and the berry contains three ſeeds. There are nine ſpecies, only one of which, *viz.* the communis or common juniper, is a native of Britain. The berries are uſed as carminatives and ſtomachics.

JUNK, in the ſea-language, old cables cut into ſhort pieces, and given to boatſwains for making ſwabs, plats, and nippers; as alſo to the ſhip-carpenters, and to poor people, to be picked into oakam, for caulking ſhips, *&c.*

JUNTO, in matters of government, denotes a ſelect council for taking cognizance of affairs of great conſequence, which require ſecrecy.

In Spain and Portugal, it ſignifies much the ſame with convention, aſſembly, or board among us: thus we meet with the junto of the three eſtates, of commerce, of tobacco, *&c.* See Board, *&c.*

IVORY, in natural hiſtory, *&c.* a hard, ſolid and firm ſubſtance, of a white colour, and capable of a very good poliſh. It is the tuſk of the elephant, (See Elephas,) and is hollow from the baſe to a certain height, the cavity being filled up with a compact medullary ſubſtance, ſeeming to have a great number of glands in it. It is obſerved, that the Ceylon ivory, and that of the iſland of Achem, do not become yellow in the wearing, as all other ivory does; for this reaſon the teeth of theſe places bear a larger price than thoſe of the coaſt of Guinea.

JUPITER, in aſtronomy. See Astronomy, p. 441.

JUREA, or Jura, a ſtrong city in Italy, in the province of Piedmont, ſituated on the river Doria, ſubject to the king of Sardinia: E. long. 7°, 36′; N. lat. 45°, 22′.

JURISPRUDENCE, the ſcience of what is juſt or unjuſt; or the knowledge of laws, rights, cuſtoms, ſtatutes, *&c.* neceſſary for the adminiſtration of juſtice.

JURY-MAST, whatever is ſet up in room of a maſt that has been loſt in a ſtorm or in an engagement, and to which a leſſer yard, ropes, and ſails, are fixed.

Jus deliberandi, in Scots law, that right which an heir has, by law, of deliberating for a certain time whether he will repreſent his predeceſſor. See Law, tit. 27.

Jus devolutum, in Scots law, the right of the church, of preſenting a miniſter to a vacant pariſh, in caſe the patron ſhall neglect to uſe that right within the time limited by law. See Law, tit. 5.

Jus mariti, in Scots law, the right the huſband acquires to his wife's moveable eſtate, in virtue of the marriage. See Law, tit. 6.

Jus relictæ, in Scots law, the right the wife has in the goods in communion, in caſe of the previous deceaſe of the huſband. See Law, tit. 28.

Jus preventionis, in Scots law, the preferable right of juriſdiction acquired by a court, in any cauſe to which other courts are equally competent, by having exerciſed the firſt act of juriſdiction. See Law, tit. 2.

JUST, a ſportive combat on horſeback, man againſt man, armed with lances.

The difference between juſts and tournaments, according to Du Cange, conſiſts in this, that the latter is a genus of which the former is only a ſpecies. Tournaments included all kinds of military ſports and engagements, which were made out of gallantry and diverſion. Juſts were thoſe particular combats, where the parties were near each other, and engaged with lance and ſword.

JUSTICE, in a moral ſenſe, is one of the four cardinal virtues, which gives every perſon his due.

Justice, in a legal ſenſe, a perſon deputed by the king to adminiſter juſtice to his ſubjects, whoſe authority ariſes from his deputation, and not by right of magiſtracy.

Justice-seat, is the higheſt foreſt-court, always held before the lord chief juſtice in eyre of the foreſt; in which court fines are ſet for offences, and judgments given.

JUSTICIA, in botany, a genus of the diandria monogynia claſs. The corolla is ringent; and the capſule has two cells. There are 19 ſpecies, none of them natives of Britain.

JUSTICIAR, in the old Engliſh laws, an officer inſtituted by William the Conqueror, as the chief officer of ſtate, who principally determined in all caſes civil and criminal. He was called in Latin *Capitalis Juſticiarius totius Angliæ*.—For Justiciar *in Scotland*, ſee Law, tit. 3. § 13.

JUSTICIARY, or *Court of* Justiciary, in Scotland. See Law, tit. 3. § 10.

JUTES, the ancient inhabitants of Jutland, in Denmark.

JUTLAND, a peninſula of Denmark, anciently called the Cimbrian Cherſoneſe, ſituated between 8° and 11° of E. long. and between 55° and 58° of N. lat. bounded by the Categate ſea, which ſeparates it from Norway, on the north; by the ſame ſea, which divides it from the Daniſh iſlands and Sweden, on the eaſt; by Holſtein, on the ſouth; and by the German ocean, on the weſt. It is divided into north and ſouth Jutland; the ſouth being uſually called Sleſwic. The whole is about 180 miles in length, and 90 in breadth.

IVY, in botany. See Hedera.

IXIA, in botany, a genus of the triandria monogynia claſs. The corolla conſiſts of ſix open equal petals; and it has three erect ſtigmata. There are ten ſpecies, none of them natives of Britain.

IXORA, in botany, a genus of the tetrandria monogynia claſs. The corolla conſiſts of one long funnel-ſhaped petal; and the berry contains four ſeeds. There are three ſpecies, none of them natives of Britain.

K.

KÆMPFERIA, in botany, a genus of the monandria monogynia claſs. The corolla conſiſts of ſix ſegments, three of them being large and open. There are two ſpecies, both natives of India. The root of this plant is the galangal, which was formerly uſed in bitter infuſions, but is now neglected in practice.

KAKENHAUSEN, a city of Livonia, ſubject to Ruſſia: E. long. 26°, N. lat. 57°.

KALI, in botany. See Salsola.

KALLO, a town of upper Hungary, ſituated in a lake twenty miles ſouth eaſt of Tockay.

KAOLIN, one of the ſubſtances whereof china-ware is made; being no other than a kind of talc reduced to powder, and made into a paſte with water.

KAUSBEUREN, an imperial city of Germany, thirty-two miles ſouth of Augſburg: E. long. 10° 45′, N. lat. 47° 50′.

KEBLA, an appellation given by the Mahometans to that part of the world where the temple of Mecca is ſituated, towards which they are obliged to turn themſelves when they pray.

KEDGING, in the ſea-language, is when a ſhip is brought up or down in a narrow river by means of the tide, the wind being contrary. To do this, they uſe to ſet their fore-courſe, or fore-top ſail and mizzen, that ſo they may flat her about; and if ſhe happens to come too near the ſhore, they let fall a kedge-anchor, with a hawſer faſtened to it from the ſhip, in order to turn her head about; which work is called kedging.

KEEL, the loweſt piece of timber in a ſhip, running her whole length from the lower part of her ſtem to the lower part of her ſtern poſt. Into it are all the lower futtocks faſtened; and under part of it, a falſe keel is often uſed.

KEELSON, a principal timber in a ſhip, fayed withinſide croſs all the floor timbers; and being adjuſted to the keel with ſuitable ſcarfs, it ſerves to ſtrengthen the bottom of the ſhip.

KEEPER *of the great ſeal*, is a lord by his office, is ſtyled lord keeper of the great ſeal of Great-Britain, and is always one of the privy-council. All grants, charters and commiſſions of the king under the great ſeal, paſs through the hands of the lord-keeper; for without that ſeal, many of thoſe grants, *&c.* would be of no force; the king being, in the interpretation of the law, a corporation, and therefore paſſes nothing but by the great ſeal, which is alſo ſaid to be the public faith of the kingdom, being in the higheſt eſteem and reputation.

Whenever there is a lord-keeper, he is inveſted with the ſame place, authority, preheminence, juriſdiction, or execution of laws, as the lord chancellor of Great-Britain is veſted with.

The lord-keeper is conſtituted by the delivery of the great ſeal, *&c.*

Keeper *of the privy ſeal*, is alſo a lord by his office, through whoſe hands all grants, pardons, *&c.* paſs before they come to the great ſeal, and even ſome things paſs this officer's hands which do not paſs the great ſeal at all. This officer is alſo one of the privy council, yet was anciently called clerk of the privy ſeal. His duty is to put the ſeal to no grant, *&c.* without a proper warrant; nor with warrant where it is againſt law, or inconvenient, but ſhall firſt acquaint the king therewith.

KEISERWAERT, a ſtrong town of Germany in the circle of Weſtphalia and duchy of Berg, ſituated on the Rhine, twenty-five miles north of Cologne, E. lon. 6° 8′, N. lat. 51° 20′.

KELLINGTON, a borough-town of Cornwall, thirteen miles ſouth of Launceſton, which ſends two members to parliament.

KELP, a fixed ſalt, or particular ſpecies of pot-aſh, procured by burning a ſpecies of ſalicoſa. See Salicosa.

KELSO, a town of Scotland, in the ſhire of Mers, or Roxburgh, ſituated on the north ſide the Tweed, twenty miles ſouth-weſt of Berwick.

KEMPTEN, a city of Germany, in the circle of Swabia, ſituated on the river Iſer: E. lon. 10° 7′, N. lat. 47° 38′.

KENDAL, a market-town of Weſtmoreland, twenty-two miles ſouth-weſt of Appleby.

KENKS, in the ſea language, doublings in a rope or cable, when handed in and out, ſo that it does not run eaſy; or when any rope makes turns or twiſts, and does not run free in the block, then it is ſaid to make kenks.

KENNING *to a* Terce, in Scots law, the dividing or ſetting off that part of the huſband's eſtate to his relict which ſhe is entitled to liferent after his death. See Terce.

KENSINGTON, a pleaſant village in the county of Middleſex, two miles weſt of London; where is a royal palace, with large and fine gardens.

KENT, a county bounded by the river Thames on the north, by the ocean on the eaſt, by Suſſex and the Straits of Dover on the ſouth, and by Surrey on the weſt.

KERMAN, the capital of the province of Kerman, or Carimania, in Perſia: E. lon. 56° 30′, N. lat. 30°.

KERMES, in botany. See Ilex.

Kermes mineral. See Chemistry, p. 140.

KERRY, a county of Ireland, in the province of Munſter, bounded by the river Shannon, which divides it from Clare, on the north; by Limeric and Cork, on the eaſt; by another part of Cork, on the ſouth; and by the Atlantic Ocean, on the weſt.

KESSEL, a town of Upper Guelderland, in the quarter of Roermonde, ſituated on the river Meuſe: E. lon. 6°, N. lat. 51° 25′.

KESTRIL, in ornithology. See Falco.

KETMIA, in botany. See Hibiscus.

KETTERING, a market-town of Northamptonſhire, ten miles north-eaſt of Northampton.

KETCH, in naval architecture, a veſſel with two maſts. See Ship.

KEVEL, in ſhip-building, a piece of plank ſayed againſt the quickwork on the quarter-deck, in the ſhape of a ſemicircle; about which the running rigging is belaid.

KEXHOLME, the capital of the province of the ſame name in Finland, ſituated on the lake Ladoga, eighty miles north of Peterſburgh: E. lon. 30°, N. lat. 61° 30′.

KEY, a well known inſtrument for opening and ſhutting the locks of doors, cheſts, buroes, and the like.

Key, in muſic, a certain fundamental note, or tone, to which the whole piece, be it in concerto, ſonata, cantata, *&c.* is accommodated, and with which it uſually begins, but always ends.

Key-stone of an arch, or vault, that placed at the top or vertex of an arch, to bind the two ſweeps together.

KIAM, a great river of China, which, taking its riſe near the weſt frontier, croſſes the whole kingdom eaſtward, and falls into the bay or gulph of Nanking, a little below that city.

KIAMSI, a province of China, bounded by that of Nanking on the north, and by that of Canton on the ſouth.

KIDDERMINSTER, a market-town twelve miles north of Worceſter.

KIDNEYS, in anatomy. See Anatomy, p. 268.

KIGGELARIA, in botany, a genus of the dioecia decandria claſs. The calix of both male and female conſiſts of five ſegments, and the corolla of five petals; the antheræ of the male are perforated at the apex: The female has five ſtyli; the capſule has five valves, one cell, and many ſeeds. There is but one ſpecies, a native of Ethiopia.

KIDDARE, the capital of a county of the ſame name, in Ireland, twenty-ſeven miles ſouth-weſt of Dublin.

KILDERKIN, a liquid meaſure, containing two firkins.

KILKENNY, a county of Ireland, in the province of Leinſter, bounded by Queen's County, on the north; by the county of Wexford, on the eaſt; by Waterford, on the ſouth; and by the county of Tipperary, on the weſt. It is alſo the name of the capital of that county; and is ſituated in W. lon. 7° 15′, N. lat. 52° 30′.

KIMBOLTON, a market-town of Huntingtonſhire, nine miles ſouth-weſt of Huntington.

KING, in the general acceptation of the word, is a perſon who has a ſupreme authority, with the power of levying taxes, making laws, and enforcing an obedience to them: but in Britain, which is a limited monarchy, the power of the king is greatly reſtrained; which is ſo far from diminiſhing his honour, that it adds a glory to his crown; for while other kings are abſolute monarchs over innumerable multitudes of ſlaves, the king of England has the diſtinguiſhed glory of governing a free people, the leaſt of whom is protected by the laws: he has great prerogatives, and a boundleſs power in doing good; and is at the ſame time only reſtrained from acting inconſiſtently with his own happineſs, and that of his people. He has all the enſigns of royalty, and all the marks of ſovereignty; but while he has the power of making treaties, of ſending and receiving ambaſſadors, of conferring titles of honour, creating privy counſellors, officers of ſtate, and judges, and may raiſe men and arms both for ſea and land, he cannot force his ſubjects to maintain them, or raiſe one tax by his ſole authority: he has the privilege of coining money, but he cannot force the meaneſt ſubject to part with his property: he can pardon a criminal; but he cannot put a ſubject to death, till he is condemned by his peers: he may at his pleaſure call, continue, prorogue, and diſſolve parliaments, and without his royal aſſent no bill in parliament can paſs into a law; yet he can neither act contrary to law, nor make new laws by his ſole authority; on the contrary, he may even be ſued and caſt in his own courts.

At his coronation, he takes an oath to govern his people according to the ſtatutes agreed on in parliament, to cauſe law and juſtice in mercy to be executed in all his judgments; to maintain, as much as in him lies, the laws of God, the true profeſſion of the goſpel, and the proteſtant reformed religion by law eſtabliſhed. But tho' he may mitigate the rigour of the law, and forgive offenders, he cannot pardon murder, where an appeal is brought by the ſubject; nor any other crime, when the offender is impeached by the houſe of commons. He may lay an embargo on ſhipping; but then it ought to be for the public good, and not for the private advantage of any particular traders. Writs, proceſſes, commiſſions, *&c.* are in his name; and he has a power not only to make courts, but to create univerſities, colleges, and boroughs; to incorporate a city or town, and to grant franchiſes to ſuch corporations; but they muſt not, under colour thereof, ſet up a monopoly. He is eſteemed the head of the church in that part of his dominions called England. But notwithſtanding theſe and other prerogatives, the king can take what he has a right to only by due courſe of law. In ſhort, he has a principal ſhare in the legiſlative power, and the whole executive power is lodged in him; he is ſuppoſed preſent in all his courts, he can do no wrong, and, according to the laws of England, he never dies.

KING's bench, a court in which the king was formerly accuſtomed to ſit in perſon, and on that account was moved with the king's houſhold. This was originally the only court in Weſtminſter-hall, and from this it is thought that the courts of common pleas and exchequer were derived. As the king in perſon is ſtill preſumed in law to ſit in this court, though only repreſented by his judges, it is ſaid to have ſupreme authority; and the proceedings in it are ſuppoſed to be coram nobis, that is, before the king. This court conſiſts of a lord chief juſtice and three other juſtices or judges, who are inveſted with a ſovereign juriſdiction over all matters, whether of a criminal or public nature. All crimes againſt the public good, though they do not injure any particular perſon, are under the cognizance of this court; and no private ſubject can ſuffer any unlawful violence or injury againſt his perſon, liberty, or poſſeſſions, but a proper remedy is afforded him here; not only for ſatisfaction of damages ſuſtained, but for the puniſhment of the offender: and wherever this court meets with an offence contrary to the firſt principles of juſtice, it may puniſh it. It frequently proceeds on indictments found before other courts, and removed by certiorari into this. Perſons illegally committed to priſon, though by the king and counſel, or either of the houſes of parliament, may be bailed in it; and in ſome caſes, even upon legal commitments. Writs of mandamus are iſſued by this court, for the reſtoring of officers in corporations, *&c.* unjuſtly turned out, and freemen wrongfully disfranchiſed.

The court of king's bench is now divided into a crown-ſide and plea-ſide, the one determining criminal, and the other civil cauſes: in the firſt it determines criminal matters of all kinds, where the king is plaintiff; ſuch as treaſons, felonies, murders, rapes, robberies, riots, breaches of the peace, and all other cauſes that are proſecuted by indictment, information, *&c.* On the plea-ſide, it determines all perſonal actions commenced by bill or writ; as actions of debt, upon the caſe, detinue, trover, ejectment, treſpaſs, waſte, *&c.* againſt any perſon in the cuſtody of the marſhal of the court, as every perſon ſued here is ſuppoſed to be by law.

The officers of this court on the crown-ſide are the clerk and ſecondary of the crown; and on the ſide of the pleas there are two chief clerks or prothonotaries, and their ſecondary and deputy, the cuſtos brevium, two clerks of the papers, the clerk of the declarations, the ſigner and ſealer of bills, the clerk of the rules, clerk of the errors, and clerk of the bails; to which may be added the filazers, the marſhal of the court, and the crier.

Books of **Kings**, two canonical books of the Old Teſtament, ſo called becauſe they contain the hiſtory of the kings of Iſrael and Judah, from the beginning of the reign of Solomon, down to the Babyloniſh captivity, for the ſpace of near ſix hundred years.

It is probable that theſe books were compoſed by Ezra, who extracted them out of the public records, which were kept of what paſſed in that nation.

King's county, a county of Ireland, in the province of Leinſter, bounded by Weſt-meath on the north, by the county of Kildare on the eaſt, by Queen's county and Tipperary on the ſouth, and by the river Shannon, which ſeparates it from Galway, on the weſt.

King's-evil. See **Medicine**.

King's fisher in ornithology. See **Alcedo**.

KINGHORN, a town of Scotland, on the coaſt of Fife, nine miles north of Edinburgh.

KINGSTON, a market-town of Surry, ſituated on the river Thames, twelve miles weſt of London.

Kingston, a port-town of Jamaica, ſituated on the north ſide of the bay of Port royal: W. long. 77°, N. lat. 17° 32′.

KINROSS, a town of Scotland, in the ſhire of Fiſe, ſituated on the lake of Loch-Leven, twenty miles north of Edinburgh.

KINSALE, a port-town of Ireland, in the county of Cork and province of Munſter, ſituated on the river Bandon, fourteen miles ſouth of the city of Cork: W. long. 8° 20′, and N. lat. 51° 32′.

KIOF, or **Kiow**, the capital of the Ruſſian Ukraine, on the frontiers of Poland: E. long. 30° 30′, and N. lat. 51°.

KIRK, a Saxon term, ſignifying the ſame with church.

Kirk-oswald, a market-town of Cumberland, twelve miles ſouth of Carliſle.

Kirk-sessions, an inferior church judicatory in Scotland, conſiſting of the miniſters, elders, and deacons of a pariſh.

It regulates matters relating to public worſhip, catechiſing, viſitations, *&c.* and judges in caſes of fornication and leſſer ſcandals.

KIRKALDY, a town of Fifeſhire, in Scotland, ten miles north of Edinburgh.

KIRKHAM, a market-town of Lancaſhire, ſixteen miles ſouth of Lancaſter.

KIRKUDBRIGHT, a parliament-town of Scotland, which ranks with Dumfries, Annan, *&c.* ſituated on a bay of the Iriſh ſea, ſixty miles weſt of Carliſle: W. long. 4° 5′, and N. lat. 54° 38′.

KIRKWALL, the capital of the Orkney-iſlands, and ſituated in that of Pomona, is a parliament-town, which claſſes with Dingwall, Tain, *&c.* W. long. 25°, and N. lat. 59° 45′.

Kitchen-garden, a piece of ground laid out for the cultivation of fruit, herbs, pulſe, and other vegetables uſed in the kitchen. See Gardening.

KITE. See Falco.

KNARESBOROUGH, a borough-town in the north riding of Yorkſhire, fifteen miles north of York. It ſends two members to parliament.

KNAVE, in old law-books, an appellation given to a man-ſervant, or even to a male child.

KNAVESHIP, in Scots law, one of the names of the ſmall-duties payable in thirlage to the miller's ſervants, called ſequels. See Scots Law, tit. 16.

KNAUTIA, in botany, a genus of the tetrandria monogynia claſs. The common calix is oblong, ſimple, and contains five flowers; the proper calix is ſimple, and above the fruit; the corollulæ are irregular; and the receptacle is naked. There are two ſpecies, none of them natives of Britain.

KNEE, in anatomy, the articulation of the thigh and leg-bones. See Anatomy, part I. *&c.*

Knee, in a ſhip, a crooked piece of timber, bent like a knee, uſed to bind the beams and futtocks together, by being bolted faſt into them both. Theſe are uſed about all the decks.

***Carling*-Knees**, in a ſhip, thoſe timbers which extend from the ſides to the hatch-way, and bear up the deck on both ſides.

KNIFE, a well-known inſtrument, made for cutting.

All ſorts of knives are prohibited to be imported.

KNIGHT, among the Romans, a perſon of the ſecond degree of nobility, following immediately that of the ſenators.

Part of the ceremony whereby this honour was conferred, was the giving of an horſe; for each had an horſe at the public charge, and received the ſtipend of a horſeman, to ſerve in the wars.

When the knights were taken in among the ſenators, they reſigned the privilege of having an horſe kept for them at the charge of the public: then it become neceſſary, in order to be a knight, that they ſhould have a certain revenue, that their poverty might not diſgrace the order; and when they failed of the preſcribed revenue, they were expunged out of the liſt of knights, and thruſt down among the Plebeians. Ten thouſand crowns is computed to have been the revenue required.

The knights at length grew ſo very powerful, that they became a balance between the power of the ſenate and people: they neglected the exerciſes of war, and betook themſelves principally to civil employments in Rome.

Knight, in a modern ſenſe, properly ſignifies a perſon, who, for his virtue and martial proweſs, is by the king raiſed above the rank of gentlemen, into an higher claſs of dignity and honour.

Knighthood was formerly the firſt degree of honour in the army, and uſually conferred with a great deal of ceremony on thoſe who had diſtinguiſhed themſelves by ſome notable exploit in arms: the ceremonies at their creation have been various; the principal was a box on the ear, and a ſtroke with a ſword on the ſhoulder; they put on him a ſhoulder-belt, and a gilt ſword, ſpurs, and other military accoutrements; after which being armed as a knight, he was led to the church in great pomp. Camden deſcribes the manner of making a knight-batchelor among us, which is the loweſt, though the moſt ancient order of knighthood, to be thus: the perſon kneeling, was gently ſtruck on the ſhoulder by the prince, and accoſted in theſe words, "Riſe, or be a knight, in the name of God."

Knight is alſo underſtood of a perſon admitted into any order, either purely military, or military and religious, inſtituted by ſome king or prince, with certain marks and tokens of honour and diſtinction, as the knights of the garter, knights of the thiſtle, knights of Malta, the knights of the Holy Ghoſt, *&c.*

Knights-errant, a pretended order of chivalry, much talked of in old romances, being a kind of heroes that travelled the world in ſearch of adventures, redreſſing wrongs, reſcuing damſels, and taking all occaſions of ſignalizing their proweſs. This romantic bravery of the old knights was heretofore the chimera of the Spaniards.

Knights *of the ſhire*, or **Knights** *of parliament*, in the Britiſh polity, are knights or gentlemen of eſtate, who are elected, on the king's writ, by the freeholders of every county, to repreſent them in parliament.

The qualifications of a knight of the ſhire in England, is to be poſſeſſed of 600 l. *per. ann.* in a freehold eſtate; and in Scotland 400 l. Scots valued rent, or 40 ſhillings of old extent. Their expences during their ſitting, were, by a ſtatute of Hen. VIII. to be defrayed by the county; but this is now ſcarce ever required.

Knight-marshal, an officer in the king's houſehold, who has juriſdiction and cognizance of any tranſgreſſion within the king's houſehold and verge; as alſo of contracts made there, whereof one of the houſe is party.

Knights, in a ſhip, two thick ſhort pieces of wood, commonly carved like a man's head, having four ſhivers in each, three for the halyards, and one for the top-ropes to run in: one of them ſtands faſt bolted on the beams abaſt the foremaſt, and is therefore called the fore-knight; and the other, ſtanding abaſt the main maſt, is called the main knight.

KNOWLEDGE, is defined, by Mr Locke, to be the perception of the connection and agreement, or diſagreement and repugnancy, of our ideas.

KONIGSBURG, a city of Poland, the capital of ducal Pruſſia, and of the king of Pruſſia's Poliſh dominions, ſituated on the river Pregel, near a bay of the Baltic ſea, ſeventy miles north-eaſt of Dantzick: E. long. 21°, and N. lat. 54° 40′.

KORAN, or Alcoran. See Mahometanism.

KOS, in Jewiſh antiquity, a meaſure of capacity, containing about four cubic inches: this was the cup of bleſſing, out of which they drank when they gave thanks after ſolemn meals, like that of the paſſover.

KUR, the ancient Cyrus, a river of Perſia, which riſes in the mountains of Georgia, and running ſouth eaſt by Teflis, unites it ſtreams with the river Arras (the ancient Arraxes) and falls into the Caſpian ſea, ſouth of Baku.

KUTUCHTA, among the Calmuc Tartars, the name of their high-prieſt, or ſovereign pontiff; formerly only the deputy of the delai-lama, or high-prieſt of the Tartars, but at preſent independent on him.

* * *

L.

LA, in muſic, the ſyllable by which Guido denotes the laſt ſound of each hexachord: if it begins in C, it anſwers to our A; if in G, to E; and if in F, to D.

LABARUM, in Roman antiquity, the ſtandard borne before the Roman emperors; being a rich purple ſtreamer, ſupported by a ſpear.

LABDANUM, or ladanum, a reſin of the ſofter kind, though of too firm a conſiſtence to be ranked among the fluid ones.

There are two kinds of it kept in the ſhops; one uſually imported in bladders, to preſerve it in its genuine ſoft conſiſtence, and to prevent the evaporation of its finer parts; another in rolls, much inferior to the former in purity and virtue.

Labdanum ſhould be choſen ſoft and moiſt, of a ſtrong ſmell, pure, very inflammable, and diffuſing a fragrant ſmell while burning. It is a reſinous juice which exſudes from a tree of the ciſtus-kind.

In medicine it is uſed externally, to attenuate and diſcuſs tumours; internally, it is more rarely uſed, but it is greatly extolled by ſome againſt catarrhs, and in dyſenteries.

LABEL, in heraldry, a fillet uſually placed in the middle along the chief of the coat, without touching its extremities. Its breadth ought to be a ninth part of the chief. It is adorned with pendants; and when there are above three of theſe, the number muſt be ſpecified in blazoning.

This is a kind of addition to the arms of a ſecond brother, to diſtinguiſh him from the firſt, and is eſteemed the moſt honourable of all differences. See Plate CII.

LABIAL letters, thoſe pronounced chiefly by means of the lips.

LABIATED flowers, monopetalous flowers, conſiſting of a narrow tube, with a wide mouth, divided into two or more.

LABIAU, a port-town of Pruſſia, ſituated on a bay of the Baltic ſea, twenty miles north-eaſt of Koningſburg: E. long. 22° 15′, N. lat. 55°.

LABORATORY or Elaboratory, the chemiſts work-houſe, or the place where they perform their operations; where the furnaces are built, their veſſels kept, *&c.* and in general, the term laboratory, is applied to any place where phyſical experiments in pharmacy, chemiſtry, pyrotechny, *&c.* are performed. See Chemistry, p. 108, *&c.*

LABOUR, in general, denotes a cloſe application to work or buſineſs. Among ſeamen a ſhip is ſaid to be in labour, when ſhe rolls and tumbles very much, either a hull, under ſail, or at anchor.—It is alſo ſpoke of a woman in travail or child birth. See Midwifery.

LABOURER, generally ſignifies one that does the moſt ſlaviſh and leſs artful part of a laborious work, as that of huſbandry, maſonry, *&c.*

LABRADOR, alſo called New-Britain, and Eſkimaux, is a country in North America, bounded by Hudſon's Straits and the Atlantic Ocean, on the north; by the ſame ocean, on the eaſt; by the river of St. Lawrence and Canada, on the ſouth; and by Hudſon's bay, on the weſt: ſituated between 59° and 79° of W. long. and between 50° and 64° of N. lat.

LABRUS, in ichthyology, a genus of fiſhes belonging to the order of thoracici, the characters of which are theſe. The teeth are ſharp, and the lips are ſimple and very thick; there are ſix bony rays in the membrane of the gills, and the opercula are ſcaly. The rays of the back fin are furniſhed with a thread-like ramentum behind; the breaſt fins are ſharp-pointed; and the lateral line is ſtraight. There are forty-one ſpecies of labrus, diſtinguiſhed by the ſhape of the tail, fins, colour, *&c.*

LABURNUM, in botany. See CYTISUS.

LABYRINTH, in anatomy. See ANATOMY, p. 297.

LAC, MILK, among phyſicians, *&c.* See MILK.

LACCA, or LAC, in natural hiſtory, improperly called gum-lac, a ſort of wax of a red colour, collected in the Eaſt-Indies by certain inſects, and depoſited on ſticks faſtened for that purpoſe in the earth. It is brought over, either adhering to the ſticks, or in ſmall tranſparent grains, or in ſemi-tranſparent flat cakes: the firſt is called ſtick lac, the ſecond ſeed lac, and the third ſhell lac. On breaking a piece of ſtick lac, it appears compoſed of regular cells like the honey-comb, with ſmall corpuſcles of a deep red colour lodged in them: theſe are the young inſects, and to theſe the lac owes its tincture, for when freed from them its colour is very dilute. The ſhell and ſeed lacs, which do not exhibit any inſects or cellular appearance upon breaking, are ſuppoſed to be artificial preparations of the other: the ſeed ſort is ſaid to be the ſtick lac bruiſed and robbed of its more ſoluble parts; and the ſhell to be the ſeed lac, melted and formed into cakes. The ſtick lac therefore is the genuine ſort, and ought alone to be employed for medicinal purpoſes. This concrete is of great eſteem in Germany and other countries, for laxity and ſpongineſs of the gums, proceeding from cold, or a ſcorbutic habit: for this uſe the lac is boiled in water, with the addition of a little alum, which promotes its ſolution: or a tincture is made from it with rectified ſpirit. This tincture is recommended alſo internally in the fluor albus, and in rheumatic and ſcorbutic diſorders: it has a grateful ſmell, and a not unpleaſant, bitteriſh, aſtringent taſte: in the Edinburgh pharmacopœia, a tincture is directed to be made with ſpirit of ſcurvy graſs. The principal uſe of lac among us is in certain mechanic arts as a colouring drug, and for making ſealing wax.

LACE, in commerce, a work compoſed of many threads of gold, ſilver or ſilk, interwoven the one with the other, and worked upon a pillow with ſpindles, according to the pattern deſigned. The open work being formed with pins, which are placed and diſplaced as the ſpindles are moved.

The importation of gold and ſilver lace is prohibited.

Bone LACE, a lace made of fine linen thread or ſilk, much in the ſame manner as that of gold and ſilver. The pattern of the lace is fixed upon a large round pillow, and pins being ſtuck into the holes or openings in the pattern, the threads are interwoven by means of a number of bobbins made of bone or ivory, each of which contains a ſmall quantity of fine thread, in ſuch a manner as to make the lace exactly reſemble the pattern. There are ſeveral towns in England, and particularly in Buckinghamſhire, that carry on this manufacture; but vaſt quantities of the fineſt laces have been imported from Flanders.

LACEDEMON, the ancient name of Miſithra. See MISITHRA.

LACERTA, the lizard, in zoology, a genus of amphibious animals belonging to the order of reptilia, the characters of which are theſe: The body is naked, with four feet, and a tail. There are 49 ſpecies, *viz.*

1. The crocodylus, or crocodile, has a compreſſed jagged tail, five toes on the fore-feet, and four on the hind-feet. This is the largeſt animal of the lizard kind. One that was diſſected at Siam, an account of which was ſent to the Royal Academy at Paris, was eighteen feet and a half long, of which the tail was no leſs than five feet and a half, and the head and neck above two and a half. He was four feet and nine inches in circumference where thickeſt.

The hinder legs, including the thigh and the paw, were two feet and two inches long; the paws, from the joint to the extremity of the longeſt claws, were above nine inches. They were divided into four toes; of which three were armed with large claws, the longeſt of which was an inch and a half, and ſeven lines and a half broad at the root. The fourth toe was without a nail, and of a conical figure; but was covered with a thick ſkin like ſhagreen leather. Theſe toes were united with membranes like thoſe of ducks, but much thicker.

The fore-legs had the ſame parts and conformation as the arms of a man, both within and without; but they were ſomewhat ſhorter than thoſe behind. The hands had five fingers, the two laſt of which had no nails, and were of a conical figure, like the fourth toe on the hind paws. The head was long, and had a little riſing at the top; but the reſt was flat, and eſpecially towards the extremity of the jaws. It was covered with a ſkin, which adhered firmly to the ſkull and to the jaws. The ſkull was rough and unequal in ſeveral places; and about the middle of the forehead there were two bony creſts, about two inches high. They were not quite parallel, but ſeparated from each other in proportion as they mounted upwards.

The eye was very ſmall in proportion to the reſt of the body, and was ſo placed within its orbit, that the outward part, when ſhut, was only a little above an inch in length, and run parallel to the opening of the jaws.

The noſe was placed in the middle of the upper jaw, near an inch from its extremity, and was perfectly round and flat, being two inches in diameter, of a black, ſoft, ſpungy ſubſtance, not unlike the noſe of a dog. The noſtrils were in the form of a Greek capital Ξ, and there were two caruncles which filled and cloſed them very exactly, and which opened as often as he breathed through the noſe. The jaws ſeemed to ſhut one within another by means of ſeveral apophyſes,

which

Plate CII.

Fig. 4. LACERTA CROCODYLUS *or* CROCODYLE

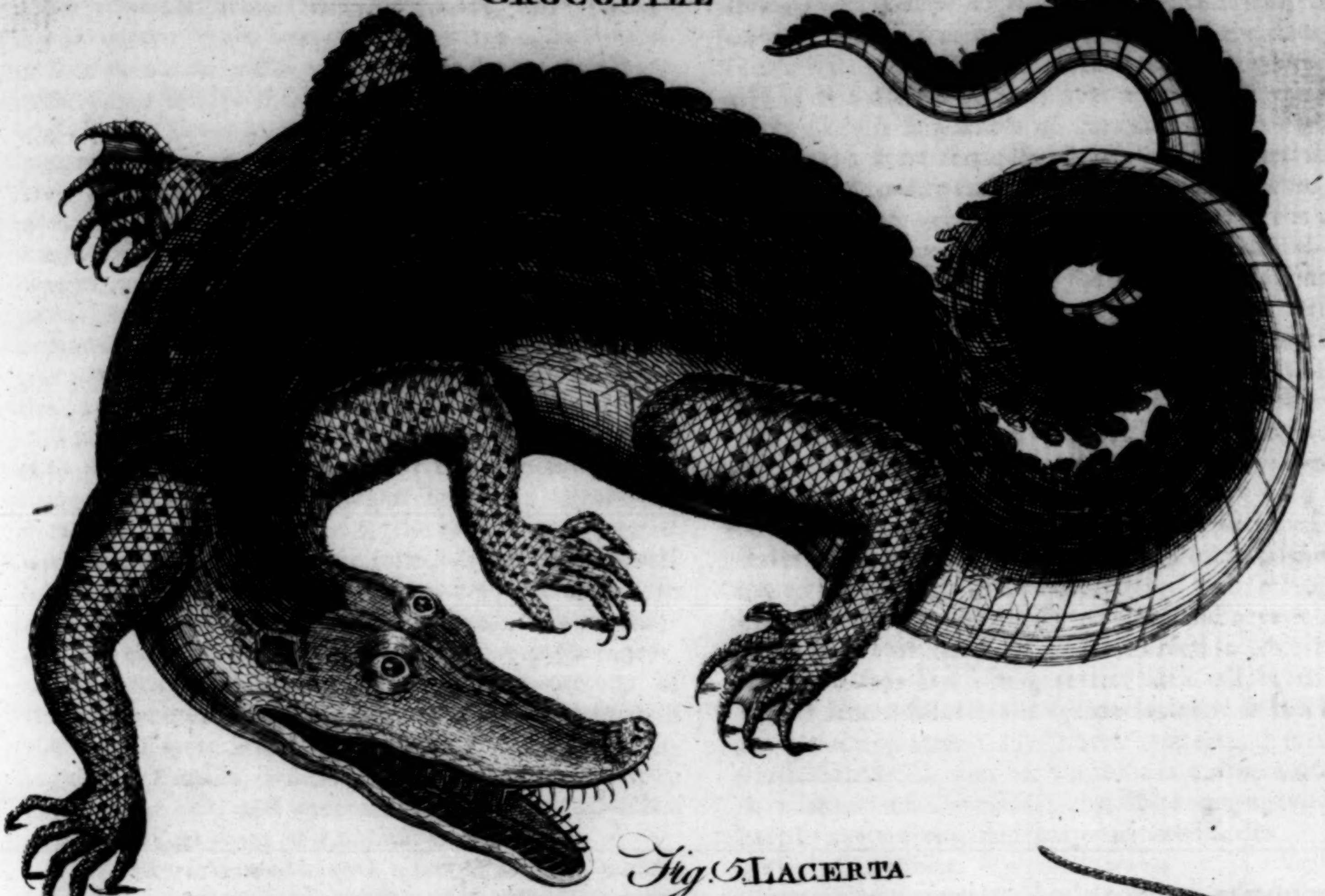


Fig. 5. LACERTA CHAMÆLEON.

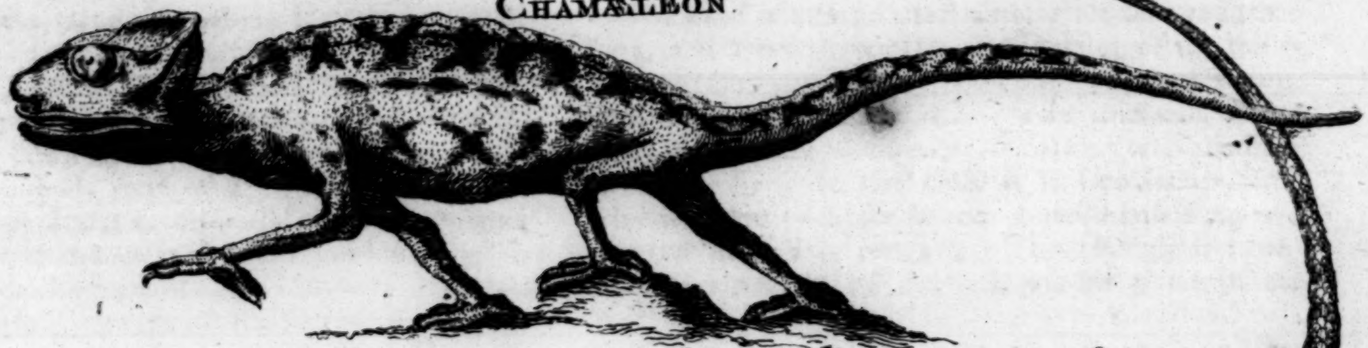


Fig. 1. INDENTED

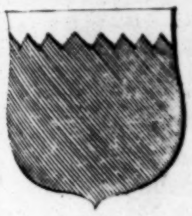


Fig. 6. LACERTA BASILISCUS

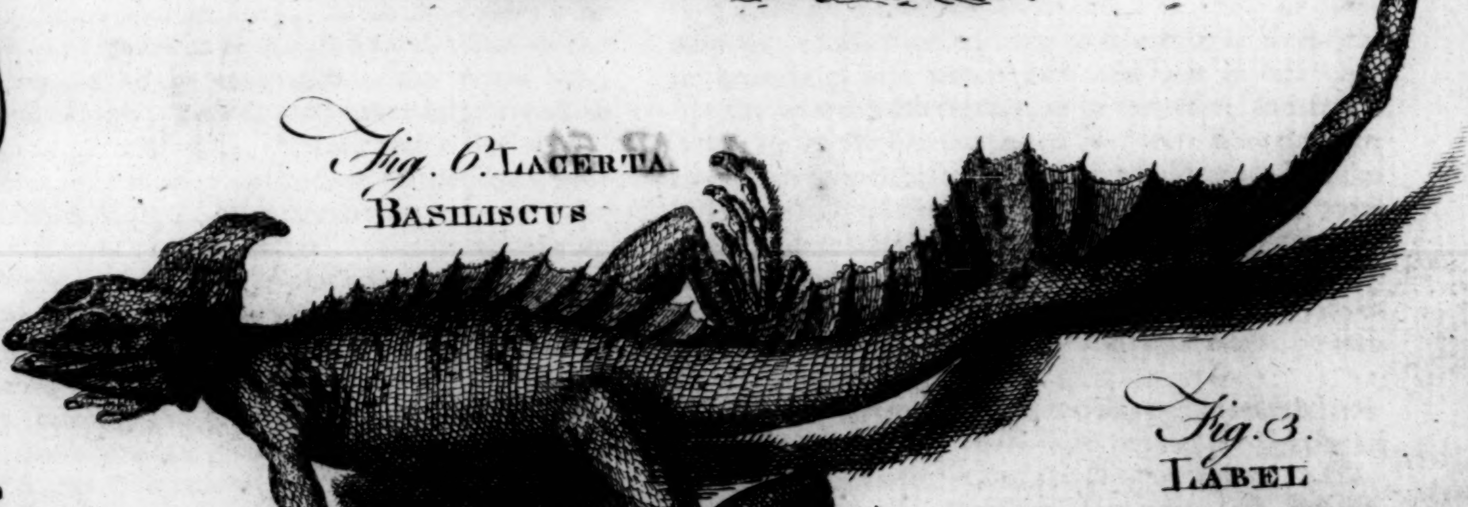


Fig. 2. INVECTED

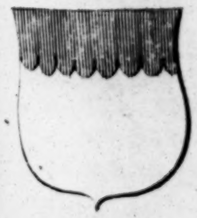
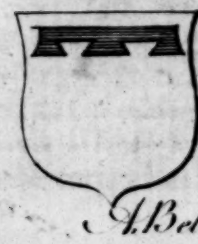


Fig. 3. LABEL



A. Bell Sculpt.

4 AP 54

which proceeded from above downwards, and from below upwards, there being cavities in the oppoſite jaw to receive them. They had twenty-ſeven dog-teeth in the upper jaw, and fifteen in the lower, with ſeveral void ſpaces between them. They were thick at the bottom, and ſharp at the point; being all of different ſizes, except ten large hooked ones, ſix of which were in the lower jaw, and four in the upper. The mouth was fifteen inches in length, and eight and a half in breadth where broadeſt; and the diſtance of the two jaws, when opened as wide as they could be, was fifteen inches and a half. The ſkull, between the two creſts, was proof againſt a muſket ball, for it only rendered the part a little white that it ſtruck againſt.

The colour of the body was of a dark brown on the upper part, and of a whitiſh citron below, with large ſpots of both colours on the ſides. From the ſhoulders to the extremity of the tail he was covered with large ſcales of a ſquare form, diſpoſed like parallel girdles, and were fifty-two in number; but thoſe near the tail were not ſo thick as the reſt. In the middle of each girdle there were four protuberances, which became higher as they aproached the end of the tail, and compoſed four rows, of which the two in the middle were lower than the remaining two, forming three channels, which grew deeper the nearer they came to the tail, and were confounded with each other about two feet from its extremity.

The ſkin was defended with a ſort of armour, which, however, was not proof againſt a muſket ball, contrary to what has been commonly ſaid. However, it muſt be acknowledged, that the attitude in which it was placed might contribute not a little thereto; for probably, if the ball had ſtruck obliquely againſt the ſhell, it would have flown off. Thoſe parts of the girdles underneath the belly were of a whitiſh colour, and were made up of ſcales of divers ſhapes. They were about one ſixth of an inch in thickneſs, and were not ſo hard as thoſe on the back.

This creature lays eggs of the ſize of thoſe of a gooſe, to the number of ſixty; which ſhe covers over with ſand, and leaves to be hatched by the heat of the ſun. They are to be met with in the rivers Nile, Niger, and Ganges, beſides moſt other large rivers in the ſouthern parts of Aſia, Africa, and America.

The crocodile is very deſtructive to the lower people of Upper Egypt, often devouring women who come to the river to fetch water, and children playing on the ſhore or ſwimming in the river.

2. The caudiverbera, has a depreſſed pinnatifid tail, and palmated feet. It is larger than the common green lizard, is found in Peru, and has got its name from its beating the ground with its tail. 3. The dracæra, has a long tail dentated above, a ſmooth body, and equal toes. It is a native of America. 4. The ſupercilioſa, has a carinated tail, and the ſcales on the back and eye brows are ciliated. It is a native of the Indies. 5 The ſcutata, has a ſubcompreſſed tail, and a dentated ſuture on the back. It is a native of Aſia. 6. The monitor, has a carinated tail, and white eye-like ſpots on the body. It is a native of the Indies. 7. The principalis, has a carinated tail, a creſt on the throat, and a ſmooth back. It is found in ſouth America. 8. The bicarinata, has a compreſſed tail with a double carina, and a quadruple carina on the back. It is a native of the Indies. 9. The cordylus has a ſhort verticillated tail, and dentated ſcales. It is found in Africa and Aſia. 10. The ſtellio, has a verticillated tail, and dentated ſcales. It is a native of Africa. 11. The mauritanica, has a ſhort verticillated tail ſmooth at the apex. It is found in Mauritania. 12. The azurea, has a ſhort verticillated tail, and ſharp pointed ſcales. It is a native of Africa. 13. The turcica, has a verticillated tail, and a rough grey body. It is a native of the Eaſt Indies. 14. The ameiva, has a long verticillated tail, 30 ſcutæ on the belly, and a plaited collar. It is a native of America. 15. The agilis, has a pretty long verticillated tail, with ſharp ſcales, and a collar formed by ſcales. This is the common green lizard, and is a native both of Europe and India. 16. The algira, has a pretty long verticillated tail, and a yellow line on each ſide of the body. It is found in Mauritania. 17. The ſeps has a long verticillated tail, with a reflected lateral ſuture, and ſquare ſcales. It is a native of warm climates. 18. The ſex-lineata, has a long verticillated tail, and ſix white lines on the back. It is a native of Carolina. 19. The angulata, has a long hexagonal tail, and ſharp carinated ſcales. It is a native of America.

20. The chamæleon, has a crooked cylindrical tail.

The head of a large chamæleon is almoſt two inches long, and from thence to the beginning of the tail it is four inches and a half. The tail is five inches long, and the feet two and a half. The thickneſs of the body is different at different ſeaſons; for ſometimes from the back to the belly it is two inches, and ſometimes but one; for he can blow himſelf up and contract himſelf at pleaſure. This ſwelling and contraction is not only of the back and belly, but of the legs and tail

Theſe different motions are not like thoſe of other animals, which proceed from a dilatation of the breaſt in breathing, and which riſes and falls ſucceſſively; but they are very irregular, as in tortoiſes, and frogs. The chamæleon has continued as it were blown up for two hours together, and then he would grow leſs and leſs inſenſibly; for the dilatation was always more quick and viſible than the contraction. In this laſt ſtate he appeared extremely lean, and the ſpine of the back was ſharp, and all his ribs might be told; likewiſe the tendons of the arms and legs might be ſeen very diſtinctly.

The ſkin is very cold to the touch; and, notwithſtanding he ſeems ſo lean, there is no feeling the beating of the heart. The ſurface of the ſkin is unequal, and has a grain not unlike ſhagreen, but very ſoft, becauſe each eminence is as ſmooth as if it was poliſhed. Some of theſe are as large as a middling pin's head on the arms, legs, belly, and tail, but on the ſhoulders and head they are of an oval figure, and a little larger. Thoſe under the throat are ranged in the form of a chaplet.

let, from the lower lip to the breaſt. Some on the head and back are amaſſed together in cluſters, with ſpaces between them, on which are almoſt imperceptible ſpots of a pale red and yellow colour; as well as the ground of the ſkin itſelf; which plainly appears between theſe cluſters. This ground changes colour when the animal is dead, becoming of a greyiſh brown, and the ſmall ſpots are whitiſh.

The colour of all theſe eminences, when the chamæleon is at reſt in a ſhady place, is of a bluiſh grey, except on the claws, where it is white with a little yellow; and the ſpaces between the cluſters is of a pale red and yellow, as was before obſerved. But when he is in the ſun, all parts of the body which are affected with the light, become of a greyiſh brown, or rather of a tawny. That part of the ſkin which the ſun does not ſhine on, changes into ſeveral brighter colours, which form ſpots of the ſize of half one's finger. Some of theſe deſcend from the ſpine half way on the back; and others appear on the ſides, arms, and tail. They are all of an iſabella colour, from a mixture of a pale yellow and of a bright red, which is the colour of the ground of the ſkin.

The head of a chameleon is not unlike that of a fiſh, it being joined to the breaſt by a very ſhort neck, covered on each ſide with cartilaginous membranes reſembling the gills of fiſhes. There is a creſt directly on the top of the head, and two others on each ſide above the eyes, and between theſe there are two cavities near the top of the head. The muzzle is blunt, and not much unlike that of a frog; at the end there is a hole on each ſide for the noſtrils, but there are no ears, nor any ſign of any.

The jaws are furniſhed with teeth, or rather with a bone in the form of teeth, which he makes little or no uſe of, becauſe he lives upon ſwallowing flies and other inſects, without chewing them. The form, ſtructure, and motion of the eyes, have ſomething very particular; for they are very large, being almoſt half an inch in diameter. They are of a globous figure; which may be eaſily ſeen, becauſe they ſtand out of the head. They have a ſingle eye-lid like a cap, with a hole in the middle, through which the ſight of the eye appears, which is of a ſhining brown, and round it there is a little circle of a gold colour. This eye-lid has a grain like ſhagreen, as well as the other parts of the ſkin; and when the reſt of the body changes colour, and aſſumes ſpots of different ſhapes, thoſe on the lid always keep the ſame form, though they are tinctured with the ſame colour as the ſkin. But the moſt extraordinary thing relating to the eyes is, that this animal often moves one when the other is entirely at reſt; nay, ſometimes one eye will ſeem to look directly forward, and the other backward; and one will look up to the ſky when the other regards the earth.

That part of the body which is called the trunk, and comprehends the thorax and the belly, in a chamæleon is almoſt all thorax with little or no belly. The four feet are all of a length; and the only difference between them is, that thoſe before are turned backwards, and thoſe behind forwards. There are five toes on each paw, which have a greater reſemblance to hands than feet. They are all divided into two, which gives the appearance of two hands to each arm, and two feet to each leg; and though one of theſe parts have three toes, and the other but two, yet they ſeem to be all of the ſame ſize. Theſe toes lie together under the ſame ſkin as in a mitten; however, their ſhape might be ſeen through the ſkin. With theſe paws the chamæleon can lay hold of the ſmall branches of trees in the ſame manner as a parrot. When he is about to perch, he parts his toes different from birds, becauſe he puts two behind and two before. The claws are little, crooked, very ſharp, and of a pale yellow, proceeding but half way out of the ſkin, while the other half is hid beneath it. His walk is ſlower than that of a tortoiſe, and he ſeems to move along with an affectation of gravity. He ſeems to ſeek for a proper place to ſet his feet upon; and when he climbs up trees, he does not truſt to his feet like ſquirrels, but endeavours to find out clefts in the bark, that he may get a ſurer hold.

His tail is like that of a viper when it is puffed up and round; for otherwiſe the bones may be ſeen in the ſame manner as on the back. He always wraps his tail round the branches of trees, and it ſerves him as it were inſtead of a fifth hand.

He is a native of Africa and Aſia.

21. The gecko, has a cylindrical tail, concave ears, and a warty body. It is the Indian ſalamander of Bontius. "This animal is very frequent in Cairo, (ſays Haſſelquiſt) both in the houſes and without them. The poiſon of this animal is very ſingular, as it exhales from the lobuli of the toes. The animal ſeeks all places and things impregnated with ſea ſalt, and paſſing over them ſeveral times leaves this very noxious poiſon behind it. In July 1750, I ſaw two women and a girl, in Cairo, at the point of death, from eating cheeſe new ſalted, bought in the market, and on which this animal had dropt its poiſon. Once at Cairo, I had an opportunity of obſerving how acrid the exhalations of the toes of this animal are, as it ran over the hand of a man who endeavoured to catch it; there immediately roſe little puſtules over all thoſe parts the animal had touched; theſe were red, inflamed, and ſmarted a little, greatly reſembling thoſe occaſioned by the ſtinging of nettles. It emits an odd ſound, eſpecially in the night, from its throat, not unlike that of a frog." 22. The ſcincus, has a cylindrical tail, compreſſed at the point, and blunt marginated toes. This animal is found in Arabia Petræa near the Red Sea, and in Upper Egypt near the Nile. It is much uſed by the inhabitants of the Eaſt as an aphrodiſiacum, but not at this time by the Europeans. The fleſh of the animal is given in powder, with ſome ſtimulating vehicle; broth made of the recent fleſh, is likewiſe uſed by the Arabs. It is brought from Upper Egypt and Arabia to Alexandria, whence it is carried to Venice and Marſeilles, and from thence to all the apothecaries ſhops of Europe. It has been an error, common to almoſt all authors, to imagine the ſcincus to be a fiſh. 23. The orbicularis, has a cylindrical

tail, and a roundiſh belly. It is a native of Mexico. 24. The quinque-lineata, has a cylindrical tail, and five white lines on the back. It is found in Carolina. 25. The baſiliſcus, has a long cylindrical tail, a radiated fin on the back, and a creſt on the hind part of the head. It is a native of South America. 26. The ignava, has a long cylindrical tail, a teethed ridge on the back, and a creſt on the throat. It is a native of the Indies. 27. The calotes, has a long cylindrical tail, with the fore-part of the back and hind-part of the head teethed. It is a native of Ceylon. 28. The agama, has a long cylindrical tail, with prickles on the neck and hind-part of the head. It is a native of America. 29. The umbra, has a long cylindrical tail, a callous creſt on the nape of the neck, and a ſtreaked back. It is a native of ſouthern climates. 30. The plica, has a long cylindrical tail, a callous creſt on the hind-head, and a warty neck. It is a native of the Indies. 31. The marmorata, has a long cylindrical tail, a ſmooth back, and a ſmall teethed creſt on the throat. It is a native of Spain. 32. The bullaris, has a long cylindrical tail, and a bladder on the throat, which it blows up when enraged. It is a native of Jamaica. 33. The ſtrumoſa has a long cylindrical tail, and a gibbous breaſt. It is found in South America. 34. The tequiſein, has a long cylindrical tail, and a plaited ſuture on the ſide. It is a native of the Indies. 35. The aurata, has a cylindrical tail, and round ſhining ſcales like gold. It is found in the iſlands of Cyprus and Jerſey. 36. The nilotica, has a long tail with a triangular edge, and four lines of ſcales on the back. It is a native of Egypt. 37. The punctata, has a long cylindrical tail, two yellow lines on the back, and is interſperſed with black points. It is found in Aſia. 38. The lemniſcata, has a long cylindrical tail, and 8 white lines on the back. It is found in Guinea. 39. The faſciata, has a blue cylindrical tail, and five yellow lines on the back. It is a native of Carolina. 40. The chalcides, has a long cylindrical tail, and very ſhort legs, with five toes on the feet. It is a native of Europe and Africa. 41. The vulgaris, has a cylindrical tail, four toes on the fore feet, and two duſky-coloured lines on the back. It is a native of Europe. 42. The aquatica, has a tail ſomewhat cylindrical, and four toes on the fore-feet. It lives in the freſh waters, pools, *&c.* of Europe. 43. The paluſtris, has a lanceolated tail, and four toes on the fore-feet. It inhabits the ſtagnant waters of Europe. 44. The punctata, has a cylindrical tail, four toes on the fore-feet, and longitudinal rows of white ſpots on the back. It is a native of Carolina. 45. The quatuor-lineata, has a long cylindrical tail, four toes on the fore-feet, and four yellow lines on the back. It is a native of North America. 46. The ſalamandra, has a ſhort cylindrical tail, four toes on the fore-feet, and a naked porous body. This animal is vulgarly ſaid to live in fire; but it is found to be a miſtake. It is found in the ſouthern countries of Europe. 47. The anguina, has a very long verticillated tail, extremely rigid at the point. It is found at the Cape of Good-hope.

See Plate CII.

LACHNÆA, in botany, a genus of the octandria monogynia claſs. It has no calix; the corolla is divided into four ſegments; the limbus is unequal; and the fruit, which is a kind of berry, contains but one ſeed. There are two ſpecies, both natives of warm climates.

LACHRYMAL, in anatomy, an appellation given to ſeveral parts of the eye. See ANATOMY, p. 289.

LACHRYMATORY, in antiquity, a veſſel wherein were collected the tears of a deceaſed perſon's friends, and preſerved along with the aſhes and urn.

LACTEAL VESSELS, in anatomy. See ANAT. p. 263.

LACTIFEROUS, an appellation given to plants abounding with a milky juice, as the ſow-thiſtle, and the like.

LACTUCA, LETTUCE, in botany. See LETTUCE.

LACUNÆ, in anatomy. See ANATOMY, p. 275, 276.

LACUNAR, in architecture, an arched roof or ceiling, more eſpecially the planking or flooring above porticos and piazzas.

LADENBURG, a town of Germany, ſituated on the river Neckar, eighty miles north-weſt of Heidelburg.

LADRONE ISLANDS, are ſituated in the Pacific Ocean, between 12° and 28° of N. lat. and about 140° E. long.

LADY's BEDSTRAW. See GALLIUM.

LADY's MANTLE. See ALCHIMILLA.

LALY's SMOCK. See CARDAMINE.

LADY's SLIPPER. See CYPRIPEDIUM.

LADY's TRACES. See OPHRYS

LADY-DAY, in law, the 25th of March, being the annunciation of the holy virgin. See ANNUNCIATION.

LAGOECIA, ROUND-HEADED CUMMIN, in botany, a genus of the pentandria monogynia claſs. It has both an univerſal and partial involucrum; the petals are bifid; and the ſeed is ſolitary. There is but one ſpecies, a native of Crete.

LAGOPUS, in ornithology. See TETRAO.

LAGOS, a port-town of Portugal, in the province of Algarva: W. long. 9° 27′, N. lat. 36° 45′.

LAGURUS, in botany, a genus of the triandria digynia claſs. The calix has a double valve, with a villous aun, and the exterior petal has two auns at the end. There are two ſpecies, none of them natives of Britain.

LAHOLM, a port-town of Gothland, in Sweden, ſixty miles north of Copenhagen.

LAHOR, the capital of a province of the ſame name in the hither India: E. long. 75° and N. lat. 33°.

LAKE, a collection of waters contained in ſome cavity in an inland place, of a large extent, ſurrounded with land, and having no communication with the ocean.

LAMA, the ſovereign pontiff, or rather god of the Aſiatic Tartars, inhabiting the country of Barantola. The lama is not only adored by the inhabitants of the country, but alſo by the kings of Tartary, who ſend him rich preſents, and go in pilgrimage to pay him adoration, calling him *lama congiu*, i. e. god the everlaſting father of heaven. He is never to be ſeen but in a ſecret place of his palace, amidſt a great number of lamps, ſitting croſs-legged upon a cuſhion, and adorned all over with gold and precious ſtones; where, at a diſtance, they proſtrate themſelves before him, it not being lawful for any to kiſs even his feet. He is called the great lama, or lama of lamas, that is, prieſt of prieſts. And to perſuade the people that he is immortal, the inferior prieſts, when he dies, ſubſtitute another in his ſtead, and ſo continue the cheat from generation to generation. Theſe prieſts perſuade the people, that the lama was raiſed from death many hundred years ago, that he has lived ever ſince, and will continue to live for ever.

LAMB, in zoology, the young of the ſheep kind. See Ovis.

LAMBOIDES, in anatomy. See Anatomy, p. 152.

LAMELLÆ, in natural hiſtory, denotes very thin plates, ſuch as the ſcales of fiſhes are compoſed of.

LAMENTATIONS, a canonical book of the Old Teſtament, written by the prophet Jeremiah. The two firſt chapters of this book are employed in deſcribing the calamities of the ſiege of Jeruſalem. In the third, the author deplores the perſecutions he himſelf had ſuffered. The fourth turns upon the deſolation of the city and temple, and the misfortune of Zedekiah. The fifth chapter is a prayer for the Jews in their diſperſion and captivity; and at the end of all, he ſpeaks of the cruelty of the Edomites, who had inſulted Jeruſalem in her miſery. The firſt four chapters of the lamentations are an abcedary, every verſe or couplet beginning with one of the letters of the Hebrew alphabet, in the alphabetical order.

LAMINÆ, in phyſiology, the thin plates whereof many ſubſtances conſiſt.

LAMIUM, DEAD-NETTLE, in botany, a genus of the didynamia gymnoſpermia claſs. The ſuperior labium is entire and vaulted; the inferior one conſiſts of two lobes; in the margin of the faux on each ſide there is a remarkable tooth. There are eight ſpecies, three of them natives of Britain, *viz.* the album, or white dead-nettle; the rubrum, or red dead nettle; and the amplexicaule, or great henbit.

LAMMAS-DAY, a feſtival celebrated on the firſt of Auguſt by the Romiſh church, in memory of St. Peter's impriſonment.

LAMP, a veſſel containing oil, with a lighted wick.

Dr. St. Clair, in Phil. Tranſ. n° 245, gives the deſcription of an improvement upon the common lamp. He propoſes that it ſhould be made two or three inches deep, with a pipe coming from the bottom almoſt as high as the top of the veſſel: let it be filled ſo high with water as to cover the hole of the pipe at the bottom, that the oil may not get in at the pipe, and ſo be loſt. Then let the oil be poured in, ſo as to fill the veſſel almoſt brim full, which muſt have a cover pierced with as many holes as there are wicks deſigned. When the veſſel is thus filled, and the wicks are lighted, if water falls in by drops at the pipe, it will always keep the oil at the ſame height, or very near; the weight of the water being to that of the oil as $20\frac{8}{11}$ to 19, which in two or three inches makes no great difference. If the water runs faſter than the oil waſtes, it will only run over at the top of the pipe, and what does not run over will come under the oil, and keep it at the ſame height.

LAMPAS, in farriery. See Farriery, p. 557.

LAMPREY. See Petromyzon.

LAMPSACUS, a port-town of the leſſer Aſia, at the entrance of the Propontis, oppoſite to Gallipoli, ſituated eighty miles ſouth-weſt of Conſtantinople: E. long. 28°, N. lat. 40° 12′.

LANCASTFR, the county-town of Lancaſhire: W. long. 2° 44′, N. lat. 54°. It ſends two members to parliament.

LANCEOLATED LEAF. See Botany, p. 639.

LANCET, a chirurgical inſtrument, ſharp-pointed, and two-edged, chiefly uſed for opening veins in the operation of phlebotomy, or bleeding; alſo for laying open abſceſſes, tumors, &c.

LANCHANG, the capital of the kingdom of Laos, in the further India: E. long. 101°, N. lat. 20°.

LAND, in a limited ſenſe, denotes arable ground. See Agriculture.

Land, in the ſea-language, makes part of ſeveral compound terms; thus *land-laid,* or to lay the land, is juſt to loſe ſight of it. *Land-locked,* is when land lies all round the ſhip, ſo that no point of the compaſs is open to the ſea; if ſhe is at anchor in ſuch a place, ſhe is ſaid to ride land-locked, and is therefore concluded to ride ſafe from the violence of winds and tides. *Land mark,* any mountain, rock, ſteeple, tree, &c. that may ſerve to make the land known at ſea. *Land is ſhut in,* a term uſed to ſignify that another point of land hinders the ſight of that the ſhip came from. *Land to,* or the ſhip *lies land to;* that is, ſhe is ſo far from ſhore that it can only be juſt diſcerned. *Land turn,* is a wind that in almoſt all hot countries blows at certain times from the ſhore in the night. *To ſet the land,* that is, to ſee by the compaſs how it bears.

LANDAFF, a city and biſhop's ſee of Glamorganſhire, in ſouth Wales, twenty-ſix miles north weſt of Briſtol: W. long. 3° 20′, N. lat. 51° 33′.

LANDAU, a city of Germany, in the circle of the Upper Rhine, and landgraviate of Alſace, ſituated fifteen miles ſouth-weſt of Spire: E. long. 8°, N. lat. 49° 12′.

LANDEN, a ſmall town of the Auſtrian Netherlands, in the province of Brabant, eighteen miles ſouth-eaſt of Louvain, and twenty miles north of Namur.

LANDGRAVE, the German name for a count or earl, that has the government of a province, country, or large tract of land.

LANDGRAVIATE, or LANDGRAVATE, the office, authority, juriſdiction, or teritory of a landgrave.

LANDRECY, a town of the French Netherlands, in the province of Hainault: E. long. 3° 25′, N. lat. 50° 5′.

LANDSCROON, a port-town of Sweden, in the province of Gothland, and territory of Schonen, ſituated on the Baltic ſea, within the Sound: E. long. 14° 20′, N. lat. 55° 42′.

LANDSHUT, a city of Germany, and the capital of Lower Bavaria, ſituated forty miles north-eaſt of Munich: E. long. 12° 6′, N. lat. 48° 30′.

LANDSKIP, or Landſcape, in painting, the view or proſpect of a country, extended as far as the eye will reach.

Landſkips are eſteemed one of the loweſt branches of painting, repreſenting ſome rural ſcene, as hills, valleys, rivers, country-houſes, *&c.* where human figures are only introduced as accidents.

LANDSPERG, the name of two towns in Germany; one ſituated on the river Warta, thirty-two miles north-eaſt of Frankfort upon the Oder; and the other in Bavaria, twenty-three miles ſouth of Augſburg.

LANERK, a parliament town of Scotland, ſituated on the river Clyde, twenty miles ſouth-eaſt of Glaſgow.

LANGREL ſhot, at ſea, that conſiſting of two bars of iron, joined by a chain or ſhackle, and having half a ball of iron fixed on each end; by means of which apparatus, it does great execution among the enemy's rigging.

LANGRES, a great city of Champaign, the biſhop of which is one of the twelve peers of France: E. long. 5° 22′, and N. lat. 48°.

LANGUAGE, in the moſt general meaning of the word, ſignifies any ſound uttered by an animal, by which it expreſſes any of its paſſions, ſenſations, or affections; but it is more particularly underſtood to denote thoſe various modifications of the human voice, by which the ſeveral ſenſations and ideas of one man are communicated to another.

Nature has endowed every animal with powers ſufficient to communicate to others of the ſame ſpecies ſome of its ſenſations and deſires. The organs of moſt animals are ſo formed, as readily to perceive and underſtand (as far as is neceſſary for their particular ſpecies of exiſtence) the voice of thoſe of their own kind; by means of which they aſſemble together, for the defence or preſervation of the ſpecies. But as they riſe higher in the order of intellectual powers, the powers of expreſſion likewiſe increaſe. However, the voice alone, even when endowed with a great extent of modulation, is incapable of conveying all that variety of emotions and ſenſations, which on many occaſions are neceſſary to be communicated. In all theſe caſes, motion and geſture are called in to ſupply the defects of the voice. The amorous pigeon does not truſt ſolely to his plaintive cooing in order to ſoften the rigour of his reluctant mate, but adds to it the moſt ſubmiſſive and expreſſive geſtures; and the faithful dog, finding his voice alone inſufficient to expreſs his joy at meeting with his maſter, is obliged to have recourſe to a variety of endearing actions. But man—the moſt diſtinguiſhed of all the animal creation,—although endowed with a power of voice and expreſſion of countenance and geſture eminently ſuperior to all the creatures of God, finds that all theſe united are not ſufficient to expreſs the infinite variety of ideas with which his mind is ſtored: for although theſe may powerfully expreſs the paſſions and ſtronger feelings of the mind; yet as they are incapable of expreſſing the ſeveral progreſſive ſteps of perception by which his *reaſon* aſcends from one degree of knowledge to another, he has been obliged to diſcover, by means of his reaſoning faculty, a method of expreſſing with certainty, and communicating with the utmoſt facility, every perception of his mind.—With this view, having obſerved, that beſides the power of uttering ſimple ſounds, and the ſeveral variations of theſe into acute or grave, open or ſhrill, *&c.* by which his ſtronger feelings were naturally expreſſed, he was likewiſe endowed with a power of ſtopping or interrupting theſe ſounds, by certain cloſings of of the lips with one another, and of the tongue with the palate, *&c.* he has taken advantage of theſe circumſtances, and formed unto himſelf a language capable of expreſſing every perception of the mind; for by affixing at all times the ſame idea to any one ſound or combination of ſounds thus modified and joined together, he is enabled at any time to excite in the mind of any other perſon an idea ſimilar to that in his own mind, provided the other perſon has been previouſly ſo far inſtructed as to know the particular modification of ſound which has been agreed upon as the *ſymbol* of that idea.—Thus man is endowed with two different ſpecies of language: one conſiſting of tones and geſtures; which as it is natural to man conſidered as a diſtinct ſpecies of animals, and neceſſary for the preſervation and well-being of the whole, is univerſally underſtood by all mankind: thus laughter and mirth univerſally expreſs chearfulneſs of mind; while tears, in every part of the globe, diſcover a heart overflowing with tender ſenſations; and the humble tone of ſupplication, or the acute accent of pain, are equally underſtood by the Hurons of America, and by the more refined inhabitants of Europe. The other ſpecies of language, as it is entirely artificial, and derives its power from particular compact, (for before any thing can be recogniſed as the ſymbol of an idea, ſeveral perſons muſt firſt agree that ſuch an idea muſt always be denoted by this ſymbol,) muſt be different in different parts of the globe; and every diſtinct form which it may aſſume, from the different genius of every ſociety who originally formed a particular language for themſelves, will be altogethet unintelligible to every other body of men, but thoſe belonging to the ſame ſociety where that language was originally invented, or thoſe who have been at pains to acquire a knowledge of it by means of ſtudy.

It is unneceſſary for us here to draw any parallel between the nature of theſe two different ſpecies of language; it being ſufficiently evident, that the artificial language does not debar the uſe of the tones and geſtures of the natural, but tends to aſcertain the meaning of theſe with greater preciſion, and conſequently to give them greater power. Man muſt therefore reap many advantages from the uſe of artificial language, which he could not have enjoyed without it. It is equally plain, that the one, being natural and inſpired, muſt remain nearly the ſame, without making any progreſs to perfection; whereas the other, being entirely the invention of man, muſt have been exceedingly rude and imperfect at firſt, and muſt have arrived by ſlow degrees at greater and greater perfection, as the reaſoning faculties acquired vigour and acuteneſs. It muſt likewiſe be ſubject to perpetual changes, from that variety of incidents which affect all ſublunary things:

and theſe changes muſt always correſpond with the change of circumſtances in the people who make uſe of that particular language: for when any particular ſet of ideas become prevalent among any ſociety of men, words muſt be adopted to expreſs them; and from theſe the language muſt aſſume its character. Hence the reaſon why the language of all barbarous and uncivilized people is rude and uncultivated; while thoſe nations which have improved their reaſoning faculties, and made ſome progreſs in the polite arts, have been no leſs diſtinguiſhed by the ſuperiority of their language than by their pre-eminence in other reſpects.—The language of a brave and martial people is bold and nervous, although perhaps rude and uncultivated; while the language of thoſe nations in which luxury and effeminancy prevail, is flowing and harmonious, but devoid of force and energy of expreſſion.

It may be conſidered as a general rule, that the language of any nation is an exact index of the ſtate of their minds, But as man is naturally an imitative animal, and in matters of this kind never has recourſe to invention but through neceſſity; if by ſome accident any part of a nation ſhould be ſeparated from that community to which they belonged, after a language had been invented, they would retain the ſame general ſounds and *idiom* of language with thoſe from whom they were ſeparated; although in proceſs of time theſe two people, by living in countries of a diſſimilar nature, or being engaged in different occupations, and leading a different manner of life, might in time loſe all knowledge of one another, aſſume a different national character and oppoſite diſpoſitions of mind, and form each of them a diſtinct language to themſelves, totally different in genius and ſtyle, though agreeing with one another in the fundamental ſounds and general idiom: ſo that if this particular idiom, formed before their ſeparation, ſhould happen to be more peculiarly adapted to the genius of one of theſe people than the other, that particular people whoſe natural genius and ſtyle of language was not in concord with the *idiom* which they had adopted, would labour under an inconvenience on this account which they never would be able entirely to overcome; and this inconvenience would prevent their language from attaining ſuch a degree of perfection, as the genius of the people would otherwiſe naturally have led them to. Thus languages have been originally formed; and thus that happy concord of circumſtances which have concurred to raiſe ſome languages to that height of perfection which they have attained may be eaſily accounted for, while many ineffectual efforts have been made to raiſe other languages to the ſame degree of excellence.

We ſhall not here enter upon any fruitleſs inquiries, with a view to diſcover if only one language was originally formed, or if any language that we are acquainted with has a greater claim to that much envied pre-eminence than others. We have ſeen, that the diſcovery of language is entirely within our reach, and evidently the invention of man; and therefore that the invention of different languages by different ſocieties, is extremely probable. But theſe different ſocieties, in proceſs of time, behoved to intermix by war or commerce, and their different languages would likewiſe become mixed. Hence during the ſucceſſion of many ages, while the principles of language were not underſtood, many different languages muſt have been formed, while others may have ſunk into oblivion, eſpecially in thoſe early ages before the invention of letters, which alone could preſerve their memory. In vain, therefore, would we endeavour to diſcover the ſtate of thoſe nations or languages of which we have but obſcure traces in hiſtory. Indeed we have no reaſon to lament our loſs in this particular; for ſuppoſing ſuch a diſcovery could be made, we could derive little advantage from it. The antiquity of a language does not imply any degree of excellence: ſome nations have made more progreſs in improving their mental faculties, and refining their language, in a few years, than others have done in many ages. We ſhall therefore leave this ſubject, and proceed to make ſome remarks on the advantages or defects of ſome of thoſe *idioms* of language with which we are moſt intimately acquainted, as this may perhaps lead us to ſome diſcoveries of real utility to ourſelves.

As the words IDIOM and GENIUS of a language are often confounded, it will be neceſſary to inform the reader, that by IDIOM we would here be underſtood to mean *that general mode of arranging words into ſentences which prevails in any particular language*; and by the GENIUS of a language we mean to expreſs *the particular ſet of ideas which the words of any language, either from their formation or multiplicity, are moſt naturally apt to excite in the mind of any one who hears it properly uttered*. Thus although the *Engliſh*, *French*, *Italian*, and *Spaniſh* languages, nearly agree in the ſame general IDIOM; yet the particular GENIUS of each is remarkably different: The *Engliſh* is naturally bold nervous, and ſtrongly articulated; the *French* is weaker, and more flowing; the *Italian* more ſoothing and harmonius; and the *Spaniſh* more grave, ſonorous, and ſtately. Now, when we examine the ſeveral languages which have been moſt eſteemed in Europe, we find that there are only two diſtinct IDIOMS among them which are eſſentially diſtinguiſhed from one another; and all theſe languages are divided between theſe two idioms, following ſometimes the one, and ſometimes the other, either wholly or in part. The languages which may be ſaid to adhere to the firſt IDIOM, are thoſe which in their conſtruction follow the order of nature; that is, expreſs their ideas in the natural order in which they occur to the mind; the ſubject which occaſions the action appearing firſt; then the action, accompanied with its ſeveral modifications; and, laſt of all, the object to which it has reference.—Theſe may be properly called ANALOGOUS languages; and of this kind are the Engliſh, French, and moſt of the modern languages in Europe.—The languages which may be referred to the other IDIOM, are thoſe which follow no other order in their conſtruction than what the taſte or fancy of the compoſer may ſuggeſt; ſometimes making the object, ſometimes the action, and ſometimes the modification of the action, to precede or follow the other parts. The confuſion which this might occaſion is avoided by the particular manner of *inflecting* their words, by which they are made to refer to the others with which they ought to be connected, in whatever part of the ſentence they occur, the mind being left at liberty to connect the ſeveral parts with one another after the whole ſentence is concluded. And as the words may be here tranſpoſed at pleaſure, thoſe languages may be called TRANSPOSITIVE languages. To this claſs we muſt, in an eſpecial manner, refer the *Latin* and *Greek* languages.—As each of theſe IDIOMS has ſeveral advantages and defects peculiar to itſelf, we ſhall endeavour to point out the moſt conſiderable of them, in order to aſcertain with greater preciſion the particular character and excellence of ſome of thoſe languages now principally ſpoken or ſtudied in Europe.

The partiality which our forefathers, at the revival of letters in Europe, naturally entertained for the Greek and Roman languages, made them look upon every diſtinguiſhing peculiarity belonging to them, as *one* of the *many* cauſes of the amazing ſuperiority which theſe languages evidently enjoyed above every other at that time ſpoken in Europe.—This blind deference ſtill continues to be paid to them, as our minds are early prepoſſeſſed with theſe ideas, and as we are taught in our earlieſt infancy to believe, that to entertain the leaſt idea of our own language being equal to the Greek or Latin in any particular whatever, would be a certain mark of ignorance or want of taſte.—Their rights, therefore, like thoſe of the church in former ages, remain ſtill to be examined; and we, without exerting our reaſon to diſcover truth from falſehood, tamely ſit down ſatisfied with the idea of their undoubted pre-eminence in every reſpect.—But if we look around us for a moment, and obſerve the many excellent productions which are to be met with in almoſt every language of Europe, we muſt be ſatisfied, that *even theſe* are now poſſeſſed of *ſome* powers which might afford at leaſt a preſumption, that, if they were cultivated with a proper degree of attention, they might, in *ſome reſpects*, be made to rival, if not to excel, thoſe beautiful and juſtly admired remains of antiquity.—Without endeavouring to derogate from their merit, let us, with the cool eye of philoſophic reaſoning, endeavour to bring before the ſacred tribunal of Truth ſome of thoſe opinions which have been moſt generally received upon this ſubject, and reſt the determination of the cauſe on her impartial deciſion.

The learned reader well knows, that the ſeveral changes which take place in the arrangement of the words in every TRANSPOSITIVE language could not be admitted without occaſioning great confuſion, unleſs certain claſſes of words were endowed with particular variations, by means of which they might be made to refer to the other words with which they ought naturally to be connected.—From this cauſe proceeds the neceſſity of ſeveral variations of *verbs*, *nouns*, and *adjectives;* which are not in the leaſt eſſential or neceſſary in the ANALOGOUS languages, as we have pretty fully explained under the article GRAMMAR, to which we refer for ſatisfaction on this head. We ſhall in this place conſider, whether theſe variations are an advantage or a diſadvantage to language.

As it is generally ſuppoſed, that every language whoſe verbs admit of *inflection*, is on that account much more perfect than one where they are varied by *auxiliaries;* we ſhall, in the firſt place, examine this with ſome degree of attention; and that what is ſaid on this head may be the more intelligible, we ſhall give examples from the Latin and Engliſh languages. We make choice of theſe languages, becauſe the Latin is more purely *tranſpoſitive* than the Greek, and the Engliſh admits of leſs *inflection* than any other language that we are acquainted with.

If any preference be due to a language from the one or the other method of *conjugating* verbs, it muſt in a great meaſure be owing to one or more of theſe three cauſes:—Either it muſt admit of a greater variety of ſounds, and conſequently more room for harmonious diverſity of tones in the language;—or a greater freedom of expreſſion is allowed in utering any ſimple idea, by the one admitting of a greater variety in the arrangement of the words which are neceſſary to expreſs that idea than the other does;—or, laſtly, a greater preciſion and accuracy in fixing the meaning of the perſon who uſes the language, ariſe from the uſe of one of theſe forms above the other!—for, as every other circumſtance which may ſerve to give a diverſity to language, ſuch as the general and moſt prevalent ſounds, the frequent repetition of any one particular letter, and a variety of other circumſtances of that nature, which may ſerve to debaſe a particular language, are not influenced in the leaſt by the different methods of varying the verbs, they cannot be here conſidered. We ſhall therefore proceed to make a compariſon of the advantages or diſadvantages which may accrue to a language by inflecting their verbs, with regard to each of theſe particulars.

The *firſt* particular that we have to examine, is, Whether the one method of expreſſing the variations of a verb admits of a greater variety of ſounds.—In this reſpect the *Latin* ſeems, at firſt view, to have a great advantage over the *Engliſh:* for the word *amo*, *amabam*, *amaveram*, *amavero*, *amem*, &c. ſeem to be more different from one another than the Engliſh tranſlations of theſe, *I love*, *I did love*, *I had loved*, *I ſhall have loved*, *I may love*, &c. for, although the ſyllable AM is repeated in every one of the firſt, yet as the laſt ſyllable uſually ſtrikes the ear with greater force, and leaves a greater impreſſion than the firſt, it is very probable that many will think the frequent repetition of the word LOVE will, in the laſt inſtance, appear more ſtriking to the ear than the other: we will therefore allow this its full weight, and grant that there is as great, or even a greater difference between the ſounds of the different *tenſes* of a Latin verb, than there is between the words that are equivalent to them in Engliſh.—But as we here conſider the variety of ſounds of the language in general, before any juſt concluſion can be drawn, we muſt not only compare the different parts of the ſame verb, but alſo compare the different verbs with one another in each of theſe languages.—And here, at firſt view, we perceive a moſt ſtriking diſtinction in favours of the *analogous* language over the *inflected:* for as it would be impoſſible to form a particular ſet of inflections different from one another for each particular verb, all thoſe languages which have adopted this method have been obliged to reduce their verbs into a ſmall number of claſſes; all the words of each of which claſſes, commonly called *conjugations*, have the ſeveral variations of the *modes*, *tenſes*, and *perſons*, expreſſed exactly in the ſame manner, which muſt of neceſſity introduce a ſimilarity of ſounds into the language in general, much greater than where every particularverb always retains its own diſtinguiſhing ſound.—To be convinced of this, we need only repeat any number of verbs in Latin and Engliſh, and obſerve on which ſide the preference with reſpect to variety of ſounds muſt fall.

Pono,	*I put.*	Moveo,	*I move.*
Dono,	*I give.*	Doleo,	*I ail.*
Cano,	*I ſing.*	Lugeo,	*I mourn.*
Sono,	*I ſound.*	Obeo,	*I die.*
Orno,	*I adorn.*	Gaudeo,	*I rejoice.*
Pugno,	*I fight.*	Incipio,	*I begin.*
Lego,	*I read.*	Faceo,	*I make.*
Scribo,	*I write.*	Fodio,	*I dig.*
Puto,	*I think.*	Odio,	*I hate.*
Vivo,	*I live.*	Rideo,	*I laugh.*
Ambulo,	*I walk.*	Impleo,	*I fill.*
Loqueo,	*I ſpeak.*	Abſtineo,	*I forbear.*

The ſimilarity of ſounds is here ſo obvious in the Latin as to be perceived at the firſt glance: nor can we be ſurpriſed to find it ſo, when we conſider, that all their regular verbs, amounting to four thouſand or upwards, muſt all be reduced to four conjugations, and even theſe differing but little from one another, which muſt of neceſſity produce the ſameneſs of ſounds which we here perceive; whereas every language that follows the natural order, like the Engliſh, inſtead of theſe ſmall number of uniform terminations, have almoſt as many diſtinct ſounds as original verbs in their language.

But if, inſtead of the preſent of the indicative mood, we ſhould take almoſt any other tenſe of the Latin verb, the ſimilarity of ſounds would be ſtill more perceptible, as many of theſe tenſes have the ſame termination in all the four conjugations, particularly in the imperfect of the indicative, as below.

Pona bam ;	*I did put,*	*I put.*
Dona-bam ;	*I did give,*	*I gave.*
Cane-bam ;	*I did ſing,*	*I ſung.*
Sona-bam ;	*I did ſound,*	*I ſounded.*
Orna-bam ;	*I did adorn,*	*I adorned.*
Pugna-bam ;	*I did fight,*	*I fought.*
Lege-bam ;	*I did read,*	*I read.*
Scribe bam ;	*I did write,*	*I wrote.*
Puta-bam ;	*I did think,*	*I thought.*
Vive-bam ;	*I did live,*	*I lived.*
Ambula bam	*I did walk,*	*I walked.*
Loque-bam ;	*I did ſpeak,*	*I ſpoke.*
Move-bam ;	*I did move,*	*I moved.*
Dole-bam ;	*I did ail,*	*I ailed.*
Luge-bam ;	*I did mourn,*	*I mourned.*
Obie-bam ;	*I did die,*	*I died.*
Gaudie-bam ;	*I did rejoice,*	*I rejoiced.*
Incipie bam ;	*I did begin,*	*I began.*
Facie-bam ;	*I did make,*	*I made.*
Fodie-bam ;	*I did dig,*	*I dug.*
Odie-bam ;	*I did hate,*	*I hated.*
Ride-bam ;	*I did laugh,*	*I laughed.*
Imple-bam ;	*I did fill,*	*I filled.*
Abſtinie-bam	*I did forbear,*	*I forbore.*

It is unneceſſary to make any remarks on the Latin words in this example: but in the Engliſh tranſlation we have carefully marked, in the firſt column, the words without any inflection; and, in the ſecond, have put down the ſame meaning by an inflection of our verb; which we have been enabled to do, from a peculiar excellency in our own language unknown to any other, either ancient or modern.—Were it neceſſary to purſue this ſubject farther, we might obſerve, that the *perfect* tenſe in all the conjugations ends univerſally in *I*, the *pluperfect* in ERAM, the *future* in AM or BO; in the ſubjunctive mood, the *imperfect* univerſally in REM, the *perfect* in ERIM, and the *pluperfect* in ISSEM and ERO: and as a ſtill greater ſameneſs is obſervable in the different variations for the perſons in theſe tenſes, ſeeing the firſt perſon plural in all tenſes ends in MUS, and the ſecond perſon in TIS, with little variation in the other perſons; it is evident, that, in reſpect of diverſity of ſounds, this method of conjugating verbs by *inflection*, is greatly inferior to the more natural method of expreſſing the various connections and relations of the verbal attributive by different words, uſually called *auxiliaries*.

The *ſecond* particular by which the different methods of marking the relation of the verbal attributive can affect language, ariſes from the variety of expreſſions, which either of theſe may admit of in uttering the ſame ſentiment.—In this reſpect likewiſe the method of conjugating by inflection ſeems to be deficient. Thus the preſent of the indicative mood in Latin can at moſt be expreſſed only in two ways, *viz.* SCRIBO, and EGO SCRIBO; which ought perhaps in ſtrictneſs to be admitted only as one: whereas, in Engliſh, we can vary it in four different ways, *viz.* *1ſt*, I WRITE; *2dly*, I DO WRITE; *3dly*, WRITE I DO; *4thly*, WRITE DO I*. And if we conſider the further variation which theſe receive in power as well as in ſound, by having the accent placed on the different words; inſtead of four, we will find eleven different variations: thus, *1ſt*, I *write*, with the emphaſis upon the *I*;—*2dly*, *I* WRITE, with the emphaſis upon the word WRITE. Let any one pronounce theſe with the different accent neceſſary, and he will be immediately ſatisfied that they are not only diſtinct from each other with reſpect to meaning, but alſo with regard

* We are ſufficiently aware, that the laſt variation cannot in ſtrictneſs be conſidered as good language; although many examples of this manner of uſing it in ſerious compoſitions, both in poetry and proſe, might be eaſily produced from the beſt authors in the Engliſh language.---But however unjuſtifiable it may be to uſe it in ſerious compoſition; yet, when judiciouſly employed in works of humour, this and other forced expreſſions of the like nature produce a fine effect, by giving a burleſque air to the language, and beautifully contraſting it to the purer diction of ſolid reaſoning. The ſagacious Shakeſpeare has, on many occaſions, ſhewed how ſucceſsfully theſe may be employed in compoſition, particularly in drawing the character of *ancient Piſtol*, in Henry V. Without this liberty, Butler would have found greater difficulty in drawing the inimitable character of Hudibras.--Let this apology ſuffice for our having inſerted this and other variations of the ſame kind; which, although they may be often improper for ſerious compoſition, have ſtill their uſe in language.

regard to ſound; and the ſame muſt be underſtood of all the other parts of this example.

3. I *do write*,
4. *I* DO *write*,
5. *I do* WRITE,
6. WRITE *I do*,
7. *Write* I *do*.
8. *Write I* DO,
9. WRITE *do I*,
10. *Write* DO *I*,
11. *Write do* I.

None of the Latin tenſes admit of more variations than the two above mentioned: nor do almoſt any of the Engliſh admit of fewer than in the above example; and ſeveral of theſe phraſes, which muſt be conſidered as exact tranſlations of ſome of the tenſes of the Latin verb, admit of many more. Thus the imperfect of the ſubjunctive mood, which in Latin admits of the above two variations, admits in Engliſh of the following:

1. *I might have wrote.*
2. *Wrote I might have.*
3. *Have wrote I might.*
4. *Wrote might have I.*
5. *I wrote might have.*
6. *Have wrote might I.*

And if we likewiſe conſider the variations which may be produced by a variation of the emphaſis, they will be as under.

1. I *might have wrote.*
2. *I* MIGHT *have wrote.*
3. *I might* HAVE *wrote.*
4. *I might have* WROTE.
5. WROTE *I might have.*
6. *Wrote* I *might have.*
7. *Wrote I* MIGHT *have.*
8. *Wrote I might* HAVE.
9. HAVE *wrote I might.*
10. *Have* WROTE *I might.*
11. *Have wrote* I *might.*
12. *Have wrote I* MIGHT.
13. WROTE *might have I.*
14. *Wrote* MIGHT *have I.*
15. *Wrote might* HAVE *I.*
16. *Wrote might have* I.
17. I *wrote might have.*
18. *I* WROTE *might have.*
19. *I wrote* MIGHT *have.*
20. *I wrote might* HAVE.
21. HAVE *wrote might I.*
22. *Have* WROTE *might I.*
23. *Have wrote* MIGHT *I.*
24. *Have wrote might* I.

In all twenty four variations, inſtead of two.—If we likewiſe conſider, that the Latins were obliged to employ the ſame word, not only to expreſs "I *might* have wrote." but alſo "I *could*, I *would*, or I *ſhould* have wrote," each of which would admit of the ſame variations as the word *might*, we have in all *ninety-ſix* different expreſſions in Engliſh for the ſame phraſe which in Latin admits only of two, unleſs they have recourſe to other forced turns of expreſſion, which the defects of their verbs in this particular has compelled them to invent.

But, if it ſhould be objected, that the laſt circumſtance we have taken notice of as a defect, can only be conſidered as a defect of the Latin language, and is not to be attributed to the *inflection* of their verbs, ſeeing they might have had a particular tenſe for each of theſe different words *might*, *could*, *would*, and *ſhould;* we anſwer, that, even admitting this excuſe as valid, the ſuperiority of the analogous language, as ſuch, ſtill remains in this reſpect as twelve to one.—Yet even this conceſſion is greater than ought to have been made: For as the difficulty of forming a ſufficient variety of words for all the different modifications which a verb may be made to undergo is too great for any rude people to be able to overcome; we find, that every nation which has adopted this mode of inflection, not excepting the Greeks themſelves, has been obliged to remain ſatisfied with fewer words than would have been neceſſary even to effect this purpoſe, and make the ſame word ſerve a double, treble, or even quadruple office, as in the Latin tenſe which gave riſe to theſe obſervations: So that however in phyſical neceſſity this may not be chargeable upon this particular mode of conſtruction, yet in moral certainty this muſt always be the caſe; and therefore we may ſafely conclude, that the mode of varying verbs by *inflection* affords leſs variety in the arrangement of the words of the particular phraſes, than the method of varying them by the help of auxiliaries.

But if there ſhould ſtill remain any ſhadow of doubt in the mind of the reader, whether the method of varying the verbs by *inflection*, is inferior to that by *auxiliaries*, with regard to diverſity of ſounds, or variety of expreſſion; there cannot be the leaſt doubt, but that, with reſpect to preciſion, diſtinctneſs, and accuracy in expreſſing any idea, the latter enjoys a ſuperiority beyond all compariſon.—Thus the Latin verb *Amo*, may be Engliſhed either by the words *I love*, or *I do love*, and the emphaſis placed upon any of the words that the circumſtances may require; by means of which, the meaning is pointed out with a force and energy which it is altogether impoſſible to produce by the uſe of any ſingle word. The following line from Shakeſpear's Othello may ſerve as an example;

——Excellent wretch!
Perdition catch my ſoul, but *I* DO *love* thee:

In which the ſtrong emphaſis upon the word DO, gives it a force and energy which conveys, in an irreſiſtible manner, a moſt perfect knowledge of the ſituation of the mind of the ſpeaker at the time.—That the whole energy of the expreſſion depends upon this ſeemingly inſignificant word, we may be at once ſatiſfied of, by keeping it away in this manner;

——Excellent wretch!
Perdition catch my ſoul, but *I love* thee.

How poor—how tame—how inſignificant is this, when compared with the other! Here nothing remains but a tame aſſertion, uſhered in with a pompous exclamation which could not here be introduced with any degree of propriety. Whereas, in the way that Shakeſpear has left it to us, it has a forcible power which nothing can ſurpaſs; for, overpowered with the irreſiſtible force of Deſdemona's charms, this ſtrong exclamation is forced from the ſoul of Othello in ſpite of himſelf. Surpriſed at this tender emotion which brings to his mind all thoſe amiable qualities for which he had ſo much eſteemed her, and at the ſame time fully impreſſed with the firm perſuaſion of her guilt, he burſts out into that ſeemingly inconſiſtent exclamation—*Excellent wretch!* And then he adds in the warmth of his ſurpriſe,——thinking it a thing moſt aſtoniſhing that any warmth of affection ſhould ſtill remain in his breaſt, he even confirms it with an oath,—"*Perdition catch my ſoul, but I* DO *love thee.*"—"In ſpite of all the falſehoods with which I know thou haſt deceived me—in ſpite of all the crimes of which I know thee guilty—in ſpite of all theſe reaſons for which I ought to hate thee—in ſpite of myſelf,—ſtill I find that I love,—yes, I DO love thee."—We look upon it as a thing altogether impoſſible to tranſfuſe

fuſe the energy of this expreſſion into any language whoſe verbs are regularly inflected.

In the ſame manner we might go through all the other tenſes, and ſhew that the ſame ſuperiority is to be found in each.—Thus in the *perfect tenſe* of the Latins, inſtead of the ſimple AMAVI, we ſay, I HAVE LOVED; and by the liberty we have of putting the emphaſis upon any of the words which compoſe this phraſe, we can in the moſt accurate manner fix the preciſe idea which we mean to excite: for if we ſay *I have loved*, with the emphaſis upon the word I, it at once points out the perſon as the principal object in that phraſe, and makes us naturally look for a contraſt in ſome other perſon, and the other parts of the phraſe become ſubordinate to it;—"HE *has loved* thee much, but I *have loved* thee infinitely more."—The Latins too, as they were not prohibited from joining the pronoun with their verb, were alſo acquainted with this excellence, which Virgil has beautifully uſed in this verſe:

——Nos *patriam fugimus;*
TU, *Tytere, lentis in umbra*, &c.

But *we* are not only enabled thus to diſtinguiſh the perſon in as powerful a manner as the Latins, but can alſo with the ſame facility point out any of the other circumſtances as principals; for if we ſay, with the emphaſis upon the word *Have*, "I HAVE *loved*," it as naturally points out the time as the principal object, and makes us look for a contract in that peculiarity, *I* HAVE: "I *have* loved indeed;—my imagination *has* been led aſtray—my reaſon *has* been perverted:—but, *now* that time has opened my eyes, I can ſmile at thoſe imaginary diſtreſſes which once perplexed me."—In the ſame manner we can put the emphaſis upon the other word of the phraſe *loved*,—"I *have* LOVED."—Here the paſſion is exhibited as the principal circumſtance; and as this can never be excited without ſome object, we naturally wiſh to know the object of that paſion.—"Who! what have you *loved?*" are the natural queſtions we would put in his caſe. "I have LOVED ——Eliza."——In this manner we are, on all occaſions, enabled to expreſs, with the utmoſt preciſion, that particular idea which we would wiſh to excite, ſo as to give an energy and perſpicuity to the language, which can never be attained by thoſe languages whoſe verbs are conjugated by inflection; and if to this we add the inconconvenience which all inflected languages are ſubjected to, by having too ſmall a number of tenſes, ſo as to be compelled to make one word on many occaſions ſupply the place of two, three, or even four, the balance is turned ſtill more in our favours.—Thus, in Latin, the ſame word AMABO ſtands for *ſhall* or *will* love, ſo that the reader is left to gueſs from the context which of the two meanings it was moſt likely the writer had in view.—In the ſame manner, *may* or *can* love are expreſſed by the ſame word AMEM; as is alſo *might, could, would*, or *ſhould* love, by the ſingle word AMAREM, as we have already obſerved; ſo that the reader is left to gueſs which of theſe four meanings the writer intended to expreſs; which occaſions a perplexity very different from that clear preciſion which our language allows of, by not only pointing out the different words, but alſo by allowing us to put the emphaſis upon any of them we pleaſe, which ſuperadds energy and force to the preciſion it would have had without that of aſſiſtance.

Upon the whole, therefore, after the moſt candid examination, we muſt conclude, that the method of conjugating verbs by *inflection* is inferior to that which is performed by the help of *auxiliaries*;—becauſe it does not afford ſuch a diverſity of ſounds,—nor allow ſuch variety in the arrangement of expreſſion for the ſame thought,—nor give ſo much diſtinction and preciſion in the meaning.——It is, however, attended with one conſiderable advantage above the other method: for as the words of which it is formed are neceſſarily of greater length, and more ſonorous, than in the analogous languages, it admits of a more flowing harmony of expreſſion; for the number of monoſyllables in this laſt greatly checks that pompous dignity which naturally reſults from longer words. Whether this ſingle advantage is ſufficient to counterbalance all the other defects with which it is attended, is left to the judgment of the reader to determine:—but we may remark, before we quit the ſubject, that even this excellence is attended with ſome peculiar inconveniences, which ſhall be more particularly pointed out in the ſequel.

But perhaps it might ſtill be objected, that the compariſon we have made above, although it may be fair, and the concluſion juſt with regard to the Latin and Engliſh languages; yet it does not appear clear, that on that account the method of conjugating verbs by *inflection* is *inferior* to that by *auxiliaries:* for although it be allowed, that the Latin language is defective in point of tenſes; yet if a language were formed which had a ſufficient number of inflected tenſes to anſwer every purpoſe; if it had, for inſtance, a word properly formed for every variation of each tenſe; one for *I love*, another for *I do love;* one for *I ſhall*, another for *I will love;* one for *I might*, another for *I could*, and *would*, and *ſhould* love; and ſo on through all the other tenſes; that this lanouage would not be liable to the objections we have brought againſt the inflection of verbs; and that of courſe, the objections we have brought are only valid againſt thoſe languages which have followed that mode and executed it imperfectly.——We anſwer, that although this would in ſome meaſure remedy the evil, yet it would not remove it entirely. For in the firſt place, unleſs every verb, or a very ſmall number of verbs, was conjugated in one way, having the ſound of the words in each tenſe, and diviſions of tenſes, as we may ſay, different from all the other conjugations,—it would always occaſion a ſameneſs of ſounds which would in ſome meaſure prevent that variety of ſounds ſo proper for a language. And even if this could be effected, it would not give ſuch a latitude to the expreſſion as auxiliaries allow: for although there ſhould be two words, one for *I might*, and another for *I could* love; yet as theſe are ſingle words, they cannot be varied; whereas, by auxiliaries, either of theſe can be varied twenty-four different ways, as has been ſhewn above.—In the laſt place, no ſingle word can ever expreſs all that variety of meaning which we can do by the help of our auxiliaries and the emphaſis. *I have loved*, if expreſſed by any one word, could only denote at all times one diſtinct meaning; ſo that, to give it the power of ours, there behoved to be three diſtinct words at leaſt. However, if all this was done;—that is, if there was a diſtinct conjugation formed for every forty or fifty verbs;—if each of the tenſes was properly formed, and all of them different from every other tenſe as well as every other verb; and theſe all carried through each of the different perſons, ſo as to be all different from one another;—and if likewiſe there was a diſtinct word to mark each of the ſeparate meanings which the ſame tenſe could be made to aſſume by means of the emphaſis;—and if all this infinite variety of words could be formed in a diſtinct manner, different from each other and harmonious;—this language would have powers greater than any that could be formed by auxiliaries, if it were poſſible for the human powers to acquire ſuch a degree of knowledge as to be able to employ it with facility. But how could this be attained, ſince upwards of ten thouſand words would be neceſſity to form the variations of any one verb, and a hundred times that number would not include the knowledge of the verbs alone of ſuch a language*?—How much, therefore, ought we to admire the ſimple perſpicuity of our language, which ~~which~~ enables us, by the proper application of ten or twelve ſeemingly trifling words, the meaning and uſe of which can be attained with the utmoſt eaſe, to expreſs all that could be expreſſed by this unwieldy apparatus? What can equal the ſimplicity or the power of the one method, but the well-known powers of the twenty-four letters, the knowledge of which can be obtained with ſo much eaſe—and their power knows no limits?—or what can be compared to the fancied perfection of the other, but the tranſcrpt of it which the Chineſe ſeem to have formed in their unintelligible language?

Having thus conſidered pretty fully the advantages and defects of each of theſe two methods of varying verbs, we cannot help feeling a ſecret wiſh ariſe in our mind, that there had been a people ſagacious enough to have united the powers of the one method with thoſe of the other;—nor can we help being ſurpriſed, that, among the changes which took place in the ſeveral languages of Europe after the downfall of the Roman monarchy, ſome of them did not accidentally ſtumble on the method of doing it.—From many concurring circumſtances, it ſeems probable, that the greateſt part, if not all the Gothic nations that over-ran Italy at that time, had their verbs varied by the help of auxiliaries; and many of the modern European languages which have ſprung from them, have ſo far borrowed from the Latin, as to have ſome of the tenſes of their verbs inflected: yet the Engliſh alone have in any inſtance combined the joint powers of the two: which could only be done by forming inflections for the different tenſes in the ſame manner as the Latins, and at the ſame time retaining the original method of varying them by auxiliaries; by which means either the one or the other method could have been employed as occaſion required.—We have luckily two tenſes formed in that way; the *preſent* of the indicative, and the *paſt*. In almoſt all our verbs theſe can be declined either with or without auxiliaries. Thus the preſent, without an auxiliary, is, *I love, I write, I ſpeak;* with an auxiliary, *I do write, I do love, I do ſpeak.* In the ſame manner, the paſt tenſe, by inflection, is, *I loved, I wrote, I ſpoke;* by auxiliaries, *I did love, I did ſpeak, I did write.* Every author, who knows any thing of the power of the Engliſh language, knows the uſe which may be made of this diſtinction. What a pity is it that we ſhould have ſtopt ſhort ſo ſoon? how blind was it in ſo many other nations to imitate the defects, without making a proper uſe of that beautiful language which is now numbered among the dead?

After the verbs, the next moſt conſiderable variation we find between the *Analogous* and *tranſpoſitive* languages, is in the nouns; the latter varying the different caſes of theſe by *inflection*; whereas the former expreſs all the different variations of them by the help of other words prefixed, called *prepoſitions*. Now, if we conſider the advantages or diſadvantages of either of theſe methods under the ſame heads as we have done the verbs, we will find, that with regard to the firſt particular, *viz.* variety of ſounds, almoſt the ſame remarks may be made as upon the verbs;—for if we compare any particular noun by itſelf, the variety of ſound appears much greater between the different caſes in the *Tranſpoſitive*, than between the tranſlation of theſe in the *Analogous* language. Thus, REX, REGIS, REGI, REGEM, *&c.* are more diſtinct from one another in point of ſound, than the tranſlation of theſe, *a king, of a king, to a king, a king,* &c. But if we proceed one ſtep further, and conſider the variety which is produced in the language *in general*, by the one or the other of theſe methods, the caſe is entirely reverſed. For as it would have been impoſſible to form diſtinct variations, different from one another, for each caſe of every noun, they have been obliged to reduce all their nouns into a few general claſſes, called *declenſions*, and endowed all of thoſe included under each claſs with the ſame termination in every caſe; which produces a like ſimilarity of ſound with what we already obſerved was occaſioned to the verbs from the ſame cauſe; whereas in the analogous languages, as there is no neceſſity for any conſtraint, there is almoſt as great a variety of ſounds as there are of nouns. The Latins have only five different declenſions, ſo that all the great number of words of this general order muſt be reduced to the very ſmall diverſity of ſounds which theſe few claſſes admit of; and even the ſounds of theſe few claſſes are not ſo much diverſified as they ought to have been, as many of the different *caſes* in the different *declenſions* have exactly the ſame ſounds, as we ſhall have occaſion to remark more fully hereafter.—We might here produce examples to ſhew the great *ſimilarity* of ſounds between different nouns in the Latin language, and *variety* in the Engliſh, in the ſame way as we did of the verbs: but as every reader, in the leaſt

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* This aſſertion may perhaps appear to many very much exaggerated: but if any ſhould think ſo, we only beg the favour that he will ſet himſelf to mark all the variation of tenſes, mode, perſon, and number, which an Engliſh verb can be made to aſſume, varying each of theſe in every way that it will admit, both as to the diverſity of expreſſions, and the emphaſis; he will ſoon be convinced that we have here ſaid nothing more than enough.

acquainted with theſe two languages, can ſatisfy himſelf in this particular, without any further trouble than by marking down any number of Latin nouns, with their tranſlations in Engliſh; we thought it unneceſſary to dwell longer on this particular.

But if the inflection of nouns is a diſadvantage to a language in point of diverſity of ſounds, it is very much the reverſe with regard to the variety it allows in the arranging the words of the phraſe. Here, indeed, the Tranſpoſitive language ſhines forth in all its glory, and the Analogous muſt yield the palm without the ſmalleſt diſpute. For as the *nominative caſe* (or that noun which is the cauſe of that energy expreſſed by the verb) is different from the *accuſative* (or that noun upon which the energy expreſſed by the verb is exerted) theſe may be placed in any ſituation that the writer ſhall think proper, without occaſioning the ſmalleſt confuſion: whereas in the analogous languages, as theſe two different ſtates of the noun are expreſſed by the ſame word, they cannot be diſtinguiſhed but by their poſition alone; ſo that the noun which is the efficient cauſe muſt always precede the verb, and that which is the active ſubject muſt follow; which greatly cramps the harmonious flow of compoſition. —Thus the Latins, without the ſmalleſt perplexity in the meaning, could ſay either *Brutum amavit Caſſius*, or *Caſſius amavit Brutum*, or *Brutum Caſſius amavit*, or *Caſſius Brutum amavit*. As the termination of the word *Caſſius* always points out that it is in the *nominative caſe*, and therefore that he is the perſon from whom the energy proceeds; and in the ſame manner, as the termination of the word *Brutum* points out that it is in the *accuſative caſe*, and conſequently that he is the object upon which the energy is exerted; the meaning continues ſtill diſtinct and clear, notwithſtanding of all theſe ſeveral variations: whereas in the Engliſh language, we could only ſay *Caſſius loved Brutus*, or, by a more forced phraſeology, *Caſſius Brutus loved*: Were we to reverſe the caſe, as in the Latin, the meaning alſo would be reverſed; for if we ſay *Brutus loved Caſſius*, it is evident, that, inſtead of being the perſon beloved, as before, *Brutus* now becomes the perſon from whom the energy proceeds, and *Caſſius* becomes the object beloved.—In this reſpect, therefore, the analogous languages are greatly inferior to the tranſpoſitive; and indeed it is from this ſingle circumſtance alone that they derive their chief excellence.

But although it thus appears evident, that any language, which has a particular variation of its nouns to diſtinguiſh the *accuſative* from the *nominative caſe*, has an advantage over thoſe languages which have none; yet it does not appear that any other of their *caſes* adds to the variety, but rather the reverſe: for, in Latin, we can only ſay *Amor Dei*; in Engliſh the ſame phraſe may be rendered, either,—*the love of God*,—*of God the love*,—or, by a more forced arrangement, *God the love of*. And as theſe oblique caſes, as the Latins called them, except the accuſative, are clearly diſtinguiſhed from one another, and from the nominative, by the prepoſition which accompanies them, we are not confined to any particular arrangement with regard to theſe as with the accuſative, but may place them in what order we pleaſe, as in Milton's elegant invocation at the beginning of Paradiſe Loſt:—

Of man's firſt diſobedience, and the fruit
Of that forbidden tree, whoſe mortal taſte
Brought death into the world, and all our wo,
With loſs of Eden, till one greater Man
Reſtore us, and regain the bliſsful ſeat,
Sing, heavenly muſe.

In this ſentence the tranſpoſition is almoſt as great as the Latin language would admit of, and the meaning as diſtinct as if Milton had begun with the plain language of proſe, thus,—"Heavenly muſe, ſing of man's firſt diſobedience," *&c.*

Before we leave this head, we may remark, that the little attention which ſeems to have been paid to this peculiar advantage derived from the uſe of an accuſative caſe different from the nominative, is ſomewhat ſurpriſing.—The Latins, who had more occaſion to attend to this with care than any other nation, have in many caſes overlooked it, as is evident from the many inſtances we meet with in their language where this is not diſtinguiſhed. For the nominative and accuſative are the ſame in the ſingular number of all thoſe of the firſt declenſion ending in E; as is likewiſe the caſe with thoſe in UM of the ſecond, in E of the third, and in U of the fourth. In the plural number, there is no diſtinction between theſe two caſes in thoſe of the ſecond declenſion ending in UM, nor in all thoſe of the third, fourth, and fifth, of every termination, the number of which is very conſiderable. So that their language reaps no advantage in this reſpect from almoſt one half of their nouns. Nor have any of the modern languages in Europe, however much they may have borrowed from the ancient languages in other reſpects, attempted to copy from them in this particular; from which perhaps more advantage would have been gained, than from copying all the other ſuppoſed excellencies of their language.—But to return to our ſubject.

It remains that we conſider, whether the inflection of nouns gives any advantage over the method of defining them by prepoſitions, in point of diſtinctneſs and preciſion of meaning.—But in this reſpect too the analogous language muſt come off victorious.—Indeed this is the particular in which their greateſt excellence conſiſts; nor was it, we believe, ever diſputed, but that, in point of accuracy and preciſion, this method muſt excel all others, however it may be defective in other reſpects.—We obſerved under this head, when ſpeaking of verbs, that it might perhaps be poſſible to form a language by inflection which ſhould be capable of as great accuracy as in the more ſimple order of auxiliaries: but this would have been ſuch an infinite labour, that it was not to be expected that ever human powers would have been able to accompliſh it. More eaſy would it have been to have formed the ſeveral inflections of the nouns ſo different from one another, as to have rendered it impoſſible ever to miſtake the meaning. Yet even this has not been attempted. And as we find that thoſe languages which have adopted the method of inflecting their verbs are more imperfect in point of preciſion than the other, ſo the ſame may be ſaid of inflecting the nouns: for, not to mention the energy which the analogous languages acquire by putting the accent upon the noun, or its prepoſition (when in an oblique caſe), according as the ſubject may require, to expreſs which variation of meaning no particular variety of words have been invented in any inflected language, they are not even complete in other reſpects.—The Latin, in particular, is in many caſes defective, the ſame termination being employed in many inſtances for different caſes of the ſame noun.—Thus the genitive and dative ſingular, and nominative and vocative plural, of the firſt declenſion, are all exactly alike, and can only be diſtinguiſhed from one another by the formation of the ſentences;—as are alſo the nominative, vocative and ablative ſingular, and the dative and ablative plural. In the ſecond, the genitive ſingular, and nominative and vocative plural, are the ſame; as are alſo the dative and ablative ſingular, and dative and ablative plural; except thoſe in UM, whoſe nominative, accuſative, and vocative ſingular, and nominative, accuſative and vocative plural, are alike. The other three declenſions agree in as many of their caſes as theſe do; which evidently tends to perplex the meaning, unleſs the hearer is particularly attentive to, and well acquainted with, the particular conſtruction of the other parts of the ſentence; all of which is totally removed, and the cleareſt certainty exhibited, at once, by the help of prepoſitions in the analogous languages.

It will hardly be neceſſary to enter into ſuch a minute examination of the advantages or diſadvantages attending the variation of *adjectives*; as it will appear evident, from what has been already ſaid, that the endowing them with terminations ſimilar to, and correſponding with the nouns, muſt tend ſtill more and more to increaſe the ſimilarity of ſounds in any language, than any of thoſe particulars we have already taken notice of; and were it not for the liberty which they have, in tranſpoſitive languages, of ſeparating the adjective from the noun, this muſt have occaſioned ſuch a jingle of ſimilar ſounds as behoved to have been moſt diſguſting to the ear: but as it would have been impoſſible in many caſes, in thoſe languages where the verbs and nouns are inflected, to have pronounced the words which ought to have followed each other, unleſs their adjectives could have been ſeparated from the nouns; therefore, to remedy this inconvenience, they were forced to deviſe this unnatural method of inflecting them alſo; by which means it is eaſy to recognize to what noun any adjective has a reference, in whatever part of the ſentence it may be placed.—In theſe languages, therefore, this inflection, both as to gender, number, and caſe, becomes abſolutely neceſſary; and, by the diverſity which it admitted in the arranging the words of the ſeveral phraſes, might counterbalance the jingle of ſimilar ſounds which it introduced into the language.—But what ſhall we ſay of thoſe European nations, who, although poſſeſſed of a language in every reſpect different from the tranſpoſitive idiom, have nevertheleſs adopted the variations of their adjectives in the fulleſt ſenſe? for here they have nothing to counterbalance this diſagreeable jingle of ſimilar ſounds, ſo deſtructive of all real harmony.—In the days of monkiſh ignorance, when this cuſtom was probably introduced, the claſhing of words with one another might be eſteemed an ornament; but now that mankind have attained a higher ſenſe of harmony and propriety, we in Britain may felicitate ourſelves to find, that our language has eſcaped this mark of barbarity, which ſo many others are now ſubjected to.

Having thus examined the moſt ſtriking particulars in which the tranſpoſitive and analogous languages differ, and endeavoured to ſhow the general tendency of every one of the particulars ſeparately, it would not be fair to diſmiſs the ſubject without conſidering each of theſe as a whole, and pointing out their general tendency in that light: for we all know, that it often happens in human inventions, that every part which compoſes a whole, taken ſeparately, may appear extremely fine; and yet, when all theſe parts are put together, they may not agree, but produce a jarring and confuſion very different from what we might have expected. We therefore imagine a few remarks upon the genius of each of theſe two diſtinct IDIOMS of language conſidered as a whole will not be deemed uſeleſs.

Although all languages agree in this reſpect, that they are the means of conveying the ideas of one man to another; yet as there are an infinite variety of ways in which we might wiſh to convey theſe ideas, ſometimes by the eaſy and familiar mode of converſation, and at other times by more ſolemn addreſſes to the underſtanding, by pompous declamation, *&c.* it may ſo happen, that the genius of one language may be more properly adapted to the one of theſe than the other, while another language may excel in the oppoſite particular. This is exactly the caſe in the two general IDIOMS of which we now treat.—Every particular in a *tranſpoſitive* language, is peculiarly calculated for that ſolemn dignity which is neceſſary for pompous orations. Long ſounding words, formed by the inflection of the different parts of ſpeech,—flowing periods, in which the attention is kept awake by the harmony of the ſounds, and an expectation of that word which is to unravel the whole,—if compoſed by a ſkilful artiſt, are admirably ſuited to that ſolemn dignity and awful grace which conſtitute the eſſence of a public harangue. On the contrary, in private converſation, where the mind wiſhes to unbend itſelf with eaſe, theſe become ſo many cloggs which encumber and perplex. At theſe moments we wiſh to transfuſe our thoughts with eaſe and facility—we are tired with every unneceſſary ſyllable—and wiſh to be freed of the trouble of attention as much as may be. Like our ſtate-robes, we would wiſh to lay aſide our pompous language, and enjoy ourſelves at home with freedom and eaſe. Here the ſolemnity and windings of the *tranſpoſitive* language are burdenſome; while the facility with which a ſentiment can be expreſſed in the the *analogous* language is the thing that we wiſh to acquire.—In this humble, though moſt engaging ſphere, the analogous language moves unrivalled;—in this it wiſhes to indulge, and never tires. But it in vain attempts to rival the *tranſpoſitive* in dignity and pomp: The number of monoſyllables interrupt the flow of harmony; and altho' they may give a greater variety of ſounds, yet they do not naturally poſſeſs that dignified gravity which ſuits the other language. This, then, muſt be conſidered as the ſtriking particular in the genius of theſe two different IDIOMS, which marks their characters.

If we conſider the effects which theſe two different characters of language muſt naturally produce upon the people who employ them, we will ſoon perceive, that the genius of the *analogous* language is much more favourable for the moſt engaging purpoſes of life, the civilizing the human mind by mutual intercourſe of thought, *than the tranſpoſitive*. For as it is chiefly by the uſe of ſpeech that man is raiſed above the brute creation;—as it is by this means he improves every faculty of his mind, and, to the obſervations which he may himſelf have made, has the additional advantage of the experience of thoſe with whom he may converſe, as well as the knowledge which the human race have acquired by accumulated experience of all preceding ages;—as it is by the enlivening glow of converſation that kindred ſouls catch fire from one another, that thought produces thought, and each improves upon the other, till they ſoar beyond the bounds which human reaſon, if left alone, could ever have aſpired to;—we muſt ſurely conſider that language as the moſt beneficial to ſociety, which moſt effectually removes theſe bars that obſtruct its progreſs. Now, the genius of the *analogous* languages is ſo eaſy, ſo ſimple and plain, as to be within the reach of every one who is born in the kingdom where it is uſed, to ſpeak it with facility; even the rudeſt among the vulgar can hardly fall into any grammatical errors: whereas, in the *tranſpoſitive* languages, ſo many rules are neceſſary to be attended to, and ſo much variation is produced in the meaning by the ſlighteſt variations in the ſound, that it requires a ſtudy far above the reach of the illiterate mechanic ever to attain. So that, how perfect ſoever the language may be when ſpoken with purity, the bulk of the nation muſt ever labour under the inconvenience of rudeneſs and inaccuracy of ſpeech, and all the evils which this naturally produces.—Accordingly we find, that in Rome, a man, even in the higheſt rank, received as much honour, and was as much diſtinguiſhed among his equals, for being able to converſe with eaſe, as a modern author would be for writing in an eaſy and elegant ſtyle; and Cæſar among his cotemporaries was as much eſteemed for his ſuperiority in ſpeaking the language in ordinary converſation with eaſe and elegance, as for his powers of oratory, his ſkill in arms, or his excellence in literary compoſition. It is needleſs to point out the many inconveniences that this behoved to produce in a ſtate. It is ſufficient to obſerve, that it naturally tends to introduce a vaſt diſtinction between the different orders of men; to ſet an impenetrable barrier between thoſe born in a high and thoſe born in a low ſtation; to keep the latter in ignorance and barbarity, while it elevates the former to ſuch a height as muſt ſubject the other to be eaſily led by every popular demagogue.—How far the hiſtory of the nations who have followed this IDIOM of language confirms this obſervation, every one is left to judge for himſelf.

Having thus conſidered LANGUAGE in general, and pointed out the genius and tendency of the two moſt diſtinguiſhed IDIOMS which have prevailed; we ſhall cloſe theſe remarks with a few obſervations upon the particular nature and genius of thoſe languages which are now chiefly ſtudied or ſpoken in Europe.

Of all the nations whoſe memory hiſtory has tranſmitted to us, none have been ſo eminently diſtinguiſhed for their literary accompliſhments, as well as acquaintance with the polite arts, as the Greeks; nor are we as yet acquainted with a language poſſeſſed of ſo many advantages, with ſo few defects, as that which they uſed, and which continues ſtill to be known by their name.—The neceſſary connection between the progreſs of knowledge and the improvement of language has been already explained; ſo that it will not be ſurpriſing to find their progreſs in the one keep pace with that of the other: but it will be of utility to point out ſome advantages which that diſtinguiſhed people poſſeſſed, which other nations, perhaps not leſs diſtinguiſhed for talents or taſte, have not enjoyed, which has contributed to render their language the moſt univerſally admired in ancient as well as in modern times.

As it is probable, that many different ſocieties of men, in the early ages of antiquity, may have found themſelves in ſuch circumſtances as to be obliged to invent a language to themſelves; each would naturally adopt thoſe ſounds into their language which chance might ſuggeſt, or were moſt agreeable to their perception of harmony, or moſt conſonant to the diſpoſition of mind of the original inventors; in the ſame manner as we ſee that each compoſer of muſic has a particular ſpecies of ſounds of which he is fonder than any other, which will predominate through all his compoſitions, and give them a certain characteriſtic tone by which they may be diſtinguiſhed from that of other compoſers:—So the language of each particular ſet of people would have originally a certain characteriſtic tone of harmony, which would diſtinguiſh it from all others; and behoved to be more or leſs perfect, according to the greater or leſs degree of that delicate ſenſe of harmony, diſtinguiſhed by the name of *taſte*, which theſe original inventors were poſſeſſed of. Theſe ſounds, then, being once eſtabliſhed by cuſtom, would become familiar to the ear of the deſcendents of theſe particular tribes: new words would be invented as knowledge increaſed; but theſe behoved to be modulated ſo as to be agreeable to the general tenor of their language, from the neceſſity of making it conſonant as well to the organs of hearing as the organs of ſpeech.—Hence it happens, that the characteriſtic tones of a language are preſerved much longer without variation than any other particular relating to it; and if it change at all, the change muſt be ſlow and imperceptible. Knowledge after this may increaſe;—taſte may be improved;—it may be perceived that the language is not copious enough to expreſs the ideas, or harmonious enough to pleaſe the ear of the compoſer;—he may readily invent words to ſupply the deficiency in that reſpect; but the ſounds in a great meaſure remain without the reach of his power, and he muſt reſt ſatisfied with theſe, ſuch as they are, without attempting innovations.——Happy therefore, in this reſpect, muſt we deem thoſe nations, whoſe earlieſt anceſtors have been ſo fortunate as to adopt no unharmonious ſounds into their language, whereby they are freed from one bar to the cultivating thoſe refined pleaſures which proceed from the uſe of a delicate taſte, which others may perhaps never be able to ſurmount:—and in this reſpect no nation was ever ſo eminently diſtinguiſhed as the Greeks; which no doubt contributed its ſhare to promote that general elegance and harmony of proportion which prevailed in all their arts. The original ſounds and fundamental tones of that language are the moſt harmonious, and the moſt agreeable to the ear, of any that have hitherto been invented; inſomuch, that from this principle alone the ſound of their language is agreeable to every nation who have heard it, even when the meaning of the words are not underſtood; whereas almoſt all other languages, till they are underſtood, appear, to an ear which has not been accuſtomed to them, jarring and diſcordant. This is the fundamental excellence of that juſtly admired language; nor have the people failed to improve this to the utmoſt of their power, by many aids of their own invention.—The Greek language is of the *tranſpoſitive* kind: but a people ſo lively, ſo acute, and ſo loquacious, could ill bear the ceremonious reſtraint which that mode of language naturally ſubjected them to; and have therefore, by various methods, freed it in a great meaſure from the ſtiffneſs which that produced. In inflecting their nouns and verbs, they ſometimes prefix a ſyllable, and ſometimes add one; which, beſides the variety that it gives to the ſounds of the language, adds greatly to the diſtinctneſs, and admits of a more natural arrangement of the words than in the Latin, and of conſequence renders it much fitter for the eaſineſs of private converſation: and indeed, the genius of the people ſo far prevailed over the *idiom* of the language, as to render it, in the age of its greateſt perfection, capable of almoſt as much eaſe, and requiring almoſt as little tranſpoſition of words, as thoſe languages which have been called analogous. But as thoſe nations who ſpoke this language were all governed by popular aſſemblies, and as no authority could be obtained among them but by a ſkill in rhetoric and the powers of perſuaſion; it became neceſſary for every one, who wiſhed to acquire power or conſideration in the ſtate, to improve himſelf in the knowledge of that language, in the uſe of which alone he could expect honours or reputation. Hence it happened, that while the vivacity of the people rendered it eaſy, the great men ſtudiouſly improved every excellence that it could reap from its powers as a *tranſpoſitive* language; ſo that, when brought to its utmoſt perfection by the amazing genius of the great Demoſthenes, it attained a power altogether unknown to any other language.—Thus happily circumſtanced, the Greek language arrived at that envied pre-eminence which it ſtill juſtly retains. From the progreſs of arts and ſciences; from the gaiety and inventive genius of the people; from the number of free ſtates into which Greece was divided, each of which invented words of its own, all of which contributed to the general ſtock; and from the natural commutation which took place between theſe ſtates, which excited in the ſtrongeſt degree the talents of the people; it acquired a copiouſneſs unknown to any ancient language, and excelled by few of the moderns.—In point of harmony of numbers, it is altogether unrivalled; and on account of the eaſe as well as dignity which it admitted of from the cauſes aſſigned above, it admits of perfection in a greater number of particular kinds of compoſition than any other language ever known.—The irreſiſtible force and overwhelming impetuoſity of *Demoſthenes* ſeems not more natural to the genius of the language; than the more flowery charms of Plato's calm and harmonious cadences, or the unadorned ſimplicity of Xenophon; nor does the majeſtic pomp of Homer ſeem to be more naturally adapted to the genius of the language, than the more humble ſtrains of Theocritus, or the laughing feſtivity of Anacreon: Equally adapted to all purpoſes, when we peruſe any of theſe authors, we would imagine the language was moſt happily adapted for his particular ſtyle alone. The ſame powers it likewiſe in a great meaſure poſſeſſed for converſation; and the dialogue ſeems not more natural for the dignity of Sophocles or Euripides, than for the more eaſy tenderneſs of Menander, or buffoonery of Ariſtophanes.—With all theſe advantages, however, it muſt be acknowledged, that it did not poſſeſs that unexceptionable clearneſs of meaning, which ſome analogous languages enjoy, or that characteriſtic force which the accent has power to give it, were not theſe defects counterbalanced by other cauſes which we ſhall afterwards point out.

The Romans, a people of fierce and warlike diſpoſitions, for many ages during the infancy of their republic, more intent on purſuing conqueſts and military glory, than in making improvements in literature or the fine arts, beſtowed little attention to their language. Of a diſpoſition leſs ſocial and more phlegmatic than the Greeks, they gave themſelves no trouble about rendering their language fit for converſation; and it remained ſtrong and nervous, but, like their ideas, was limited and confined. More diſpoſed to command reſpect by the power of their arms than by the force of perſuaſion, they deſpiſed the more effeminate powers of ſpeech: ſo that, before the Punic wars, their language was perhaps more reſerved and uncourtly than any other at that time known.—But after their rival Carthage was deſtroyed, and they had no longer that powerful curb upon their ambition; when riches flowed in upon them by the multiplicity of that conqueſts;—luxury began to prevail, the ſtern auſterity of their manners to relax, and ſelfiſh ambition to take place of that diſintereſted love for their country ſo eminently conſpicuous among all orders of men before that period.—Popularity began then to be courted: ambitious men, finding themſelves not poſſeſſed of that merit which inſured them ſucceſs with the virtuous ſenate, amuſed the mob with artful and ſeditious harangues; and by making them believe that they were poſſeſſed of all power, and had their ſacred rights encroached upon by the ſenate, led them about at their pleaſure, and got themſelves exalted to honours and riches by theſe inſidious arts. It was then the Romans firſt began to perceive the uſe to which a command of language could be put.—Ambitious men then ſtudied it with care, to be able to accompliſh their ends; while the more virtuous were obliged to acquire a ſkill in this, that they might be able to repel the attacks of their adverſaries.—Thus it happened, that in a ſhort time that people, from having entirely neglected, began to ſtudy their language with the greateſt aſſiduity; and as Greece happened to be ſubjected to the Roman yoke about that time, and a friendly intercourſe was eſtabliſhed between theſe two countries, this greatly conſpired to nouriſh in the

their

minds of the Romans a taſte for that art of which they had lately become ſo much enamoured. Greece had, long before this period, been corrupted by luxury; their taſte for the fine arts had degenerated into unneceſſary refinement; and all their patriotiſm conſiſted in popular harangues and unmeaning declamation. Oratory was then ſtudied as a refined art; and all the ſubtleties of it were taught by rule, with as great care as the gladiators were afterwards trained up in Rome. But while they were thus idly trying who ſhould be the lord of their own people, the nerves of government were relaxed, and they became an eaſy prey to every invading power. In this ſituation they became the *ſubjects*, under the title of the *allies*, of Rome, and introduced among them the ſame taſte for haranguing which prevailed among themſelves. Well acquainted as they were with the powers of their own language, they ſet themſelves with unwearied aſſiduity to poliſh and improve that of their new maſters: but with all their aſſiduity and pains they never were able to make it arrive at that perfection which their own language had acquired; and in the Auguſtan age, when it had arrived at the ſummit of its glory, Cicero bitterly complains of its want of copiouſneſs in many particulars.

But as it was the deſire of all who ſtudied this language with care, to make it capable of that ſtately dignity and pomp neceſſary for public harangues; they followed the genius of the language in this particular, and in a great meaſure neglected thoſe leſſer delicacies which form the pleaſure of domeſtic enjoyment; ſo that, while it acquired more copiouſneſs, more harmony, and preciſion, it remained ſtiff and inflexible for converſation; nor could the minute diſtinction of nice grammatical rules be ever brought down to the apprehenſion of the vulgar; ſo that the language ſpoken among the lower claſs of people remained rude and unpoliſhed even till the end of the monarchy. The Huns who over run Italy, incapable of acquiring any knowledge of ſuch a difficult and abſtruſe language, never adopted it; and the native inhabitants being made acquainted with a language more natural and eaſily acquired, quickly adopted that idiom of ſpeech introduced by their conquerors, although they ſtill retained many of thoſe words which the confined nature of the barbarian language made neceſſary to allow them, to expreſs their ideas.—And thus it was that the language of Rome, that proud miſtreſs of the world, from an original defect in its formation, although it had been carried to a perfection in other reſpects far ſuperior to any northern language at that time, eaſily gave way to them, and in a few ages the knowledge of it was loſt among mankind; while, on the contrary, the more eaſy nature of the Greek language has ſtill been able to keep ſome ſlight footing in the world, although the nations in which it has been ſpoken have been ſubjected to the yoke of foreign dominion for upwards of two thouſand years, and their country has been twice ravaged by barbarous nations, and more cruelly depreſſed than ever the Romans were.

From the view which we have already given of the Latin language, it appears evident, that its idiom was more ſtrictly tranſpoſitive than any other language yet known, and was attended with all the defects to which that idiom is naturally ſubjected: nor could it boaſt of ſuch favourable alleviating circumſtances as the Greek, the prevailing ſounds of the Latin being far leſs harmonious to the ear: and although the formation of the words are ſuch as to admit of full and diſtinct ſounds, and ſo modulated as to lay no reſtraint upon the voice of the ſpeaker; yet, to a perſon unacquainted with the language, they do not convey that enchanting harmony ſo remarkable in the Greek language. The Latin is ſtately and ſolemn, it does not excite diſguſt; but at the ſame time it does not charm the ear, ſo as to make it liſten with pleaſed attention. To one acquainted with the language indeed, the nervous boldneſs of the thoughts, the harmonious rounding of the periods, the full ſolemn ſwelling of the ſounds, ſo diſtinguiſhable in the moſt eminent writers in that language which have been preſerved to us, all conſpire to make it pleaſing and agreeable.—In theſe admired works we meet with all its beauties, without perceiving any of its defects; and we naturally admire, as perfect, a language which is capable of producing ſuch excellent works.—Yet with all theſe ſeeming excellencies, this language is leſs copious, and more limited in its ſtyle of compoſition, than many modern languages far leſs capable of preciſion and accuracy than almoſt any of theſe, and infinitely behind them all in point of eaſineſs in converſation. But theſe points have been ſo fully proved already, as to require no further illuſtration.—Of the compoſitions in that language which have been preſerved to us, the *orations* of Cicero are beſt adapted to the genius of the language, and we there ſee it in its utmoſt perfection. In the *philoſophical works* of that great author we perceive ſome of its defects; and it requires all the powers of that great man, to render his *epiſtles* agreeable, as theſe have the genius of the language to ſtruggle with.—Next to oratory, hiſtory agrees with the genius of this language; and Cæſar, in his Commentaries, has exhibited the language in its pureſt elegance, without the aid of pomp or foreign ornament. ——Among the Poets, Virgil has beſt adapted his works to his language. The flowing harmony and pomp of it is well adapted for the epic ſtrain, and the correct delicacy of his taſte rendered him perfectly equal to the taſk. But Horace is the only poet whoſe force of genius was able to overcome the bars which the language threw in his way, and ſucceed in lyric poetry. Were it not for the brilliancy of the thoughts, and acuteneſs of remarks, which ſo eminently diſtinguiſh this author's compoſitions, his odes would long ere now have ſunk into utter oblivion.—But ſo conſcious have all the Roman poets been of the unfitneſs of their language for eaſy dialogue; that almoſt none of them, after Plautus and Terence, have attempted any dramatic compoſitions in that language.—Nor have we any reaſon to regret that they neglected this branch of poetry, as it is probable, if they had ever become fond of theſe, they would have been obliged to have adopted ſo many unnatural contrivances to render them agreeable, as would have prevented us (who of courſe would have conſidered ourſelves as bound to follow them) from making that progreſs in the drama which ſo particularly diſtinguiſhes the productions of modern times.

The modern *Italian* language, from an inattention quite common in literary ſubjects, has been uſually called a child of the Latin language, and is commonly believed to be the ancient Latin a little debaſed by the mixture of the barbarous language of thoſe people who conquered Italy. The truth is, it is directly the reverſe: for this language, in its general idiom, and fundamental principles, is evidently of the analogous kind, firſt introduced by theſe fierce invaders, although it has borrowed many of its words, and ſome of its modes of phraſeology, from the Latin, with which they were ſo intimately blended that this could ſcarcely be avoided; and it has been from remarking this ſlight connection ſo obvious at firſt ſight, that ſuperficial obſervers have been led to draw this general concluſion, ſo contrary to fact.

When Italy was over-run with the Lombards, and the empire deſtroyed by theſe northern invaders, they, as conquerors, continued to ſpeak their own native language. Fierce and illiterate, they would not ſtoop to the ſervility of ſtudying a language ſo clogged with rules, and difficult of attainment, as the Latin behoved to be to a people altogether unacquainted with nice grammatical diſtinctions: while the Romans of neceſſity were obliged to ſtudy the language of their conquerors, as well to obtain ſome relief of their grievances by prayers and ſupplications, as to deſtroy that odious diſtinction which ſubſiſted between the conquerors and conquered while they continued as diſtinct people. As the language of their new maſters, although rude and confined, was natural in its order, and eaſy to be acquired, the Latins would ſoon attain a competent ſkill in it: and as they bore ſuch a proportion to the whole number of people, the whole language behoved to partake ſomewhat of the general ſound of the former: for, in ſpite of all their efforts to the contrary, the organs of ſpeech could not at once be made to acquire a perfect power of uttering any unaccuſtomed ſounds; and as the language of the barbarians behoved to be much leſs copious than the Latin, whenever they found themſelves at a loſs for a word, they would naturally adopt thoſe which moſt readily preſented themſelves from their new ſubjects. Thus a language in time was formed, ſomewhat reſembling the Latin, both in the general tenor of the ſounds, and in the meaning of many words: and as the barbarians gave themſelves little trouble about language, and in ſome caſes perhaps hardly knew the general analogy of their own language, it is not ſurpriſing if their new ſubjects ſhould find themſelves ſometimes at a loſs on that account, or if, in theſe ſituations, they followed, on ſome occaſions, the analogy ſuggeſted to them by their own; which accounts for the ſtrange degree of mixture of heterogeneous grammatical analogy we meet with in the Italian as well as Spaniſh and French languages.—The Idiom of all the Gothic languages is purely analogous; and in all probability, before their mixture with the Latins and other people in their provinces, the ſeveral grammatical parts of ſpeech followed the plain ſimple idea which that ſuppoſes; the verbs and nouns were all probably varied by auxiliaries, and their adjectives retained their ſimple unalterable ſtate:—but by their mixture with the Latins, this ſimple form has been in many caſes altered; their verbs became in ſome caſes inflected; but their nouns in all theſe languages ſtill retained their original form; although they have varied their adjectives, and fooliſhly clogged their nouns with gender, according to the Latin idioms. From this heterogeneous, and fortuitous (as we may ſay, becauſe injudicious) mixture of parts, reſults a language poſſeſſing almoſt all the defects of each of the languages of which it is compoſed; with few of the excellencies of either: for it has neither the eaſe and preciſion of the *analogous*, nor the pomp and boldneſs of the *tranſpoſitive* languages; at the ſame time that it is clogged with almoſt as many rules, and liable to as great abuſes.

Theſe obſervations are equally applicable to the French and Spaniſh, as to the Italian language.—With regard to this laſt in particular, we may obſerve, that as the natural inhabitants of Italy, before the laſt invaſion of the barbarians, were ſunk and enervated by luxury and that depreſſion of mind and genius which anarchy always produces; they had become fond of feaſting and entertainments, and the enjoyment of ſenſual pleaſures conſtituted their higheſt delight; and their language partook of the ſame debility as their body.——The barbarians too—unaccuſtomed to the ſeductions of pleaſure—ſoon fell from their original boldneſs and intrepidity,—and, like Hannibal's troops of old, were enervated by the ſenſual gratifications into which a nation of conquerors unaccuſtomed to the reſtraint of government freely indulged.—The ſoftneſs of the air—the fertility of the climate—the unaccuſtomed flow of riches which they at once acquired,—together with the voluptuous manner of their conquered ſubjects,—all conſpired to enervate their minds, and render them ſoft and effeminate.—No wonder then, if a language new-moulded ſhould at this juncture partake of the genius of the people who formed it; and inſtead of participating of the martial boldneſs and ferocity of either of their anceſtors, ſhould be ſoftened and enfeebled by every device which an effeminate people could invent.——The ſtrong conſonants which terminated the words, and gave them life and boldneſs, being thought too harſh for the delicate ears of theſe ſons of ſloth, were baniſhed their language;—while ſonorous vowels, which could be protracted to any length in muſic, were ſubſtituted in their ſtead.——Thus the Italian language is formed flowing and harmonious, but deſtitute of thoſe nerves which conſtitute the ſtrength and vigour of a language: at the ſame time, the ſounds are neither enough diverſified, nor in themſelves of ſuch an agreeable tone, as to afford great pleaſure without the aid of muſical notes;—and the ſmall pleaſure which this affords is ſtill leſſened by the little variety of meaſure which the great ſimilarity of the termination of words occaſions.—Hence it happens, that this language is fitted for excelling in fewer branches of literature than almoſt any other:—and although we have excellent hiſtorians, and more than ordinary poets, in this language; yet they labour under great inconveniences from the language in which they write,—as it wants nerves and ſtatelineſs for the former,—and ſufficient variety of modulation for the latter.—It is, more particularly on this account, altogether unfit for an epic poem:—and although attempts have been made in this way by two men, whoſe genius, if not fettered by the language, might have been crowned with ſucceſs; yet theſe, notwithſtanding the fame that with ſome they may have acquired, muſt, in point of poetic harmony, be deemed defective by every impartial perſon. Nor is it poſſible that a language which hardly admits of poetry without rhime, can ever be capable of producing a perfect poem of great length; and the ſtanza to which their poets have ever confined themſelves, muſt always produce the moſt diſagreeable effect in a poem where unreſtrained pomp or pathos are neceſſary qualifications. The only ſpecies of poetry in which the Italian language can claim a ſuperior excellence, is the tender tone of elegy: and here it remains unrivalled and alone:—the plaintive melody of the ſounds, and ſmooth flow of the language, ſeem perfectly adapted to expreſs that ſoothing melancholy which this ſpecies of poetry requires.—On this account, the plaintive ſtanzas of the *Paſtor Fido* of *Guarini* have juſtly gained to that poem an univerſal applauſe; although, unleſs on this account alone, it is perhaps inferior to almoſt every other poem of the kind which ever appeared.——We muſt obſerve with ſurpriſe, that the Italians, who have fettered every other ſpecies of poetry with the ſevereſt ſhackles of rhime, have in this ſpecies ſhewed an example of the moſt unreſtrained freedom; the happy effects of which ought to have taught all Europe the powerful charms attending it: yet with amazement we perceive, that ſcarce an attempt to imitate them has been made by any poet in Europe except by Milton in his Lycidas; no dramatic poet, even in Britain, having ever adopted the unreſtrained harmony of numbers to be met with in this and many other of their beſt dramatic compoſitions.

Of all the languages which ſprung up from the mixture of the Latins with the northern people on the deſtruction of the Roman empire, none of them approach ſo near to the genius of the Latin as the Spaniſh does. For as the Spaniards have been always remarkable for their military proweſs and dignity of mind, their language is naturally adapted to expreſs ideas of that kind. Sonorous and ſolemn, it admits nearly of as much dignity as the Latin. For converſation, it is the moſt elegant and courteous language in Europe.—The humane and generous order of chivalry was firſt invented and kept its footing longeſt in this nation; and although it run at laſt into ſuch a ridiculous exceſs as deſervedly made it fall into univerſal diſrepute, yet it left ſuch a ſtrong tincture of romantic heroiſm upon the minds of all ranks of people, as made them jealous of their glory, and ſtrongly emulous of cultivating that heroic politeneſs, which they conſidered as the higheſt perfection they could attain. Every man diſdained to flatter, or to yield up any point of honour which he poſſeſſed: at the ſame time, he rigorouſly exacted from others all that was his due. Theſe circumſtances have given riſe to a great many terms of reſpect, and courteous condeſcenſion, without meanneſs or flattery, which give their dialogue a reſpectful politeneſs and elegance unknown to any other European language. This is the reaſon why the characters ſo finely drawn by Cervantes in Don Quixote are ſtill unknown to all but thoſe who underſtand the language in which he wrote.—Nothing can be more unlike the gentle meekneſs and humane heroiſm of the knight, or the native ſimplicity, warmth of affection, and reſpectful loquacity of the ſquire,—than the inconſiſtent follies of the one, or the impertinent forwardneſs and diſreſpectful petulance of the other, as they are exhibited in every Engliſh tranſlation.—Nor is it poſſible to repreſent ſo much familiarity, united with ſuch becoming condeſcenſion in the one, and unfeigned deference in the other, in any other European language, as is neceſſary to paint theſe two admirable characters.

Although this language, from the ſolemn dignity and majeſtic elegance of its ſtructure, is perhaps better qualified than any other modern one for the ſublime ſtrains of epic poetry; yet as the poets of this nation have all along imitated the Italians by a moſt ſervile ſubjection to rhime, they never have produced one poem of this ſort, which in point of poeſy of ſtyle deſerves to be tranſmitted to poſterity. And in any other ſpecies of poetry but this, or the higher tragedy, is it not naturally fitted to excel. But although the drama and other polite branches of literature were early cultivated in this country, and made conſiderable progreſs in it, before the thirſt of gain debaſed their ſouls, or the deſire of univerſal dominion made them forfeit that liberty which they once ſo much prized; ſince they became enervated by an overbearing pride, and their minds enſlaved by ſuperſtition; all the polite arts have been neglected: ſo that, while other European nation have been advancing in knowledge, and improving their language, they have remained in a ſtate of torpid inactivity; and their language has not arrived at that perfection which its nature would admit, or the acute genius of the people would have made us naturally expect.

It will perhaps, by ſome, be thought an unpardonable inſult, if we do not allow the French the preference of all modern languages in many reſpects. But ſo far muſt we pay a deference to truth, as to be obliged to rank it among the pooreſt languages in Europe.—Every other language has ſome ſounds which can be uttered clearly by the voice: even the Italian, although it wants energy, ſtill poſſeſſes diſtinctneſs of articulation. But the French is almoſt incapable of either of theſe beauties; for in that language the vowels are ſo much curtailed in the pronunciation, and the words run into one another in ſuch a manner, as of neceſſity to produce an indiſtinctneſs which renders it incapable of meaſure or harmony. From this cauſe, it is in a great meaſure incapable of poetic modulation, and rhime has been obliged to be ſubſtituted in its ſtead; ſo that this pooreſt of all contrivances which has ever yet been invented to diſtinguiſh poetry from proſe, admitted into all the modern languages when ignorance prevailed over Europe, has ſtill kept ſome footing in the greateſt part of theſe, rather through a deference for eſtabliſhed cuſtoms, than from any neceſſity.—Yet as the French language admits of ſo little poetic modulation, rhime is in ſome meaſure *neceſſary* to it; and therefore they have adopted, and dignified this poor deviation from proſe with the name of Poetry; and, by their blind attachment to this art, have neglected to improve ſo much as they might have done the ſmall powers for harmony that their language is poſſeſſed of; and, by being long accuſtomed to this falſe taſte, have become fond of it to ſuch a ridiculous exceſs, as to have all their tragedies,—nay even their comedies, in rhime. While the poet is obliged to enervate his language, and check the flow of compoſition, for the ſake of linking his lines together, the judicious actor finds more difficulty in deſtroying the appearance of that meaſure, and preventing the clinking of the rhimes, than in all the reſt of his taſk.——After this we will not be ſurpriſed to find Voltaire attempt an epic poem in this ſpecies of poetry; although the more judicious Fenelon in his *Telemaque* had ſhewn to his countrymen the only ſpecies of poeſy which their language could admit of for any poem which aſpired to the dignity of the epic ſtrain.——Madam Deſpouliers, in her *Idyllie*, has ſhewn the utmoſt extent of harmony to which their language can attain in ſmaller poems:—indeed in the tenderneſs of an elegy, or the gaiety of a ſong, it may ſucceed; but it is ſo deſtitute of force and energy, that it can never be able to reach the Pindaric, or even perhaps the Lyric ſtrain,—as the ineffectual efforts even of the harmonious Rouſſeau, in his tranſlation of the Pſalms of David of this ſtamp, may fully convince us.

With regard to its power in other ſpecies of compoſition, the ſententious rapidity of Voltaire, and the more nervous dignity of Rouſſeau, afford us no ſmall preſumption, that, in a ſkilful hand, it might acquire ſo much force, as to tranſmit to futurity hiſtorical facts in a ſtyle not altogether unworthy of the ſubject.—In attempts at pathetic declamation, the ſuperior abilities of the compoſer may perhaps on ſome occaſions excite a great idea, but this is ever cramped by the genius of the language: and altho' no nation in Europe can boaſt of ſo many orations where this grandeur is attempted; yet perhaps there are few who cannot produce more perfect, although not more laboured, compoſitions of this kind.

But notwithſtanding the French language labours under all theſe inconveniences;—although it can neither equal the dignity or genuine politeneſs of the Spaniſh, the nervous boldneſs of the Engliſh, nor the melting ſoftneſs of the Italian;—although it is deſtitute of poetic harmony, and ſo much cramped in ſound as to be abſolutely unfit for almoſt every ſpecies of muſical compoſition*;—yet the ſprightly genius of that volatile people has been able to ſurmount all theſe difficulties, and render it the language moſt generally eſteemed, and moſt univerſally ſpoken, of any in Europe: for this people, naturally gay and loquacious, and fond to exceſs of thoſe ſuperficial accompliſhments which engage the attention of the fair ſex, have invented ſuch an infinity of words capable of expreſſing vague and unmeaning compliment, now dignified by the name of *politeneſs*, that, in this ſtrain, one who uſes the French can never be at a loſs; and as it is eaſy to converſe *more*, and really ſay *leſs*, In this than any other language, a man of very moderate talents may diſtinguiſh himſelf much more by uſing this than any other that has ever yet been invented.—On this account, it is peculiarly well adapted for that ſpecies of converſation which muſt ever take place in thoſe general and promiſcuous companies, where many perſons of both ſexes are met together for the purpoſes of relaxation or amuſement; and muſt of courſe be naturally admitted into the courts of princes, and aſſemblies of great perſonages; who, having fewer equals with whom they can aſſociate, are more under a neceſſity of converſing with ſtrangers, in whoſe company the tender ſtimulus of friendſhip does not ſo naturally expand the heart to mutual truſt or unreſtrained confidence. In theſe circumſtances, as the heart remaineth diſengaged, converſation muſt neceſſarily flag; and mankind in this ſituation will gladly adopt that language in which they can converſe moſt eaſily without being deeply intereſted—One theſe accounts the French now is, and probably will continue to be reckoned the moſt polite language in Europe, and therefore the moſt generally ſtudied and known: nor ſhould we envy them this diſtinction, if our countrymen would not weaken and enervate their own manly language, by adopting too many of their unmeaning phraſes.

The Engliſh is perhaps poſſeſſed of a greater degree of excellence, blended with a greater number of defects, than any of the languages that we have hitherto mentioned.—As the people of great Britain are a bold, daring, and impetuous race of men; ſubject to ſtrong paſſions, and, from the abſolute freedom and independence which reigns among all ranks of people throughout this happy iſle, little ſolicituous about controuling theſe paſſions;—our language takes its ſtrongeſt characteriſtic diſtinction from the genius of the people; and, being bold, daring, and abrupt, is admirably well adapted to expreſs thoſe great emotions which ſpring up in an intrepid mind at the proſpect of intereſting events. Peculiarly happy too in the full and open ſound of the vowels, which forms the characteriſtic *tone* of the language, and in the ſtrong uſe of the aſpirate H in almoſt all thoſe words which are uſed as exclamations, or marks of ſtrong emotions upon intereſting occaſions, that particular claſs of words called *interjections* have, in our language, more of that fulneſs and unreſtrained freedom of tones, in which their chief power conſiſts, and are puſhed forth from the inmoſt receſſes of the ſoul in a more forcible and unreſtrained manner, than any other language whatever. Hence it is more

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* An author of great diſcernment, and well acquainted with the French language, has lately made the ſame remark; and as the loftineſs of his genius often prevents him from bringing down his illuſtrations to the level of ordinary comprehenſion, he has on this, and many other occaſions, been unjuſtly accuſed of being fond of paradoxes.---But as muſic never produces its full effect but when the tones it aſſumes are in uniſon with the idea that the words naturally excite, it of neceſſity follows, that if the words of any language do not admit of that fulneſs of ſound, or of that ſpecies of tones, which the paſſion or affection that may be deſcribed by the words would naturally require to excite the ſame idea in the mind of one who was unacquainted with the language, it will be impoſſible for the muſic to produce its full effect, as it will be cramped and confined by the ſound of the words;---and as the French language does not admit of thoſe full and open ſounds which are neceſſary for pathetic expreſſion in muſic, it muſt of courſe be unfit for muſical compoſition.---It is true indeed, that in modern times, in which ſo little attention is beſtowed on the ſimple and ſublime charms of pathetic expreſſion, and a fantaſtical tingling of unmeaning ſounds is called muſic---where the ſenſe of the words are loſt in fugues, quavers, and unneceſſary repetition of particular ſyllables,---all languages are nearly equally fitted for it; and among theſe the French: nor is it to be doubted, that, in the eaſy gaiety of a ſong, this language can properly enough admit of all the muſical expreſſion which that ſpecies of compoſition may require.

more peculiarly adapted for the great and intereſting ſcenes of the *Drama* than any language that has yet appeared in the globe.—Nor has any other nation ever arrived at that perfection which the Engliſh may juſtly claim in that reſpect; for however faulty our dramatic compoſitions may be in ſome of the critical niceties which relate to this art,—in nervous force of diction, and in the natural expreſſion of thoſe great emotions which conſtitute its ſoul and energy, we claim, without diſpute, an unrivalled ſuperiority.—Our language too, from the great intercourſe that we have had with almoſt all the nations of the globe by means of our extenſive commerce, and from the eminent degree of perfection which we have attained in all the arts and ſciences, has acquired a copiouſneſs beyond what any other modern nation can lay claim to; and even the moſt partial favourers of the Greek language are forced to acknowledge, that in this reſpect it muſt give place to the Engliſh. Nor is it leſs happy in that facility of conſtruction which renders it more peculiarly adapted to the genius of a free people, than any other form of language.—Of an *idiom* purely analogous, is has deviated leſs from the genius of that *idiom*, and poſſeſſes more of the characteriſtic advantages attending it, than any other language that now exiſts: for, while *others*, perhaps by their more intimate connection with the Romans, have adopted ſome of their tranſpoſitions, and clogged their language with unneceſſary fetters, *we* have preſerved ourſelves free from the contagion, and ſtill retain the primitive ſimplicity of our language. Our *verbs* are all varied by auxiliaries (except in the inſtance we have already given, which is ſo much in our favours); our *nouns* remain free from the perplexing embarraſſment of *genders*, and our pronouns mark this diſtinction where neceſſary with the moſt perfect accuracy; our *articles* alſo are of courſe freed from this unnatural encumbrance, and our *adjectives* preſerve their natural freedom and independence. From theſe cauſes, our language follows an order of conſtruction ſo natural and eaſy, and the rules of *ſyntax* are ſo few and obvious, as to be within the reach of the moſt ordinary capacity. So that from this, and the great clearneſs and diſtinctneſs of meaning which this mode of conſtruction neceſſarily is accompanied with, it is much better adapted for the familiar intercourſe of private ſociety, and liable to fewer errors in uſing it, than any other language yet known; and on this account we may boaſt, that in no nation of Europe do the lower claſs of people ſpeak their language with ſo much accuracy, or have their minds ſo much enlightened by knowledge, as thoſe of great Britain.——What then ſhall we ſay of the diſcernment of thoſe grammarians, who are every day echoing back to one another complaints of the poverty of our language on account of the few and ſimple rules which it requires in ſyntax? As juſtly might we complain of an invention in mechanics, which, by means of one or two ſimple movements, obvious to an ordinary capacity, little liable to accidents, and eaſily put in order by the rudeſt hand, ſhould poſſeſs the whole powers of a complex machine, which had required an infinite apparatus of wheels and contrary movements, the knowledge of which could only be acquired, or the various accidents to which it was expoſed by uſing it be repaired, by the powers of an ingenious artiſt, as complain of this characteriſtic excellence of our language as a defect.

But if we thus enjoy in an eminent degree the advantages attending an *analogous* language; we likewiſe feel in a conſiderable meaſure the defects to which it is expoſed; as the number of monoſyllables with which it always muſt be embarraſſed, notwithſtanding the great improvements which have been made in our language ſince the revival of letters in Europe, prevents in ſome degree that ſwelling fulneſs of ſound which ſo powerfully contributes to harmonious dignity and graceful cadences in literary compoſitions.—And as the genius of the people of Britain has always been more diſpoſed to the rougher arts of command, than the ſofter inſinuations of perſuaſion, no pains have been taken to correct theſe natural defects of our language; but on the contrary, by an inattention of which we have hardly a parallel in the hiſtory of any civilized nation, we meet with many inſtances, even within this laſt century, of the harmony of ſound being ſacrificed to that brevity ſo deſireable in converſation, as many elegant words have been curtailed, and harmonious ſyllables ſuppreſſed, to ſubſtitute in their ſtead others, ſhorter indeed, but more barbarous and uncouth.—Nay, ſo little attention have our forefathers beſtowed upon the harmony of ſounds in our language, that one would be tempted to think, on looking back to its primitive ſtate, that they had on ſome occaſions ſtudiouſly debaſed it.—Our language, at its firſt formation, ſeems to have laboured under a capital defect in point of ſound, as ſuch a number of S's enter into the formation of our words, and ſuch a number of letters and combinations of other letters aſſume a ſimilar ſound, as to give a general hiſs through the whole tenor of our language, which muſt be exceedingly diſagreeable to every unprejudiced ear. We would therefore have naturally expected, that at the revival of letters, when our forefathers became acquainted with the harmonious languages of Greece and Rome, they would have acquired a more correct taſte, and endeavoured, if poſſible, to have diminiſhed the prevalence of this diſguſting ſound. But ſo far have they been from thinking of this, that they have multiplied this letter exceedingly. The plurals of almoſt all our nouns were originally formed by adding the harmonious ſyllable *en* to the ſingular, which has given place to the letter *s*; and inſtead of *houſen* formerly, we now ſay *houſes*. In like manner, many of the variations of our verbs were formed by the ſyllable *eth*, which we have likewiſe changed into the ſame diſagreeable letter; ſo that, inſtead of *loveth*, *moveth*, *writeth*, *walketh*, &c. we have changed them into the more modiſh form of *loves*, *moves*, *writes*, *walks*, &c.—Our very auxiliary verbs have ſuffered the ſame change; and inſtead of *hath* and *doth*, we now make uſe of *has* and *does*. From theſe cauſes, notwithſtanding the great improvements which have been made in language, within theſe few centuries, in other reſpects; yet, with regard to the pleaſingneſs of ſound alone, it was perhaps much more perfect in the days of Chaucer than at preſent: and although cuſtom may have rendered theſe ſounds ſo familiar to our ear, as not to affect us much; yet to an unprejudiced perſon, unacquainted with our language, we have not the ſmalleſt doubt, but the language of *Bacon* or *Sydney* would appear more harmonious than that of *Robertſon* or *Hume*.—This is indeed the fundamental defect of our language, and loudly calls for reformation.

But notwithſtanding this great and radical defect in our language with regard to pleaſingneſs of ſounds, which muſt be ſo ſtrongly perceived by every one who is unacquainted with the meaning of our words; yet to thoſe who underſtand the language, the exceeding copiouſneſs which it allows in the choice of words proper for the occaſion, and the nervous force which it derives from the accent, with the perſpicuity and graceful elegance the emphaſis beſtows upon it, makes this defect be totally overlooked; and we could produce ſuch numerous works of proſe which excel in almoſt every different ſtyle of compoſition as would be tireſome to enumerate; and every reader of taſte and diſcernement will be able to recollect a ſufficient number of writings which excel in point of ſtyle, between the graceful and becoming gravity ſo conſpicuous in all the works of the author of the *Whole Duty of Man*, and the animated and nervous diction of Robertſon in his hiſtory of Charles the fifth,—the more flowery ſtyle of Shaftſbury, or the Attic ſimplicity and elegance of Addiſon. But although we can equal, if not ſurpaſs, every modern language in works of proſe, it is in its poetical powers that our language ſhines forth with the greateſt luſtre.—The brevity to which we muſt here neceſſarily confine ourſelves, prevents us from entering into a minute examination of the poetical powers of our own, compared with other languages; otherwiſe it would be eaſy to ſhew, that every other modern language labours under great reſtraints in this reſpect which ours is freed from;—that our language admits of a greater variety of poetic movements, and diverſity of cadence, than any of the admired languages of antiquity;—that it diſtinguiſhes with the greateſt accuracy between accent and quantity, and is poſſeſſed of every other poetic excellence which their languages were capable of: ſo that we are poſſeſſed of all the ſources of harmony which they could boaſt; and, beſides all theſe, have one ſuperadded, which is the cauſe of greater variety and more forcible expreſſion in numbers than all the reſt; that is, the unlimited power given to the emphaſis over quantity and cadence; by means whereof, a neceſſary union between ſound and ſenſe, numbers and meaning, in verſification, unknown to the ancients, has been brought about, which gives our language in this reſpect a ſuperiority over all thoſe juſtly admired languages.—But as we cannot here further purſue this ſubject, we ſhall only obſerve, that theſe great and diſtinguiſhing excellencies far more than counterbalance the inconveniencies that we have already mentioned; and although, in mere pleaſantneſs of ſounds, or harmonious flow of ſyllables, our language may be inferior to the Greek, the Latin, Italian, and Spaniſh; yet in point of manly dignity, graceful variety, intuitive diſtinctneſs, nervous energy of expreſſion, unconſtrained freedom and harmony of poetic numbers, it will yield the palm to none.—Our immortal Milton, ſlowly riſing, in graceful majeſty ſtands up as equal, if not ſuperior in theſe reſpects to any poet, in any other language, that ever yet exiſted;—while Thomſon, with more humble aim, in melody more ſmooth and flowing, ſoftens the ſoul to harmony and peace:—the plaintive moan of Hammond calls forth the tender tear and ſympathetic ſigh; while Gray's more ſoothing melancholy fixes the ſober mind to ſilent contemplation:—more tender ſtill than theſe, the amiable Shenſton comes; and from his Doric reed, ſtill free from courtly affectation, flows a ſtrain ſo pure, ſo ſimple, and of ſuch tender harmony, as even Arcadian ſhepherds would be proud to own. But far before the reſt, the daring Shakeſpear ſteps forth conſpicuous, clothed in native dignity; and, preſſing forward with unremitting ardour, boldly lays claim to both dramatic crowns held out to him by Thalia and Melpomene:—his rivals, far behind, look up, and envy him for theſe unfading glories; and the aſtoniſhed nations round, with diſtant awe, behold and tremble at his daring flight.——Thus the language, equally obedient to all, bends with eaſe under their hands, whatever form they would have it aſſume; and, like the yielding wax, readily receives, and faithfully tranſmits to poſterity, thoſe impreſſions which they have ſtamped upon it.

Such are the principal outlines of the language of Great Britain, ſuch are its beauties, and ſuch its moſt capital defects; a language more peculiarly circumſtanced than any that has ever yet appeared.——It is the language of a great and powerful nation, whoſe fleets ſurround the globe, and whoſe merchants are in every port; a people admired, or revered by all the world;—and yet it is leſs known in every foreign country, than any other language in Europe.—In it are written more perfect treatiſes on every art and ſcience, than are to be found in any other language;—yet it is leſs ſought after or eſteemed by the literati in any part of the globe, than almoſt any of theſe. Its ſuperior powers for every purpoſe of language are ſufficiently obvious from the models of perfection, in almoſt every particular, which can be produced in it;—yet it is neglected, deſpiſed, and vilified by the people who uſe it; and many of thoſe authors who owe almoſt the whole of their fame to the excellence of the language in which they wrote, look upon that very language with the higheſt contempt.—Neglected and deſpiſed, it has been trodden under foot as a thing altogether unworthy of cultivation or attention. Yet in ſpite of all theſe inconveniences, in ſpite of the many wounds it has thus received, it ſtill holds up its head, and preſerves evident marks of that comelineſs and vigour which are its characteriſtical diſtinction. Like a healthy oak planted in a rich and fertile ſoil, it has ſprung up with vigour: and although neglected, and ſuffered to be over-run with weeds; although expoſed to every blaſt, and unprotected from every violence; it ſtill beareth up under all theſe inconveniences, and ſhoots up with a robuſt healthineſs and wild luxuriance of growth. Should this plant, ſo ſound and vigorous, be now cleared from thoſe weeds with which it has been ſo much encumbered;—ſhould every obſtacle which now buries it under thick ſhades, and hides it from the view of every paſſenger, be cleared away;—ſhould the ſoil be cultivated with care, and a ſtrong fence be placed around it, to prevent the idle or the wicked from breaking or diſtorting its branches;—who can tell with what additional vigour it would flouriſh, or what amazing magnitude and perfection it might at laſt attain!—How would the aſtoniſhed world behold, with reverential awe, the majeſtic gracefulneſs of that object which they ſo lately deſpiſed!

[N. B. *Some unavoidable circumſtances which attended the printing of the preceding article, have occaſioned ſeveral miſtakes in it, of which the following deſerve immediate notice.*]

Page 864. column 1. line 29. the words *in time* ſhould be delete.
P. 865. col. 2. l. 34. for *word*, read *words*.
P. 866. col. 1. l. 6. for *one*, read *on*.
Ibid. col. 1. and 2. delete *Loqueo*, *Odio*, *Loque-bam*, *Odie-bam*, with the Engliſh words accompanying them;---and for *Faceo*, *Pona-bam*, *Obie-bam*, *Gaudie-bam*, and *Abſtinie-bam*, read *Facio*, *Pone-bam*, *Obi-bam*, *Gaude-bam*, and *Abſtine-bam*.
Ibid. col. 2. l. 22. for "and the *pluperfect* in ISSEM and ERO," read, "the *pluperfect* in ISSEM, and the *future* in ERO."
P. 868. for, TU, *Tytere*, *lentis in umbra*, &c. read, TU, *Tityre*, *lentus in umbra*, &c.
Ibid. col. 1. l. 28. for *contract*, read *contraſt*;---l. 37. for *paſion*, read *paſſion*;--- and delete the ſyllable *con* at the beginning of l. 45.
P. 870. col. 2. lines 22, 23, 24, 25, and 26. read thus:---For all their nouns in UM of the ſecond declenſion, in E of the third, and in U of the fourth, have each their nominative and accuſative ſingular alike. Nor in the plural number is there any diſtinction between theſe caſes, &c.
Ibid. col. 2. l. 19. from the bottom, for *language*, read *languages*.
P. 873. col. 2. l. 38. for *that*, read *their*.
P. 876. col. 2. l. 16. for *is it*, read *it is*.

LANGUED, in heraldry, expreſſes ſuch animals whoſe tongue apppearing out of the mouth, is borne of a different colour from that of the body.

LANGUEDOC, a province of France, bounded by Lionois, on the north; by the river Rhone, which divides it from Dauphine and Provence, on the eaſt; by the Mediterranean and the the Pyrenees, on the ſouth; and by Guienne and Gaſcony, on the weſt.

LANGUOR, among phyſicians, ſignifies great weakneſs and loſs of ſtrength, attended with a dejection of mind; ſo that the patients can ſcarce walk, or even ſtand upright, but are apt to faint away.

LANIGEROUS, an appellation given to whatever bears wool.

LANIUS, the BUTCHER-BIRD, in ornithology, a genus belonging to the order of accipitres; the characters of which are theſe: The beak is ſomewhat ſtrait, with a tooth on each ſide towards the apex, and naked at the baſe; and the tongue is lacerated. There are twenty ſix ſpecies, diſtinguiſhed by the ſhape of the tail, and colour.

LANNIERS, or **LANNIARDS**, in a ſhip, are ſmall ropes reeved into the dead-man's-eyes of all ſhrowds, either to ſlacken them or ſet them taught: the ſtays of all maſts are alſo ſet taught by lanniers.

LANTANA, in botany, a genus of the didynamia angioſpermia claſs. The calix conſiſts of four obſolete teeth; and the drupa has two cells. There are ſeven ſpecies, none of them natives of Britain.

LANUGO, the ſoft down of plants, like that growing on the fruit of the peach tree.

LANZO, a town of Italy, in the territory of Piedmont, ſituated fifteen miles north of Turin.

LAODICEA, an ancient city of the leſſer Aſia, ſituated eaſt of Epheſus, now in ruins.

LAON, a city of France, in the province of the Iſle of France, ſituated in E. long. 3° 45′, lat. 49′ 37.

LAOS, a country of the farther India in Aſia, bounded by China on the north; by Tonquin, on the eaſt; by Siam and Cambodia, on the ſouth; and Ava and Pegu, on the weſt.

LAPATHUM, in botany. See RUMEX.

LAPIDARY, an artificer, who cuts precious ſtones.

The art of cutting precious ſtones is of great antiquity. The French, though they fell into it but lately, have notwithſtanding carried this art to a very great perfection, but not in any degree ſuperior to the Engliſh.

There are various machines employed in the cutting of precious ſtones, according to their quality: the diamond, which is extremely hard, is cut on a wheel of ſoft ſteel, turned by a mill, with diamond-duſt, tempered with olive-oil, which alſo ſerves to poliſh it.

The deſcription of the diamond-cutter's wheel or mill, as repreſented in Plate CIII. fig. 7. is as follows: *a* is the pincers; *b*, the ſcrew of the pincers; *c*, the ſhell that carries the maſtic and the diamond; *d*, the maſtic that ſoftens the diamond at the end of the ſhell; *e*, the diamond preſented to the wheel, to be cut facetwiſe; *f*, the iron-wheel turning on its pivot; *g*, iron-pegs, to fix and keep the pincers ſteady; *h*, ſmall pigs of lead of different weights, wherewith the pincers are loaded at pleaſure to keep them ſteady; *i*, a wooden wheel; *k*, the axis of the wheel. It is bended and makes an elbow under the wheel, to receive the impulſion of a bar that does the office of a turning handle; *l*, the ſole, or ſquare piece of ſteel, wherein the pivot of the tree or axis moves; *m*, the turning handle, that ſets the wheel a-going by means of the elbow of its axis; the elbow of the piercer wherewith a hogſhead is broached, will give an idea of this kind of motion; *n*, the cat-gut ſtring, that goes round both the iron and the wooden wheels. If the wooden wheel is twenty times larger than the iron-one, the latter ſhall make twenty turns upon the diamond, whilſt the large wheel makes but one round its axis; and whilſt the boy gives, without any reſiſtance, a hundred impulſions to the turning handle, the diamond experiences a thouſand times the friction of the whole grinding wheel.

The diamond-cutter follows the work with his eyes, without taking any other ſhare in it than that of changing the place of the diamond to bite on a new ſurface; and of timely thrown upon it, with a few drops of oil, the minute particles of the diamonds firſt ground one againſt the other, to begin the cutting of them.

The oriental ruby, ſapphire, and topaz, are cut on a copper wheel with diamond duſt, tempered with olive-oil, and are poliſhed on another copper-wheel with tripoli and water. The hyacinth, emerald, amethyſt, garnets, agats, and other ſtones, not of an equal degree of hardneſs with the other, are cut on a leaden wheel with ſmalt and water, and poliſhed on a tin-wheel with tripoli. The turquois of the old and new rock, giraſol and opal, are cut and poliſhed on a wooden wheel with tripoli alſo.

The lapidaries of Paris have been a corporation ſince the year 1290. It is governed by four jurats, who ſuperintend their rights and privileges, viſit the maſter-workmen, take care of the maſter-piece of workmanſhip, bind apprentices, and adminiſter the freedom.

LAPIS, in general, is uſed to denote a ſtone of any kind.

LAPLAND, the moſt northerly part of Europe, divided

Plate CIII.

Fig. 1. LACERTA SALAMANDRA *or Salamander*

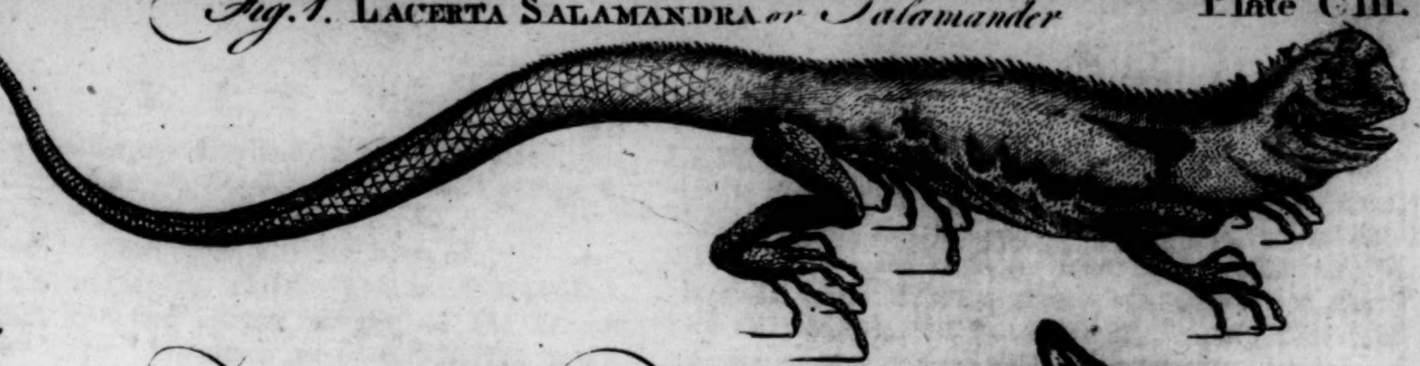


Fig. 4. LOG

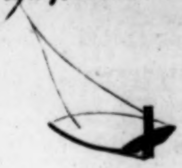


Fig. 5. LOGARITHMIC CURVE.

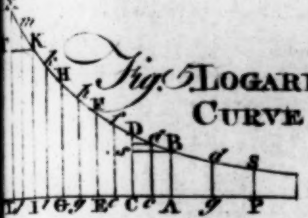


Fig. 6. LOGARITHMS

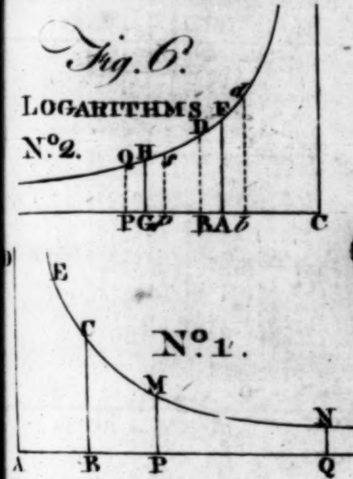

N°. 2.
F
D
Q
H
P
G
B
A
C
N°. 1.
D
E
C
M
N
A
B
P
Q

Fig. 2. LEPUS TIMIDUS *or Hare*

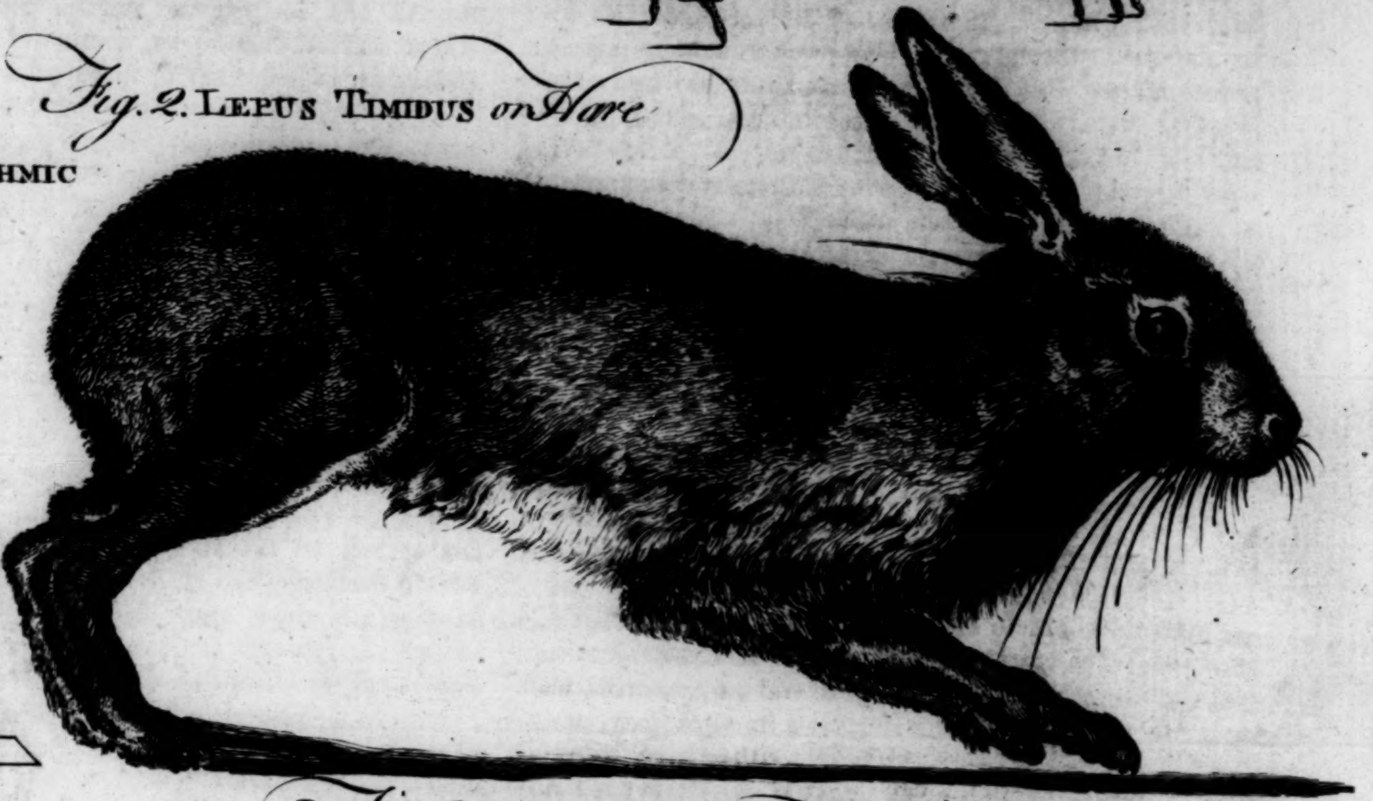


Fig. 3. LEPUS CUNICULUS *or Rabbit*

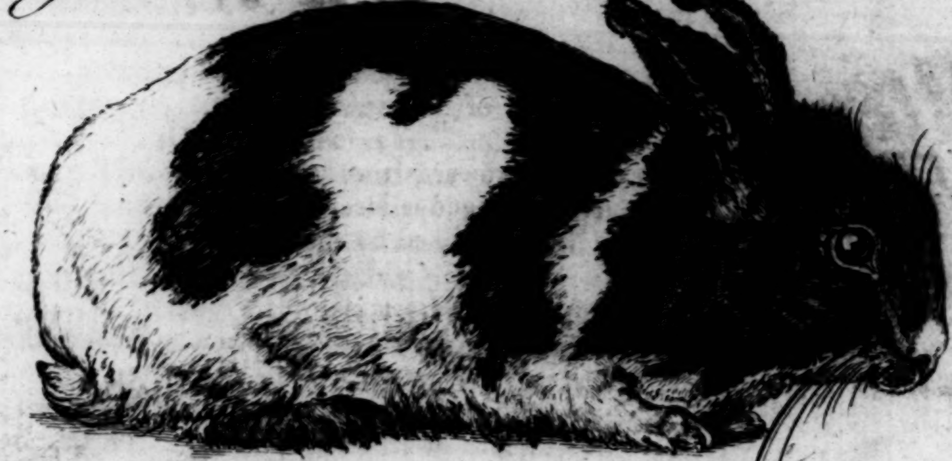


Fig. 8. LOZENGE

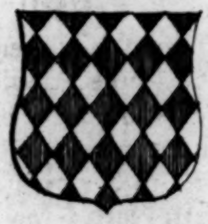
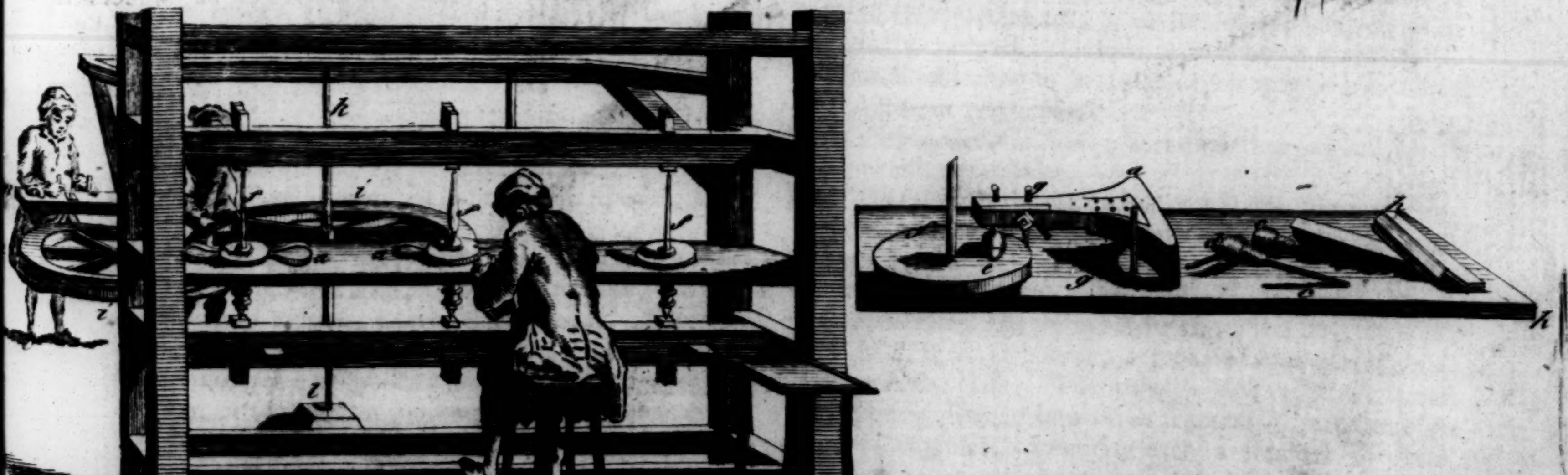


Fig. 7. LAPIDARY'S MILL *or* WHEEL



A. Bell Sculp^t.

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ded into Norwegian Lapland, Swediſh Lapland, and Ruſſian Lapland: it lies between 10° and 35° of E. long. and between 65 and 72° of N. lat.

LAPWING, in ornithology. See Fringa.

LAQUEUS, in ſurgery, a kind of ligature, ſo contrived, that when ſtretched by any weight, or the like, it draws up cloſe. Its uſe is to extend broken or diſjointed bones, to keep them in their places when they are ſet, and to bind the parts cloſe together.

LAR-BOARD, among ſeamen, the left-hand ſide of the ſhip, when you ſtand with your face towards the head.

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Theſe domeſtic deities were ſometimes repreſented under the figure of a dog, the ſymbol of fidelity; becauſe dogs have the ſame function as the lares, which is to guard the houſe. At other times their images were covered with the ſkin of a dog, and had the figure of that domeſtic animal ſtanding by them. The principal ſacrifices to the lares, were incenſe, fruit, and a hog.

LARIX. See Pinus.

LARK, in ornithology. See Alauda.

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ded into Norwegian Lapland, Swediſh Lapland, and Ruſſian Lapland: it lies between 10° and 35° of E. long. and between 65 and 72° of N. lat.

LAPWING, in ornithology. See Fringa.

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arborea, or ſea-tree mallow, is a native of Britain.

LAUBACH, a city of Germany, in the circle of Auſtria, and the capital of the duchy of Carinthia: E. lon. 14° 40′, and N. lat. 46° 28′.

LAUDANUM. See OPIUM.

LAUDER, a borough town of Scotland, in the ſhire of Mers, ſituated twenty-two miles ſouth-eaſt of Edinburgh.

LAVENDER. See LAVENDULA.

LAUGHTER, an affection peculiar to mankind, occaſioned by ſomething that tickles the fancy.

In laughter, the eye-brows are raiſed about the middle, and drawn down next the noſe; the eyes are almoſt ſhut; the mouth opens, and ſhews the teeth, the corners of the mouth being drawn back and raiſed up; the cheeks ſeem puffed up, and almoſt hide the eyes; the face is uſually red, and noſtrils open, and the eyes wet.

LAUNCESTON, the county-town of Cornwal, thirty-ſix miles weſt of Exeter; W. lon. 4° 40′, N. lat. 50° 45′.

It ſends two members to parliament.

LAUNCH, in the ſea language, ſignifies to put out: as, *launch the ſhip*, that is, put her out of the dock: *launch aſt*, or *forward*, ſpeaking of things that are ſtowed in the hold, is, put them more forward: *launch, ho!* is a term uſed when a yard is hoiſted high enough, and ſignifies, *hoiſt no more*.

LAURA, in church-hiſtory, a name given to a collection of little cells, at ſome diſtance from each other, in which the hermits, in ancient times, lived together in a wilderneſs.

Theſe hermits did not live in community, but each monk provided for himſelf in his diſtinct cell. The moſt celebrated lauras mentioned in eccleſiaſtical hiſtory, were in Paleſtine; as the Laura of St Euthymus, at four or five leagues diſtance from Jeruſalem; the laura of St Saba, near the brook Cedron; the laura of the Towers, near the river Jordan, *&c.*

LAURENTALIA, in Roman antiquity, a feſtival celebrated in honour of Acca Laurentia, Romulus's nurſe.

LAURUS, in botany, a genus of the enneandria monogynia claſs. It has no calix; the corolla conſiſts of ſix petals; the nectarium conſiſts of three glands, with two briſtles ſurrounding the germen; and the drupa contains but one ſeed. There are eleven ſpecies, among which are the cinnamonium, or cinnamon-tree; the camphora, or camphor-tree, (ſee CAMPHOR;) and the ſaſſafras, or ſaſſafras-tree.

The bark of the cinnamon-tree is light, thin, and of a reddiſh colour, rolled up in long quills or canes; of a fragrant delightful ſmell, and an aromatic ſweet pungent taſte, with ſome degree of aſtringency. It is generally mixed with the caſia bark: this laſt is eaſily diſtinguiſhable by its breaking over ſmooth, whilſt cinnamon ſplinters; and by its ſlimy mucilaginous taſte, without any thing of the roughneſs of the true cinnamon. Cinnamon is a very elegant and uſeful aromatic, more grateful both to the palate and ſtomach than moſt other ſubſtances of this claſs: by its aſtringent quality it likewiſe corroborates the viſcera, and proves of great ſervice in ſeveral kinds of alvine fluxes and immoderate diſcharges from the uterus. As eſſential oil, a ſimple and ſpirituous diſtilled water, and a tincture of it, are kept in the ſhops: it is likewiſe employed as a ſpicy ingredient in a great number of compoſitions.

The root of the ſaſſafras-tree is brought to us in long ſtraight pieces, very light, and of a ſpongy texture, covered with a rough fungous bark; outwardly of an aſh colour, inwardly of the colour of ruſty iron. It has a fragrant ſmell, and a ſweetiſh aromatic ſubacrid taſte: the bark taſtes much ſtronger than any other part; and the ſmall twigs ſtronger than the large pieces. As to the virtues of this root, it is a warm aperient and corroborant; and frequently employed, with good ſucceſs, for purifying and ſweetening the blood and juices. For theſe purpoſes, infuſions made from the raſped root or bark may be drank as tea. In ſome conſtitutions, theſe liquors, by their fragrance, are apt, on firſt taking them, to affect the head: in ſuch caſes, they may be advantagiouſly freed from their flavour by boiling; a decoction of ſaſſafras, boiled down to the conſiſtence of an extract, proves ſimply bitteriſh and ſubaſtringent. Hoffman aſſures us, that he has frequently given this extract to the quantity of a ſcruple at a time, with remarkable ſucceſs, for ſtrengthening the tone of the viſcera in cachexies; as alſo in the decline of intermittent fevers, and in hypochondriacal ſpaſms. Saſſafras yields in diſtillation an extremely fragrant oil, of a penetrating pungent taſte, ſo ponderous (notwithſtanding the lightneſs of the drug itſelf) as to ſink in water. Rectified ſpirit extracts the whole taſte and ſmell of ſaſſafras: and elevates nothing in evaporation: hence the ſpirituous extract proves the moſt elegant and efficacious preparations, as containing the virtue of the root entire.

The only officinal preparation of ſaſſafras is the eſſential oil. The ſaſſafras itſelf is an ingredient in the decoction of the woods and the compound lime waters, and the oil in the elixir guaiacinum.

LAUSANNE, a city of Switzerland, in the canton of Bern, ſituated on the north ſide of the lake of Geneva: E. lon. 6° 31′, and N. lat. 46° 33′.

LAW.

LAW may be defined, "The command of the ſovereign power, containing a common rule of life for the ſubjects." It is divided into the law of nature, the law of nations, and civil or municipal law.

1. The law of nature is that which God has preſcribed to all men, by the internal dictate of reaſon alone. It is diſcovered by a juſt conſideration of the agreeableneſs or diſagreeableneſs of human actions to the nature of man;

and comprehends all the duties we owe either to the Supreme Being, to ourſelves, or to our neighbour; as reverence to God, ſelf-defence, temperance, honour to our parents, benevolence to all, a ſtrict adherence to our engagements, gratitude, *&c.* The law of nature, where it either commands or forbids, is immutable, and cannot be controlled by any human authority; but where that law does no more than confer a right, without obliging us to uſe it, the ſupreme power may diveſt us thereof, in whole or in part.

2. The law of nations is alſo the reſult of reaſon, and has God for its author; but it ſuppoſes mankind formed into ſeveral bodies politic, or ſtates; and compriſes all the duties which one ſtate owes to another. Theſe muſt of neceſſity be ſimilar to the duties ariſing between individuals, ſince both are dictated by reaſon; ſo that what is the law of nature when applied to men conſidered ſimply as ſuch, is indeed the law of nations when applied to kingdoms or ſtates. From this ſource proceed the rights of war, the ſecurity of ambaſſadors, the obligations ariſing from treaties, *&c.* The particular uſages of nations in their mutual correſpondence which are not neceſſarily founded in reaſon, are no part of the law of nations in its proper ſenſe: for they are arbitrary, and derive their ſole authority from compact, either expreſs or preſumed; and may therefore, without violating the law of nature, be altered. For this reaſon, they ought to be thrown into the claſs of poſitive laws, whoſe obligation laſts no longer than the agreement upon which it is founded. Of this ſort, are the ceremonial uſed in receiving and entertaining ambaſſadors, the privileges indulged to ſome of their ſervants, the rules obſerved in cartels for exchanging priſoners of war, *&c.*

3. Civil or municipal law, is that which every ſovereign kingdom or ſtate has appropriated to itſelf. The appellation of municipal was originally confined to the laws of *municipia*, or dependent ſtates; but it came by degrees to ſignify all civil laws without diſtinction. No ſovereign ſtate can ſubſiſt without a ſupreme power, or a right of commanding in the laſt reſort; the ſupreme power of one age cannot therefore be fettered by any enactment of a former age, otherwiſe it would ceaſe to be ſupreme. Hence the law laſt in date derogates from prior laws.

PRINCIPLES OF THE LAW OF SCOTLAND.

Title I. *General Obſervations.*

1. The municipal law of Scotland, as of moſt other countries, conſiſts partly of ſtatutory or written law, which has the expreſs authority of the legiſlative power; partly of cuſtomary or unwritten law, which derives force from its preſumed or tacit conſent.

2. Under our ſtatutory or written law is comprehended, (1.) Our acts of parliament: not only thoſe which were made in the reign of James I. of Scotland, and from thence down to our union with England in 1707, but ſuch of the Britiſh ſtatutes enacted ſince the union as concern this part of the united kingdom.

3. The remains of our ancient written law were publiſhed by Sir John Skene clerk-regiſter, in the beginning of the laſt century, by licence of parliament. The books of *Regiam Majeſtatem*, to which the whole collection owes its title, ſeem to be a ſyſtem of Scots law, written by a private lawyer at the command of David I.; and though no expreſs confirmation of that treatiſe by the legiſlature appears, yet it is admitted to have been the ancient law of our kingdom by expreſs ſtatutes. The borough-laws, which were alſo enacted by the ſame king David, and the ſtatutes of William, Alexander II. David II. and the three Roberts, are univerſally allowed to be genuine. Our parliaments have once and again appointed commiſſions to reviſe and amend the *Regiam Majeſtatem*, and the other ancient books of our law, and to make their report: but, as no report appears to have been made, nor conſequently any ratification by parliament, none of theſe remains are received, as of proper authority, in our courts; yet they are of excellent uſe in proving and illuſtrating our moſt ancient cuſtoms.

4. Our written law comprehends, (2.) The acts of ſederunt, which are ordinances for regulating the forms of proceeding before the court of ſeſſion in the adminiſtration of juſtice, made by the judges, who have a delegated power from the legiſlature for that purpoſe. Some of theſe acts dip upon matter of right, which declare what the judges apprehend to be the law of Scotland, and what they are to obſerve afterwards as a rule of judgment.

5. The civil or Roman and canon laws, though they are not perhaps to be deemed proper parts of our written-law, have undoubtedly had the greateſt influence in Scotland. The powers exerciſed by our ſovereigns and judges have been juſtified upon no other ground, than that they were conformable to the civil or canon laws; and a ſpecial ſtatute was judged neceſſary, upon the reformation, to reſcind ſuch of their conſtitutions as were repugnant to the Proteſtant doctrine. From that period, the canon law has been little reſpected, except in queſtions of tithes, patronages, and ſome few more articles of eccleſiaſtical right: But the Roman continues to have great authority in all caſes where it is not derogated from by ſtatute or cuſtom, and where the genius of our law ſuffers us to apply it.

6. Our unwritten or cuſtomary law, is that which, without being expreſly enacted by ſtatute, derives its force from the tacit conſent of king and people; which conſent is preſumed from the ancient cuſtom of the community. Cuſtom, as it is equally founded in the will of the lawgiver with written law, has therefore the ſame effects: Hence, as one ſtatute may be explained by another, ſo a ſtatute may be explained or repealed by the uniform practice of the community, and even go into diſuſe by a poſterior contrary cuſtom. But this power of cuſtom to derogate from prior ſtatutes, is generally confined by lawyers to ſtatutes concerning private right, and does not extend to thoſe which regard public policy.

7. An uniform tract of the judgments or deciſions of the court of ſeſſion, is commonly conſidered as part of our cuſtomary law; and without doubt, where a particular cuſtom is thereby fixed or proved, ſuch cuſtom of itſelf conſtitutes law: But deciſions, though they bind the parties litigating, have not, in their own nature, the authority of law in ſimilar caſes; yet, where they continue uniform, great weight is juſtly laid on them. Neither can the judgments of the houſe of peers of Great Britain reach farther than to the parties in the appeal, ſince in theſe the peers act as judges, not as lawgivers.

8. Though the laws of nature are ſufficiently publiſhed by the internal ſuggeſtion of natural light, civil laws cannot be conſidered as a rule for the conduct of life, till they are notified to thoſe whoſe conduct they are to regulate. The *Scots* acts of parliament were, by our moſt ancient cuſtom, proclaimed in all the different ſhires, boroughs, and baron-courts of the kingdom. But after our ſtatutes came to be printed, that cuſtom was gradually neglected; and at laſt, the publication of our laws, at the market-croſs of Edinburgh, was declared ſufficient; and they became obligatory forty days thereafter. *Britiſh* ſtatutes are deemed ſufficiently notified, without formal promulgation; either becauſe the printing is truly a publication, or becauſe every ſubject is, by a maxim of the Engliſh law, party to them, as being preſent in parliament, either by himſelf or his repreſentative. After a law is publiſhed, no pretence of ignorance can excuſe the breach of it.

9. As laws are given for the rule of our conduct, they can regulate future caſes only; for paſt actions, being out of our power, can admit of no rule. Declaratory laws form no exception to this; for a ſtatute, where it is declaratory of a former law, does no more than interpret its meaning; and it is included in the notion of interpretation, that it muſt draw back to the date of the law interpreted.

10. By the rules of interpreting ſtatute-law received in Scotland, an argument may be uſed from the title to the act itſelf, *a rubro ad nigrum;* at leaſt, where the rubric has been either originally framed, or afterwards adopted by the legiſlature. The preamble or narrative, which recites the inconveniences that had ariſen from the former law, and the cauſes inducing the enactment, may alſo lead a judge to the general meaning of the ſtatute. But the chief weight is to be laid on the ſtatutory words.

11. Laws, being directed to the unlearned as well as the learned, ought to be conſtrued in their moſt obvious meaning, and not explained away by ſubtle diſtinctions; and no law is to ſuffer a figurative interpretation, where the proper ſenſe of the words is as commodious, and equally fitted to the ſubject of the ſtatute. Laws ought to be explained ſo as to exclude abſurdities, and in the ſenſe which appears moſt agreeable to former laws, to the intention of the lawgiver, and to the general frame and ſtructure of the conſtitution. In prohibitory laws, where the right of acting is taken from a perſon, ſolely for the private advantage of another, the conſent of him, in whoſe behalf the law was made, ſhall ſupport the act done in breach of it; but the conſent of parties immediately intereſted has no effect in matters which regard the public utility of a ſtate. Where the words of a ſtatute are capable but of one meaning, the ſtatute muſt be obſerved, however hard it may bear on particular perſons. Nevertheleſs, as no human ſyſtem of laws can comprehend all poſſible caſes, more may be ſometimes meant by the lawgiver than is expreſſed; and hence certain ſtatutes, where extenſion is not plainly excluded, may be extended beyond the letter, to ſimilar and omitted caſes: others are to be confined to the ſtatutory words.

12. A ſtrict interpretation is to be applied, 1. To correctory ſtatutes, which repeal or reſtrict former laws, and to ſtatutes which enact heavy penalties, or reſtrain the natural liberties of mankind. 2. Laws, made on occaſion of preſent exigencies in a ſtate, ought not to be drawn to ſimilar caſes, after the preſſure is over. 3. Where ſtatutes eſtabliſh certain ſolemnities as requiſite to deeds, ſuch ſolemnities are not ſuppliable by equivalents; for ſolemnities loſe their nature, when they are not performed ſpecifically. 4. A ſtatute, which enumerates ſpecial caſes, is, with difficulty, to be extended to caſes not expreſſed; but, where a law does not deſcend to particulars, there is greater reaſon to extend it to ſimilar caſes. 5. Statutes, which carry a diſpenſation or privilege to particular perſons or ſocieties, ſuffer a ſtrict interpretation; becauſe they derogate from the general law, and imply a burden upon the reſt of the community. But at no rate can a privilege be explained to the prejudice of thoſe in whoſe behalf it was granted. As the only foundation of cuſtomary law is uſage, which conſiſts in fact, ſuch law can go no farther than the particular uſage has gone.

13. All ſtatutes, concerning matters ſpecially favoured by law, receive an ample interpretation; as laws for the encouragement of commerce, or of any uſeful public undertaking, for making effectual the wills of dying perſons, for reſtraining fraud, for the ſecurity of creditors, *&c.* A ſtatute, though its ſubject-matter ſhould not be a favourite of the law, may be extended to ſimilar caſes, which did not exiſt when the ſtatute was made; and for which, therefore, it was not in the lawgiver's power to provide.

14. Every ſtatute, however unfavourable, muſt receive the interpretation neceſſary to give it effect: And, on the other hand, in the extenſion of favourable laws, ſcope muſt not be given to the imagination, in diſcovering remote reſemblances; the extenſion muſt be limited to the caſes immediately ſimilar. Where there is ground to conclude that the legiſlature has omitted a caſe out of the ſtatute purpoſely, the ſtatute cannot be extended to that caſe, let it be ever ſo ſimilar to the caſes expreſſed.

Tit. 2. *Of Juriſdiction and Judges in general.*

1. The object of law are perſons, things, and actions: among perſons, judges, who are inveſted with juriſdiction, deſerve the firſt conſideration. Juriſdiction is a power conferred upon a judge or magiſtrate, to take cogniſance of, and decide cauſes according to law, and to carry his ſentences into execution. That tract of ground, or diſtrict, within which a judge has the right of juriſdiction,

is called his territory: and every act of juriſdiction, exerciſed by a judge without his territory, either by pronouncing ſentence, or carrying it into execution, is null.

2. The ſupreme power, which has the right of enacting laws, falls naturally to have the right of erecting courts, and appointing judges, who may apply theſe laws to particular caſes: But, in Scotland, this right has been always intruſted with the Crown, as having the executive power of the ſtate.

3. Juriſdiction is either ſupreme, inferior, or mixed. That juriſdiction is ſupreme, from which there lies no appeal to a higher court. Inferior courts are thoſe whoſe ſentences are ſubject to the review of the ſupreme courts, and whoſe juriſdiction is confined to a particular territory. Mixed juriſdiction participates of the nature both of the ſupreme and inferior: thus, the judge of the high court of Admiralty, and the commiſſaries of Edinburgh, have an univerſal juriſdiction over Scotland, and they can review the decrees of inferior admirals and commiſſaries; but ſince their own decrees are ſubject to the review of the courts of Seſſion or Juſticiary, they are, in that reſpect, inferior courts.

4. Juriſdiction is either civil or criminal: by the firſt, queſtions of private right are decided; by the other, crimes are puniſhed. But, in all juriſdiction, though merely civil, there is a power inherent in the judge to puniſh, either corporally, or by a pecuniary fine, thoſe who offend during the proceedings of the court, or who ſhall afterwards obſtruct the execution of the ſentence.

5. Juriſdiction is either privative or cumulative. Privative juriſdiction, is that which belongs only to one court, to the excluſion of all others. Cumulative, otherwiſe called concurrent, is that which may be exerciſed by any one of two or more courts, in the ſame cauſe. In civil cumulative juriſdiction, the private purſuer has the right of election before which of the courts he ſhall ſue; but as, in criminal queſtions which are proſecuted by a public officer of court, a colliſion of juriſdiction might happen, through each of the judges claiming the exerciſe of their right, that judge, by whoſe warrant the delinquent is firſt cited or apprehended, (which is the firſt ſtep of juriſdiction), acquires thereby (*jure præventionis*) the excluſive right of judging in the cauſe.

6. All rights of juriſdiction, being originally granted in conſideration of the fitneſs of the grantee, were therefore perſonal, and died with himſelf. But, upon the introduction of the feudal ſyſtem, certain juriſdictions were annexed to lands, and deſcended to heirs, as well as the lands to which they were enexed; but now all heritable juriſdictions, except thoſe of admiralty and a ſmall pittance reſerved to barons, are either aboliſhed, or reſumed and annexed to the crown.

7. Juriſdiction is either proper or delegated. Proper juriſdiction, is that which belongs to a judge or magiſtrate himſelf, in virtue of his office. Delegated, is that which is communicated by the judge to another who acts in his name, called a depute or deputy. Where a deputy appoints one under him, he is called a ſubſtitute. No grant of juriſdiction, which is an office requiring perſonal qualifications, can be delegated by the grantee to another, without an expreſs power in the grant.

8. Civil juriſdiction is founded, 1. *Ratione domicilii*, if the defender has his domicile within the judge's territory. A domicile is the dwelling-place where a perſon lives with an intention to remain; and cuſtom has fixed it as a rule, that reſidence for forty days founds juriſdiction. If one has no fixed dwelling-place, *e. g.* a ſoldier, or a travelling-merchant, a perſonal citation againſt him within the territory is ſufficient to found the judge's juriſdiction over him, even in civil queſtions. As the defender is not obliged to appear before a court to which he is not ſubject, the purſuer muſt follow the defender's domicile.

9. It is founded, 2. *Ratione rei ſitæ*, if the ſubject in queſtion lie within the teritory. If that ſubject be immoveable, the judge, whoſe juriſdiction is founded in this way, is the ſole judge competent, excluding the judge of the domicile.

10. Where one, who has not his domicile within the territory, is to be ſued before an inferior court *ratione rei ſitæ*, the court of ſeſſion muſt be applied to, whoſe juriſdiction is univerſal, and who, of courſe, grants letters of ſupplement to cite the defender to appear before the inferior judge. Where the party to be ſued reſides in another kingdom, and has an eſtate in this, the court of ſeſſion is the only proper court, as the *commune forum* to all perſons reſiding abroad; and the defender, if his eſtate be heritable, is conſidered as lawfully ſummoned to that court, by a citation at the market-croſs of Edinburgh, and pier and ſhore of Leith: but where a ſtranger, not a native of Scotland, has only a moveable eſtate in this kingdom, he is deemed to be ſo little ſubject to the juriſdiction of our courts, that action cannot be brought againſt him till his effects be firſt attached by an arreſtment *juriſdictionis fundandæ cauſa*, *Harc.* 487, which is laid on by a warrant iſſuing from the ſupreme courts of ſeſſion, or admiralty, or from that within whoſe territory the ſubject is ſituated, at the ſuit of the creditor.

11. A judge may, in ſpecial caſes, arreſt or ſecure the perſons of ſuch as have neither domicile nor eſtate within his territory, even for civil debts. Thus, on the border between Scotland and England, warrants are granted of courſe by the judge-ordinary of either ſide, againſt thoſe who have their domicile upon the oppoſite ſide, for arreſting their perſons, till they give caution *judicio ſiſti*: and even the perſons of citizens or natives may be ſo ſecured, where there is juſt reaſon to ſuſpect that they are *in meditatione fugæ*, i. e. that they intend ſuddenly to withdraw from the kingdom; upon which ſuſpicion, the creditor who applies for the warrant muſt make oath. An inhabitant of a borough-royal, who has furniſhed one who lives without the borough in meat, cloaths, or other merchandize, and who has no ſecurity for it but his own compt-book, may arreſt his debtor, till he give ſecurity *judicio ſiſti*.

12. A judge may be declined, *i. e.* his juriſdiction diſowned judicially, 1. *Ratione cauſæ*, from his incompetency to the ſpecial cauſe brought before him. 2. *Ratione ſuſpecti judicis*; where either the judge himſelf, or his near kinſman, has an intereſt in the ſuit. No judge can vote in the cauſe of his father, brother, or ſon, either by conſanguinity or affinity; nor in the cauſe of his uncle or nephew by conſanguinity. 3. *Ratione privilegii*;

7. An uniform tract of the judgments or deciſions of the court of ſeſſion, is commonly conſidered as part of our cuſtomary law; and without doubt, where a particular cuſtom is thereby fixed or proved, ſuch cuſtom of itſelf conſtitutes law: But deciſions, though they bind the parties litigating, have not, in their own nature, the authority of law in ſimilar caſes; yet, where they continue uniform, great weight is juſtly laid on them. Neither can the judgments of the houſe of peers of Great Britain reach farther than to the parties in the appeal, ſince in theſe the peers act as judges, not as lawgivers.

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8. Civil juriſdiction is founded, 1. *Ratione domicilii*, if the defender has his domicile within the judge's territory. A domicile is the dwelling-place where a perſon lives with an intention to remain; and cuſtom has fixed it as a rule, that reſidence for forty days founds juriſdiction. If one has no fixed dwelling-place, *e. g.* a ſoldier, or a travelling-merchant, a perſonal citation againſt him within the territory is ſufficient to found the judge's juriſdiction over him, even in civil queſtions. As the defender is not obliged to appear before a court to which he is not ſubject, the purſuer muſt follow the defender's domicile.

9. It is founded, 2. *Ratione rei ſitæ*, if the ſubject in queſtion lie within the teritory. If that ſubject be immoveable, the judge, whoſe juriſdiction is founded in this way, is the ſole judge competent, excluding the judge of the domicile.

10. Where one, who has not his domicile within the territory, is to be ſued before an inferior court *ratione rei ſitæ*, the court of ſeſſion muſt be applied to, whoſe juriſdiction is univerſal, and who, of courſe, grants letters of ſupplement to cite the defender to appear before the inferior judge. Where the party to be ſued reſides in another kingdom, and has an eſtate in this, the court of ſeſſion is the only proper court, as the *commune forum* to all perſons reſiding abroad; and the defender, if his eſtate be heritable, is conſidered as lawfully ſummoned to that court, by a citation at the market-croſs of Edinburgh, and pier and ſhore of Leith: but where a ſtranger, not a native of Scotland, has only a moveable eſtate in this kingdom, he is deemed to be ſo little ſubject to the juriſdiction of our courts, that action cannot be brought againſt him till his effects be firſt attached by an arreſtment *juriſdictionis fundandæ cauſa, Harc.* 487, which is laid on by a warrant iſſuing from the ſupreme courts of ſeſſion, or admiralty, or from that within whoſe territory the ſubject is ſituated, at the ſuit of the creditor.

11. A judge may, in ſpecial caſes, arreſt or ſecure the perſons of ſuch as have neither domicile nor eſtate within his territory, even for civil debts. Thus, on the border between Scotland and England, warrants are granted of courſe by the judge-ordinary of either ſide, againſt thoſe who have their domicile upon the oppoſite ſide, for arreſting their perſons, till they give caution *judicio ſiſti*: and even the perſons of citizens or natives may be ſo ſecured, where there is juſt reaſon to ſuſpect that they are *in meditatione fugæ*, i. e. that they intend ſuddenly to withdraw from the kingdom; upon which ſuſpicion, the creditor who applies for the warrant muſt make oath. An inhabitant of a borough-royal, who has furniſhed one who lives without the borough in meat, cloaths, or other merchandize, and who has no ſecurity for it but his own compt-book, may arreſt his debtor, till he give ſecurity *judicio ſiſti*.

12. A judge may be declined, *i. e.* his juriſdiction diſowned judicially, 1. *Ratione cauſæ*, from his incompetency to the ſpecial cauſe brought before him. 2. *Ratione ſuſpecti judicis*; where either the judge himſelf, or his near kinſman, has an intereſt in the ſuit. No judge can vote in the cauſe of his father, brother, or ſon, either by conſanguinity or affinity; nor in the cauſe of his uncle or nephew by conſanguinity. 3. *Ratione pri-*

vilegii ; where the party is by privilege exempted from their juriſdiction.

13. Prorogated juriſdiction (*juriſdictio in conſentientes*) is that which is, by the conſent of parties, conferred upon a judge, who, without ſuch conſent, would be incompetent. Where a judge is incompetent, every ſtep he takes muſt be null, till his juriſdiction be made competent by the parties actual ſubmiſſion to it. It is otherwiſe where the judge is competent, but may be declined by the party upon privilege.

14. In order to prorogation, the judge muſt have juriſdiction, ſuch as may be prorogated. Hence, prorogation cannot be admitted where the judge's juriſdiction is excluded by ſtatute. Yet where the cauſe is of the ſame nature with thoſe to which the judge is competent, though law may have confined his juriſdiction within a certain ſum, parties may prorogate it above that ſum unleſs where prorogation is prohibited. Prorogation is not admitted in the king's cauſes ; for the intereſt of the Crown cannot be hurt by the negligence of its officers.

15. All judges muſt at their admiſſion ſwear, 1. The oath of allegiance, and ſubſcribe the aſſurance ; 2. The oath of abjuration ; 3. The oath of ſupremacy ; laſtly, The oath *de fideli adminiſtratione*.

16. A party who has either properly declined the juriſdiction of the judge before whom he had been cited, or who thinks himſelf aggrieved by any proceedings in the cauſe, may, before decree, apply to the court of ſeſſion to iſſue letters of advocation for calling the action from before the inferior court to themſelves. The grounds therefore, upon which a party may pray for letters of advocation, are incompetency and iniquity. Under incompetency, is comprehended not only defect of juriſdiction, but all the grounds of declining a juriſdiction, in itſelf competent, ariſing either from ſuſpicion of the judge, or privilege in the parties. A judge is ſaid to commit iniquity, when he either delays juſtice, or pronounces ſentence, in the exerciſe of his juriſdiction, contrary to law.

17. That the court of ſeſſion may not waſte their time in trifles, no cauſe for a ſum below twelve pound Sterling can be advocated to the court of ſeſſion from the inferior judge competent : but if an inferior judge ſhall proceed upon a cauſe to which he is incompetent, the cauſe may be carried from him by advocation, let the ſubject be ever ſo inconſiderable.

Tit. 3. *Of the ſupreme Judges and Courts of* Scotland.

1. The King, who is the fountain of juriſdiction, might by our conſtitution have judged in all cauſes, either in his own perſon, or by thoſe whom he was pleaſed to veſt with juriſdiction.

2. The parliament of Scotland, as our court of the laſt reſort, had the right of reviewing the ſentences of all our ſupreme courts.

3. By the treaty of union, 1707, the parliaments of Scotland and England are united into one parliament of Great Britain. From this period, the Britiſh houſe of Peers, as coming in place of the Scots parliament, is become our court of the laſt reſort, to which appeals lie from all the ſupreme courts of Scotland : But that court has no original juriſdiction in civil matters, in which they judge only upon appeal. By *art.* 22. of that treaty, the Scots ſhare of the repreſentation in the houſe of Peers is fixed to ſixteen Scots peers elective ; and in the houſe of Commons, to forty-five commoners, of which thirty are elected by the freeholders of counties, and fifteen by the royal boroughs. The Scots privy council was alſo thereupon aboliſhed, and ſunk into that of Great Britain, which for the future is declared to have no other powers than the Engliſh privy council had at the time of the union.

COURT OF SESSION.

4. A court was erected in 1425, conſiſting of certain perſons to be named by the king, out of the three eſtates of parliament, which was veſted with the juriſdiction formerly lodged in the privy council, and got the name of the Seſſion, becauſe it was ordained to hold annually a certain number of ſeſſions at the places to be ſpecially appointed by the king. This court had a juriſdiction, cumulative with the judge ordinary, in ſpuilzies, and other poſſeſſory actions, and in debts ; but they had no cognizance in queſtions of property of heritable ſubjects. No appeal lay from its judgments to the parliament. The judges of this court ſerved by rotation, and were changed from time to time, after having ſat forty days ; and became ſo negligent in the adminiſtration of juſtice, that it was at laſt thought neceſſary to transfer the juriſdiction of this court to a council to be named by the king, called the daily council.

5. The preſent model of the court of ſeſſion, or college of juſtice, was formed in the reign of James V. The judges thereof, who are veſted with an univerſal civil juriſdiction, conſiſted originally of ſeven churchmen, ſeven laymen, and a preſident, whom it behoved to be a prelate ; but ſpiritual judges were in 1584 partly, and in 1640 totally prohibited. The judges of ſeſſion have been always received by warrants from the crown. Anciently his Majeſty ſeems to have transferred to the court itſelf the right of chuſing their own preſident ; and in a ſederunt recorded June 26. 1593, the king condeſcended to preſent to the lords, upon every vacancy in the bench, a liſt of three perſons, out of which they were to chuſe one. But his Majeſty ſoon reſumed the exerciſe of both rights, which continued with the Crown till the uſurpation ; when it was ordained, that the king ſhould name the judges of the ſeſſion, by the advice of parliament. After the reſtoration, the nomination was again declared to be ſolely in the Sovereign.

6. Though judges may, in the general caſe, be named at the age of twenty-one years, the lords of ſeſſion muſt be at leaſt twenty-five. No perſon can be named lord of ſeſſion, who has not ſerved as an advocate or principal clerk of ſeſſion for five years, or as a writer to the ſignet for ten : and in the caſe of a writer to the ſignet, he muſt undergo the ordinary trials upon the Roman law, and be found qualified two years before he can be named. Upon a vacancy in the bench, the king preſents the ſucceſſor by a letter addreſſed to the lords, wherein he requires them to try and admit the perſon preſented. The powers given them to reject the preſentee upon trial are

taken away, and a bare liberty to remonſtrate ſubſtituted in its place.

7. Beſides the fifteen ordinary judges, the king was allowed to name three or four lords of his great council, who might ſit and vote with them. Theſe extraordinary lords were ſuppreſſed in the reign of Geo. I.

8. Though the juriſdiction of the ſeſſion be properly limited to civil cauſes, the judges have always ſuſtained themſelves as competent to the crime of falſehood. Where the falſehood deſerves death or demembration, they, after finding the crime proved, remit the criminal to the court of juſticiary. Special ſtatute has given to the court of ſeſſion juriſdiction in contraventions of lawburrows, deforcements, and breach of arreſtment; and they have been in uſe to judge in battery *pendente lite*, and in uſury.

9. In certain civil cauſes, the juriſdiction of the ſeſſion is excluſive of all inferior juriſdictions; as in declarators of property, and other competitions of heritable rights, provings of the tenor, *ceſſiones bonorum*, reſtitution of minors, reductions of decrees or of writings, ſales of the eſtates of minors or bankrupts, *&c.* In a ſecond claſs of cauſes, their juriſdiction can be only exerciſed in the way of review, after the cauſe is brought from the inferior court; as in maritime and conſiſtorial cauſes, which muſt be purſued in the firſt inſtance before the admiral or commiſſary; and in actions below twelve pounds Sterling, which muſt be commenced before the judge-ordinary. In all civil actions, which fall under neither of theſe claſſes, the juriſdiction of the ſeſſion is concurrent, even in the firſt inſtance, with that of the judge-ordinary. The ſeſſion may proceed as a court of equity by the rules of conſcience, in abating the rigour of law, and giving aid in proper caſes to ſuch as in a court of law can have no remedy: and this power is inherent in the ſupreme court of every country, where ſeparate courts are not eſtabliſhed for law and for equity.

COURT of JUSTICIARY.

10. The ſupreme criminal judge was ſtyled the Juſticiar; and he had anciently an univerſal civil juriſdiction, even in matters of heritage. He was obliged to hold two juſtice courts or ayres yearly at Edinburgh or Peebles, where all the free-holders of the kingdom were obliged to attend. Beſides this univerſal court, ſpecial juſtice-ayres were held in all the different ſhires of the kingdom twice in the year. Theſe laſt having gone into diſuſe, eight deputies were appointed, two for every quarter of the kingdom, who ſhould make their circuits over the whole in April and October.

11. The office of deputies was ſuppreſſed in 1972; and five lords of ſeſſion were added, as commiſſioners of Juſticiary, to the juſtice-general and juſtice-clerk. The juſtice-general, if preſent, is conſtant preſident of the court, and in his abſence the juſtice-clerk. The kingdom is divided into three diſtricts, and two of the judges are appointed to hold circuits in certain boroughs of each diſtrict twice in the year; one judge may proceed to buſineſs in the abſence of his collegue.

12. By an old ſtatute, the crimes of robbery, rape, murder, and wilful fire raiſing, (the four pleas of the Crown), are ſaid to be reſerved to the King's court of Juſticiary; but the only crime in which, *de praxi*, the juriſdiction of Juſticiary became at laſt excluſive of all inferior criminal juriſdiction, was that of high treaſon. The court of Juſticiary, when ſitting at Edinburgh, has a power of advocating cauſes from all inferior criminal judges, and of ſuſpending their ſentences.

13. The circuit-court can alſo judge in all criminal cauſes which do not infer death or demembration, upon appeal from any inferior court within their diſtrict; and has a ſupreme civil juriſdiction, by way of appeal, in all cauſes not exceeding twelve pounds Serling, in which their decrees are not ſubject to review; but no appeal is to lie to the circuit, till the cauſe be finally determined in the inferior court.

COURT of EXCHEQUER.

14. The court of Exchequer, as the King's chamberlain court, judged in all queſtions of the revenue. In purſuance of the treaty of Union, that court was aboliſhed, and a new court erected, conſiſting of the Lord High Treaſurer of Great Britain, and a chief Baron, with four other Barons of Exchequer; which Barons are to be made of ſerjeants at law, Engliſh barriſters, or Scots advocates of five years ſtanding. This court has a privative juriſdiction conferred upon it, as to the duties of cuſtoms, exciſe, or other revenues appertaining to the King or Prince of Scotland, and as to all honours and eſtates that may accrue to the crown; in which matters, they are to judge by the forms of proceeding uſed in the Engliſh court of Exchequer, under the following limitations; that no debt due to the Crown ſhall affect the debtor's real eſtate in any other manner than ſuch eſtate may be affected by the laws of Scotland, and that the validity of the Crown's titles to any honours or lands ſhall continue to be tried by the court of Seſſion. The Barons have the powers of the Scots court transferred to them, of paſſing the accounts of ſheriffs, or other officers who have the execution of writs iſſuing from, or returnable to the court of Exchequer, and of receiving reſignations, and paſſing ſignatures of charters, gifts of caſualties, *&c.* But though all theſe muſt paſs in Exchequer, it is the court of Seſſion only who can judge of their preference after they are completed.

ADMIRAL COURT.

15. The juriſdiction of the Admiral in maritime cauſes was of old concurrent with that of the Seſſion. The High-admiral is declared the King's Juſtice-General upon the ſeas, on freſh water within flood-mark, and in all harbours and creeks. His civil juriſdiction extends to all maritime cauſes, and ſo comprehends queſtions of charter parties, freights, ſalvages, bottomries, *&c.* He exerciſes this ſupreme juriſdiction by a delegate, the judge of the high-court of admiralty; and he may alſo name inferior deputies, whoſe juriſdiction is limited to particular diſtricts, and whoſe ſentences are ſubject to the review of the high court. In cauſes which are declared to fall under the Admiral's cogniſance, his juriſdiction is now ſole; in ſo much that the Seſſion itſelf, though they may review his decrees by ſuſpenſion or reduction, can-

not carry a maritime queſtion from him by advocation. The Admiral has acquired, by uſage, a juriſdiction in mercantile cauſes, even where they are not ſtrictly maritime, cumulative with that of the judge-ordinary.

16. All our ſupreme courts have ſeals or ſignets, proper to their ſeveral juriſdictions. The courts of Seſſion and Juſticiary uſed formerly the ſame ſignet, which was called the King's, becauſe the writs iſſuing from thence run in the King's name; and though the Juſticiary got at laſt a ſeparate ſignet for itſelf, yet that of the Seſſion ſtill retains the appellation of the *King's Signet*. In this office are ſealed ſummonſes for citation, letters of executorial diligence, or for ſtaying or prohibiting of diligence, and generally whatever paſſes by the warrant of the Seſſion, and is to be executed by the officers of the court. All theſe muſt, before ſealing, be ſigned by the writers or clerks of the ſignet: But letters of diligence, where they are granted in a depending proceſs, merely for probation, though they paſs by the ſignet, muſt be ſubſcribed by a clerk of Seſſion. The clerks of the ſignet alſo prepare and ſubſcribe all ſignatures of charters, or other royal grants, which paſs in Exchequer.

Tit. 4. *Of the inferior Judges and Courts of* Scotland.

SHERIFF.

SHERIFF, from *reeve*, governor, and *ſheer*, to cut or divide, is the judge ordinary conſtituted by the Crown over a particular diviſion or county. The Sheriff's juriſdiction, both civil and criminal, was, in ancient times, nearly as ample within his own territory as that of the ſupreme courts of Seſſion and Juſticiary was over the whole kingdom.

2. His civil juriſdiction now extends to all actions upon contracts, or other perſonal obligations, forthcomings, poindings of the ground, mails and duties, and to all poſſeſſory actions, as removings, ejections, ſpuilzies, &c. to all brieves iſſuing from the chancery, as of inqueſt, terce, diviſion, tutory, &c. and even to adjudications of land-eſtates, when proceeding on the renunciation of the apparent heir. His preſent criminal juriſdiction extends to certain capital crimes, as theft, and even murder, though it be one of the pleas of the Crown; and he is competent to moſt queſtions of public police, and has a cumulative juriſdiction with juſtices of the peace in all riots and breaches of the peace.

3. Sheriffs have miniſterial power, in virtue of which, they return juries, in order to the trial of cauſes that require juries. The writs for electing members of parliament have been, ſince the union, directed to the Sheriffs, who, after they are executed, return them to the crown-office from whence they iſſued. They alſo execute writs iſſuing from the court of Exchequer; and in general, take care of all eſtates, duties, or caſualties that fall to the Crown within their territory, for which they muſt account to the Exchequer.

LORD of REGALITY.

4. A Lord of Regality was a magiſtrate, who had a grant of lands from the Sovereign, with royal juriſdiction annexed thereto. His civil juriſdiction was equal to that of a Sheriff; his criminal extended to the four pleas of the crown. He had a right to repledge or reclaim all criminals, ſubject to his juriſdiction, from any other competent court, though it were the Juſticiary itſelf, to his own. He had alſo right, according to the moſt common opinion, to the ſingle eſcheat of all denounced perſons reſiding within his juriſdiction, even though ſuch privilege had not been expreſſed in the grant of regality.

STEWART.

5. The Stewart was the magiſtrate appointed by the King over ſuch regality-lands as happened to fall to the Crown by forfeiture, &c. and therefore the ſtewart's juriſdiction was equal to that of a regality. The two ſtewartries of Kircudbright, and of Orkney and Zetland, make ſhires or counties by themſelves, and ſend each a repreſentative to parliament.

BAILIE.

6. Where lands, not erected into a regality, fell into the King's hands, he appointed a Bailie over them, whoſe juriſdiction was equal to that of a Sheriff.

7. By the late juriſdiction act 20. *Geo.* II. all heritable regalities and bailieries, and all ſuch heritable ſheriffſhips and ſtewartries as were only parts of a ſhire, are diſſolved; and the powers formerly veſted in them are made to devolve upon ſuch of the King's courts as theſe powers would have belonged to if the juriſdictions diſſolved had never been granted. All ſheriffſhips and ſtewartries that were no part of a ſhire, where they had been granted, either heritably or for life, are reſumed and annexed to the crown. No High Sheriff or Stewart can hereafter judge perſonally in any cauſe. One Sheriff or Stewart-depute is to be appointed by the King in every ſhire, who muſt be an advocate of three years ſtanding; and after a certain term not yet expired, all commiſſions to theſe deputies are to be granted for life.

PRINCE of SCOTLAND.

8. The appanage, or patrimony, of the Prince of Scotland, has been long erected into a regality-juriſdiction, called the Principality. It is perſonal to the King's eldeſt ſon, upon whoſe death or ſucceſſion it returns to the Crown. The prince has, or may have, his own chancery, from which his writs iſſue, and may name his own chamberlain and other officers for receiving and managing his revenue. The vaſſals of the Prince are intitled to elect, or to be elected members of Parliament for counties, equally with thoſe who hold of the Crown.

JUSTICES of the PEACE.

9. Juſtices of the Peace are magiſtrates named by the Sovereign over the ſeveral counties of the kingdom, for the ſpecial purpoſe of preſerving the public peace. Anciently their power reached little farther than to bind over diſorderly perſons for their appearance before the Privy Council or Juſticiary; afterwards they were authoriſed to judge in breaches of the peace, and in moſt of the laws concerning public policy. They may compel workmen or labourers to ſerve for a reaſonable fee, and

they can condemn maſters in the wages due to their ſervants. They have power to judge in queſtions of highways, and to call out the tenants with their cotters and ſervants to perform ſix days work yearly for upholding them.

10. Since the Union, our juſtices of the peace, over and above the powers committed to them by the laws of Scotland, are authoriſed to exerciſe whatever belonged to the office of an Engliſh juſtice of the peace, in relation to the public peace. From that time, the Scots and the Engliſh commiſſions have run in the ſame ſtyle, which contain powers to inquire into, and judge in all capital crimes, witchcrafts, felonies, and ſeveral others ſpecially enumerated, with this limitation ſubjoined, *of which juſtices of the peace may lawfully inquire.* Two juſtices can conſtitute a court. Special ſtatute has give the cogniſance of ſeveral matters of exciſe to the juſtices, in which their ſentences are final.

BOROUGHS.

11. A borough is a body-corporate, made up of the inhabitants of a certain tract of ground erected by the Sovereign, with juriſdiction annexed to it. Boroughs are erected, either to be holden of the Sovereign himſelf, which is the general caſe of royal boroughs; or of the ſuperior of the lands erected, as boroughs of regality and barony. Boroughs-royal have power, by their charters, to chuſe annually certain office-bearers or magiſtrates; and in boroughs of regality and barony, the nomination of magiſtrates is, by their charter, lodged ſometimes in the inhabitants, ſometimes in the ſuperior. Bailies of boroughs have juriſdiction in matters of debt, ſervices, and queſtions of poſſeſſion betwixt the inhabitants. Their criminal juriſdiction extends to petty riots, and reckleſs fire-raiſing. The Dean of Guild is that magiſtrate of a royal borough who is head of the merchant-company: he has the cogniſance of mercantile cauſes within borough, and the inſpection of buildings, that they incroach neither on private property, nor on the public ſtreets; and he may direct inſufficient houſes to be pulled down. His juriſdiction has no dependance on the court of the borough, or bailie-court.

BARONS.

12. A Baron, in the large ſenſe of that word, is one who holds his lands immediately of the Crown; and, as ſuch, had, by our ancient conſtitution, right to a ſeat in parliament, however ſmall his freehold might have been. The leſſer Barons were exempted from the burden of attending the ſervice of parliament. This exemption grew inſenſibly into an utter diſability in all the leſſer Barons from ſitting in parliament, without election by the county; though no ſtatute is to be found expreſly excluding them.

13. To conſtitute a Baron in the ſtrict law-ſenſe, his lands muſt have been erected, or at leaſt confirmed by the King, *in liberam baroniam:* and ſuch Baron had a certain juriſdiction, both civil and criminal, which he might have exerciſed, either in his own perſon, or by his bailie.

14. By the late juriſdiction-act, the civil juriſdiction of a Baron is reduced to the power of recovering, from his vaſſals and tenants, the rents of his lands, and of condemning them in mill ſervices; and of judging in cauſes where the debt and damages do not exceed 40 s. Sterling. His criminal juriſdiction is, by the ſame ſtatute, limited to aſſaults, batteries, and other ſmaller offences, which may be puniſhed by a fine not exceeding 20 s. Sterling, or by ſetting the offender in the ſtocks in the day-time not above three hours; the fine to be levied by poinding, or one month's impriſonment. The juriſdiction formerly competent to proprietors of mines, and coal or ſalt works, over their workmen, is reſerved; and alſo that which was competent to proprietors who had the right of fairs or markets, for correcting the diſorders that might happen during their continuance; provided they ſhall exerciſe no juriſdiction inferring the loſs of life or demembration.

CONSTABULARIES.

15. The High Conſtable of Scotland had no fixed territorial juriſdiction, but followed the court; and had, jointly with the Mariſchal, the cogniſance of all crimes committed within two leagues of it. All other conſtabularies were dependant on him: Theſe had caſtles, and ſometimes boroughs ſubject to their juriſdiction, as Dundee, Montroſe, *&c.* and amongſt other powers, now little known, they had the right of exerciſing criminal juriſdiction within their reſpective territories during the continuance of fairs. By the late juriſdiction-act, all juriſdictions of conſtabulary are diſſolved, except that of High Conſtable.

LYON KING of ARMS.

16. The office of the Lyon King of Arms was chiefly miniſterial, to denounce war, proclaim peace, carry public meſſages, *&c.* But he has alſo a right of juriſdiction, whereby he can puniſh all who uſurp arms contrary to the law of arms, and deprive or ſuſpend meſſengers, heralds, or purſuivants, (who are officers named by himſelf;) but he has no cogniſance of the damage ariſing to the private party through the meſſenger's fault. Meſſengers are ſubſervient to the ſupreme courts of ſeſſion and juſticiary; and their proper buſineſs is to execute all the King's letters either in civil or criminal cauſes.

17. Our judges had, for a long time, no other ſalaries or appointments than what aroſe from the ſetences they pronounced. Our criminal judges applied to their own uſe the fines or iſſues of their ſeveral courts; and regalities had a right to the ſingle eſcheat of all perſons denounced, who reſided within their juriſdiction; and our civil judges got a certain proportion of the ſum contained in the decree pronounced. But theſe were all prohibited upon regular ſalaries being ſettled upon our judges.

TIT. 5. *Of Eccleſiaſtical Perſons.*

THE Pope, or biſhop of Rome, was long acknowledged, over the weſtern part of Chriſtendom, for the head of the Chriſtian church. The papal juriſdiction was aboliſhed in Scotland *anno* 1560. The King was, by act 1669, declared to have ſupreme authority over all perſons, and in all cauſes eccleſiaſtical; but this act was repealed by 1690, as inconſiſtent with Presbyterian church-government, which was then upon the point of being eſtabliſhed.

2. Before the reformation from Popery, the clergy was divided into ſecular and regular. The ſecular had a particular tract of ground given them in charge, within which they exerciſed the paſtoral office of biſhop, preſbyter, or other church officer. The regular clergy had no cure of ſouls, but were tied down to reſidence in their abbacies, priories, or other monaſteries: And they got the name of regular, from the rules of mortification to which they were bound, according to the inſtitution of their ſeveral orders. Upon the vacancy of any benefice, whether ſecular or regular, Commendators were frequently appointed to levy the fruits, as factors or ſtewards during the vacancy. The Pope alone could give the higher benefices *in commendam*; and at laſt, from the plenitude of his power, he came to name commendators for life, and without any obligation to account. After the reformation, ſeveral abbacies and priories were given by James VI. *inperpetuam commendam*, to laics.

3. Upon aboliſhing the Pope's authority, the regular clergy was totally ſuppreſſed; and, in place of all the different degrees which diſtinguiſhed the ſecular clergy, we had at firſt only parochial Preſbyters or Miniſters, and ſuperintendants, who had the overſight of the church within a certain diſtrict: Soon thereafter the church-government became epiſcopal, by Archbiſhops, Biſhops, *&c.* and after ſome intermediate turns, is now Preſbyterian by kirk-ſeſſions, preſbyteries, ſynods, and general aſſemblies.

4. Prelate, in our ſtatutes, ſignifies a Biſhop, Abbot, or other dignified clergyman, who in virtue of his office had a ſeat in parliament. Every Biſhop had his Chapter, which conſiſted of a certain number of the miniſters of the dioceſe, by whoſe aſſiſtance he managed the affairs of the church within that diſtrict. The nomination of Biſhops to vacant ſees has been in the crown ſince 1540, though under the appearance of continuing the ancient right of election. which was in the Chapter. The confirmation by the Crown under the great ſeal, of the Chapter's election, confirmed a right to the ſpirituality of the benefice; and a ſecond grant, upon the conſecration of the Biſhop elect, gave a title to the temporality; but this ſecond grant fell ſoon into diſuſe.

5. He who founded or endowed a church was intitled to the right of patronage thereof, or *advocatio eccleſiæ*; whereby, among other privileges, he might preſent a churchman to the cure, in caſe of a vacancy. The preſentee, after he was received into the church, had a right to the benefice *proprio jure*; and if the church was parochial, he was called a parſon. The Pope claimed the right of patronage of every kirk, to which no third party could ſhew a ſpecial title; and ſince the reformation, the Crown, as coming in place of the Pope, is conſidered as univerſal patron, where no right of patronage appears in a ſubject. Where two churches are united, which had different patrons, each patron preſents by turns.

6. Gentlemen of eſtates frequently founded colleges or collegiate churches, the head of which got the name of Provoſt, under whom were certain Prebendaries or Canons, who had their ſeveral ſtalls in the church, where they ſung maſſes. Others of leſſer fortunes founded chaplainries, within the precincts of a parochial church; or altarages, which were donations granted for the ſinging of maſſes for deceaſed friends at particular altars in a church. Though all theſe were ſuppreſſed upon the reformation, their founders continued patrons of the endowments; out of which they were allowed to provide burſars, to be educated in any of the univerſities.

7. Where a fund is gifted for the eſtabliſhment of a ſecond miniſter in a pariſh where the cure is thought too heavy for one, the patronage of ſuch benefice does not belong to the donor, but to him who was patron of the church, unleſs either where the donor has reſerved to himſelf the right of patronage in the donation, or where he and his ſucceſſors have been in the conſtant uſe of preſenting the ſecond miniſter, without challenge from the patron. The right of preſenting incumbents was by 1690, *c.* 23. taken from patrons, and veſted in the heritors and elders of the pariſh, upon payment to be made by the heritors to the patron of 600 merks; but it was again reſtored to patrons, 10. *An. c.* 12. with the exception of the preſentations ſold in purſuance of the former act.

8. Patrons were not ſimply adminiſtrators of the church; for they held the fruits of the vacant benefice as their own, for ſome time after the reformation. But that right is now no more than a truſt in the patron, who muſt apply them to pious uſes within the pariſh, at the ſight of the heritors, yearly as they fall due. If he fail, he loſes his right of adminiſtring the vacant ſtipend for that and the next vacancy. The king, who is exempted from this rule, may apply the vacant ſtipend of his churches to any pious uſe, though not within the pariſh. If one ſhould be ordained to a church, in oppoſition to the preſentee, the patron, whoſe civil right cannot be affected by any ſentence of a church-court, may retain the ſtipend as vacant. Patrons are to this day intitled to a ſeat and burial-place in the churches of which they are patrons; and to the right of all the teinds of the pariſh not heritably diſponed.

9. That kirks may not continue too long vacant, the patron muſt preſent to the preſbytery, (formerly to the Biſhop), a fit perſon for ſupplying the cure, within ſix months from his knowledge of the vacancy, otherwiſe the right of preſentation accrues to the preſbytery *jure devoluto*. Upon preſentation by the patron, the Biſhop collated or conferred the benefice upon the preſentee by a writing, in which he appointed certain miniſters of the dioceſe to induce or inſtitute him into the church; which induction completed his right, and was performed by their placing him in the pulpit, and delivering him the bible and the keys of the church. The biſhop collated to the churches of which himſelf was patron, *pleno jure*, or without preſentation; which he alſo did in menſal churches, whoſe patronages were ſunk, by the churches being appropriated to him, as part of his patrimony. Since the revolution, a judicial act of admiſſion by the preſbytery, proceeding either upon a preſentation, or upon

on a call from the heritors and elders, or upon their own *jus devolutum*, compleats the miniſter's right to the benefice.

10. Soon after the reformation, the Popiſh churchmen were prevailed upon to reſign in the ſovereign's hands, a third of their benefices, which was appropriated, in the firſt place, for the ſubſiſtence of the reformed clergy. To make this fund effectual, particular localities were aſſigned in every benefice, to the extent of a third, called the aſſumption of thirds; and for the farther ſupport of miniſters, Queen Mary made a grant in their favour of all the ſmall benefices not exceeding 300 merks. Biſhops, by the act which reſtored them to the whole of their benefices, were obliged to maintain the miniſters within their dioceſes, out of the thirds; and in like manner, the laic titulars, who got grants of the teinds, became bound, by their acceptation thereof, to provide the kirks within their erections in competent ſtipends.

11. But all theſe expedients for the maintenance of the clergy having proved ineffectual, a commiſſion of parliament was appointed in the reign of James VI. for planting kirks, and modifying ſtipends to miniſters out of the teinds; and afterwards ſeveral other commiſſions were appointed, with the more ample powers of dividing large pariſhes, erecting new ones, *&c.* all of which were, in 1707, transferred to the court of Seſſion, with this limitation, that no pariſh ſhould be disjoined, nor new church erected, nor old one removed to a new place, without the conſent of three-fourths of the heritors, computing the votes, not by their numbers, but by the valuation of their rents within the pariſh. The Judges of Seſſion, when ſitting in that court, are conſidered as a commiſſion of Parliament, and have their proper clerks, macers, and other officers of court, as ſuch.

12. The loweſt ſtipend that could be modified to a miniſter by the firſt commiſſion was 500 merks, or five chalders of victual, unleſs where the whole teinds of the pariſh did not extend ſo far: And the higheſt was 1000 merks, or ten chalders. The parliament 1633 raiſed the *minimum* to eight chalders of victual, and proportionably in ſilver; but as neither the commiſſion appointed by that act, nor any of the ſubſequent ones, was limited as to the *maximum*, the commiſſioners have been in uſe to augment ſtipends conſiderably above the old *maximum*, where there is ſufficiency of free teinds, and the cure is burdenſome, or living expenſive.

13. Where a certain quantity of ſtipend is modified to a miniſter out of the teinds of a pariſh, without proportioning that ſtipend among the ſeveral heritors, the decree is called *a decree of modification*: But where the commiſſioners alſo fix the particular proportions payable by each heritor, it is a decree of *modification and locality*. Where a ſtipend is only modified, it is ſecured on the whole teinds of the pariſh, ſo that the miniſter can inſiſt againſt any one heritor to the full extent of his teinds, ſuch heritor being always entitled to relief againſt the reſt, for what he ſhall have paid above his juſt ſhare: But where the ſtipend is alſo localled, each heritor is liable in no more than his own proportion.

14. Few of the reformed miniſters were, at firſt, provided with dwelling houſes: moſt of the Popiſh clergy having, upon the firſt appearance of the reformation, let their manſes in feu, or in long tacks: Miniſters therefore got a right, by 1563, to as much of theſe manſes as would ſerve them, notwithſtanding ſuch feus or tacks. Where there was no parſon's nor vicar's manſe, one was to be built by the heritors, at the ſight of the biſhop, (now the Preſbytery,) the charge not exceeding L. 1000 Scots, nor below 500 merks. Under a manſe are comprehended ſtable, barn, and byre, with a garden; for all which, it is uſual to allow half an acre of ground.

15. Every incumbent is intitled at his entry to have his manſe put into good condition; for which purpoſe, the preſbytery may appoint a viſitation by tradeſmen, and order eſtimates to be laid before them of the ſums neceſſary for the repairing, which they may proportion among the heritors according to their valuations. The preſbytery, after the manſe is made ſufficient, ought, upon application of the heritors, to declare it a free manſe, which lays the incumbent under an obligation to uphold it in good condition during his incumbency; otherwiſe, he or his executors ſhall be liable in damages: But they are not bound to make up the loſs ariſing from the neceſſary decay of the buildings by the waſte of time.

16. All miniſters, where there is any landward or country pariſh, are, over and above their ſtipend, intitled to a glebe, which comprehends four acres of arable land, or ſixteen ſowms of paſture-ground where there is no arable land, (a ſowm is what will graze ten ſheep or one cow), and is to be deſigned or marked by the biſhop or preſbytery out of ſuch kirk-lands within the pariſh as lie neareſt to the kirk, and, in default of kirk-lands, out of temporal lands.

17. A right of relief is competent to the heritors, whoſe lands are ſet off for the manſe or glebe, againſt the other heritors of the pariſh. Manſes and glebes, being once regularly deſigned, cannot be fened or ſold by the incumbent in prejudice of his ſucceſſors, which is in practice extended even to the caſe where ſuch alienation evidently appears profitable to the benefice.

18. Miniſters, beſides their glebe, are intitled to graſs for a horſe and two cows. And, if the lands out of which the graſs may be deſigned, either lie at a diſtance, or are not fit for paſture, the heritors are to pay to the miniſter L. 20 Scots yearly as an equivalent. Miniſters have alſo freedom of foggage, paſturage, fewel, feal, divot, loaning, and free iſh and entry, according to uſe and wont: What theſe privileges are, muſt be determined by the local cuſtom of the ſeveral pariſhes.

19. The legal terms at which ſtipends become due to miniſters are Whitſunday and Michaelmas. If the incumbent be admitted to his church before Whitſunday, till which term the corns are not preſumed to be fully ſown, he has right to that whole year's ſtipend; and, if he is received after Whitſunday, and before Michaelmas, he is intitled to the half of that year; becauſe, tho' the corns were ſown before his entry, he was admitted before the term at which they are preſumed to be reaped. By the ſame reaſon, if he dies or is tranſported before Whitſunday, he has right to no part of that year; if before Michaelmas, to the half; and if not till after Michaelmas, to the whole.

20. After the miniſter's death, his executors have right to the annat; which, in the ſenſe of the canon law, was a right reſerved to the Pope, of the firſt year's fruits of every benefice. Upon a threatened invaſion from England *anno* 1547, the annat was given by our Parliament, notwithſtanding this right in the Pope, to the executors of ſuch churchmen as ſhould fall in battle in defence of their country: But the word annat or ann, as it is now underſtood, is the right which law gives to the executors of miniſters, of half a year's benefice, over and above what was due to the miniſter himſelf for his incumbency.

21. The executors of a miniſter need make up no title to the ann by confirmation: Neither is the right aſſignable by the miniſter, or affectable with his debts; for it never belonged to him, but is a mere gratuity given by law to thoſe whom it is preſumed the deceaſed could not ſufficiently provide; and law has given it expreſsly to *executors*: And if it were to be governed by the rules of ſucceſſion in executory, the widow, in caſe of no children, would get one half, the other would go to the next of kin; and where there are children, ſhe would be intitled to a third, and the other two thirds would fall equally among the children. But the court of Seſſion, probably led by the general practice, have in this laſt caſe divided the ann into two equal parts, of which one goes to the widow, and the other among the children *in capita*.

22. From the great confidence that was, in the firſt ages of Chriſtianity, repoſed in churchmen, dying perſons frequently committed to them the care of their eſtates, and of their orphan children: but theſe were ſimply rights of truſt, not of juriſdiction. The clergy ſoon had the addreſs to eſtabliſh to themſelves a proper juriſdiction, not confined to points of eccleſiaſtical right, but extending to queſtions that had no concern with the church. They judged, not only in teinds, patronages, teſtaments, breach of vow, ſcandal, *&c.*; but in queſtions of marriage and divorce, becauſe marriage was a ſacrament; in tochers, becauſe theſe were given in conſideration of marriage; in all queſtions where an oath intervened, on pretence that oaths were a part of religious worſhip, *&c.* As churchmen came, by the means of this extenſive juriſdiction, to be diverted from their proper functions, they committed the exerciſe of it to their officials or commiſſaries: Hence the Commiſſary-court was called the Biſhops court, and *Curia Chriſtianitatis*; it is alſo ſtyled the Conſiſtorial Court, from *Conſiſtory*, a name firſt given to the court of appeals of the Roman Emperors, and afterwards to the courts of judicature held by churchmen.

23. At the reformation, all epiſcopal juriſdiction, exerciſed under the authority of the Biſhop of Rome, was aboliſhed. As the courſe of juſtice in conſiſtorial cauſes was thereby ſtopped, Q. Mary, beſides naming a Commiſſary for every dioceſe, did, by a ſpecial grant, eſtabliſh a new Commiſſary-court at Edinburgh, conſiſting of four judges or commiſſaries. This court is veſted with a double juriſdiction; one dioceſan, which is exerciſed in the ſpecial territory contained in the grant, *viz.* the counties of Edinburgh, Haddington, Linlithgow, Peebles, and a part part of Stirling-ſhire; and another univerſal, by which the judges confirm the teſtaments of all who die in foreign parts, and may reduce the decrees of all inferior Commiſſaries, provided the reduction be purſued within a year after the decree: Biſhops, upon their re-eſtabliſhment in the reign of James VI. were reſtored to the right of naming their ſeveral Commiſſaries.

24. As the clergy, in times of Popery, aſſumed a juriſdiction independent of the civil power or any ſecular court, their ſentences could be reviewed only by the Pope, or judges delegated by him; ſo that, with regard to the courts of Scotland, their juriſdiction was ſupreme. But by an act 1560, the appeals from our Biſhops courts, that were then depending before the Roman conſiſtories, were ordained to be decided by the court of Seſſion: And by a poſterior act 1609, the Seſſion is declared the King's great Conſiſtory, with power to review all ſentences pronounced by the Commiſſaries. Nevertheleſs, ſince that court had no inherent juriſdiction in conſiſtorial cauſes, prior to this ſtatute; and ſince the ſtatute gives them a power of judging only by way of advocation, they have not, to this day, any proper conſiſtorial juriſdiction in the firſt inſtance; neither do they pronounce ſentence, in any conſiſtorial cauſe brought from the Commiſſaries, but remit it back to them with inſtructions. By the practice immediately ſubſequent to the act before quoted, they did not admit advocations from the inferior Commiſſaries, till the cauſe was brought before the Commiſſaries of Edinburgh; but that practice is now in diſuſe.

25. The Commiſſaries retain to this day an excluſive power of judging in declarators of marriage, and of the nullity of marriage; in actions of divorce and of non-adherence, of adultery, baſtardy, and confirmation of teſtaments; becauſe all theſe matters are ſtill conſidered to be properly conſiſtorial. Inferior Commiſſaries are not competent to queſtions of divorce, under which are comprehended queſtions of baſtardy and adherence, when they have a connection with the lawfulneſs of marriage, or with adultery.

26. Commiſſaries have now no power to pronounce decrees in abſence for any ſum above L. 40 Scots, except in cauſes properly conſiſtorial: but they may authenticate tutorial and curatorial inventories; and all bonds, contracts, *&c.* which contain a clauſe for regiſtration in the books of any judge competent, and proteſts on bills, may be regiſtred in their books.

Tit. 6. *Of Marriage.*

PERSONS, when conſidered in a private capacity, are chiefly diſtinguiſhed by their mutual relations; as huſband and wife, tutor and minor, father and child, maſter and ſervant. The relation of huſband and wife is conſtituted by marriage; which is the conjunction of man and wife, vowing to live inſeparably till death.

2. Marriage is truly a contract, and ſo requires the conſent of parties. Ideots, therefore, and furious perſons cannot marry. As no perſon is preſumed capable of conſent within the years of pupillarity, which, by our law, laſts till the age of fourteen in males, and twelve in females, marriage cannot be contracted by pupils; but if the married pair ſhould cohabit after puberty, ſuch

acquieſcence gives force to the marriage. Marriage is fully perfected by conſent; which, without conſummation, founds all the conjugal rights and duties. The conſent requiſite to marriage muſt be *de præſenti*. A promiſe of marriage, (*ſtipulatio ſponſalitia*,) may be reſiled from, as long as matters are entire; but if any thing be done by one of the parties, whereby a prejudice ariſes from the non-performance, the party reſiling is liable in damages to the other. The canoniſts, and after them our courts of juſtice, explain a *copula* ſubſequent to a promiſe of marriage into actual marriage.

3. It is not neceſſary, that marriage ſhould be celebrated by a clergymen. The conſent of parties may be declared before any magiſtrate, or ſimply before witneſſes: And though no formal conſent ſhould appear, marriage is preſumed from the cohabitation, or living together at bed and board, of a man and woman who are generally reputed huſband and wife. One's acknowledgment of his marriage to the midwife whom he called to his wife, and to the miniſter who baptized his child, was found ſufficient preſumptive evidence of marriage, without the aid, either of cohabitation, or of *habite and repute*. The father's conſent was, by the Roman law, eſſential to the marriage of children *in familia*: But, by our law, children may enter into marriage, without the knowledge, and even againſt the remonſtrances of a father.

4. Marriage is forbidden within certain degrees of blood. By the law of Moſes, *Levit. c.* 18. which is made ours, ſeconds in blood, and all remoter degrees, may lawfully marry. By ſeconds in blood are meant firſt couſins. Marriage in the direct line is forbidden *in infinitum*; as it is alſo in the collateral line, in the ſpecial caſe where one of the parties is *loco parentis* to the other, as grand uncle, great grand-uncle, *&c.* with reſpect to his grand-niece, *&c.* The ſame degrees that are prohibited in conſanguinity, are prohibited in affinity; which is the tie riſing from marriage, betwixt one of the married pair and the blood-relations of the other. Marriage alſo, where either of the parties is naturally unfit for generation, or ſtands already married to a third perſon is *ipſo jure* null.

5. To prevent bigamy and inceſtuous marriages, the church has introduced proclamation of banns; which is the ceremony of publiſhing the names and deſignations of thoſe who intend to intermarry, in the churches where the bride and bridegroom reſide, after the congregation is aſſembled for divine ſervice; that all perſons who know any objection to the marriage, may offer it. When the order of the church is obſerved, the marriage is called regular; when otherwiſe, clandeſtine.

6. By marriage, a ſociety is created between the married pair, which draws after it a mutual communication of their civil intereſts, in as far as is neceſſary for maintaining it. As the ſociety laſts only for the joint lives of the *ſocii*; therefore rights that have the nature of a perpetuity, which our law ſtyles heritable, are not brought under the partnerſhip or communion of goods; as a land-eſtate, or bonds bearing a yearly intereſt: It is only moveable ſubjects, or the fruits produced by heritable ſubjects during the marriage, that become common to man and wife.

7. The huſband, as the head of the wife, has the ſole right of managing the goods in communion, which is called *jus mariti*. This right is ſo abſolute, that it bears but little reſemblance to a right of adminiſtring a common ſubject; for the huſband can, in virtue thereof, ſell, or even gift at pleaſure, the whole goods falling under communion; and his croditors may affect them for the payment of his proper debts: So that the *jus mariti* carries all the characters of an aſſignation by the wife to the huſband, of her moveable eſtate. It ariſes *ipſo jure* from the marriage; and therefore needs no other conſtitution. But a ſtranger may convey an eſtate to a wife, ſo as it ſhall not be ſubject to the huſband's adminiſtration; or the huſband himſelf may, in the marriage-contract, renounce his *jus mariti* in all or any part of his wife's moveable eſtate.

8 From this right are excepted paraphernal goods, which, as the word is underſtood in our law, comprehends the wife's wearing apparel, and the ornaments proper to her perſon, as necklaces, ear rings, breaſt or arm jewels, buckles, &c. Theſe are neither alienable by the huſband, nor affectable by his creditors. Things of promiſcuous uſe to huſband and wife, as plate, medals, &c. may become paraphernal, by the huſband's giving them to the wife, at or before marriage; but they are paraphernal only in regard to that huſband who gave them as ſuch, and are eſteemed common moveables, if the wife, whoſe *paraphernalia* they were, be afterwards married to a ſecond huſband; unleſs he ſhall in the ſame manner appropriate them to her.

9. The right of the huſband to the wife's moveable eſtate, is burdened with the moveable debts contracted by her before marriage: And as his right is univerſal, ſo is his burden; for it reaches to her whole moveable debts, though they ſhould far exceed her moveable eſtate. Yet the huſband is not conſidered as the true debtor in his wife's debts. In all actions for payment, ſhe is the proper defender: the huſband is only cited for his intereſt, that is, as curator to her, and adminiſtrator of the ſociety-goods. As ſoon therefore as the marriage is diſſolved, and the ſociety goods thereby ſuffer a diviſion, the huſband is no farther concerned in the ſhare belonging to his deceaſed wife; and conſequently is no longer liable to pay her debts, which muſt be recovered from her repreſentatives, or her ſeparate ſtate.

10. This obligation upon the huſband is perpetuated againſt him 1. Where his proper eſtate, real or perſonal, has been affected, during the marriage, by complete legal diligence; in which caſe, the huſband muſt, by the common rules of law, relieve his property from the burden with which it ſtands charged: But the utmoſt diligence againſt his perſon, is not ſufficient to perpetuate the obligation; nor even incomplete diligence againſt his eſtate. 2. The huſband continues liable, even after the wife's death, in ſo far as he is *lucratus* or profited by her eſtate. As he was at no time the proper debtor in his wife's moveable debts; therefore, though he ſhould be *lucratus*, he is, after the diſſolution, only liable for

them *ſubſidiarie*, i. e. if her own ſeparate eſtate is not ſufficient to pay them off.

11. Where the wife is debtor in that ſort of debt, which, if it had been due to her, would have excluded the *jus mariti*, *e. g.* in bonds bearing intereſt, the huſband is liable only for the bygone intereſts, and thoſe that may grow upon the debt during the marriage; becauſe his obligations for her debts muſt be commenſurated to the intereſt he has in her eſtate It is the huſband alone who is liable in perſonal diligence for his wife's debts, while the marriage ſubſiſts: The wife, who is the proper debtor, is free from all perſonal execution upon them while ſhe is *veſtita viro*.

12. The huſband by marriage becomes the perpetual curator of the wife. From this right it ariſes, 1. That no ſuit can proceed againſt the wife, till the huſband be cited for his intereſt. 2. All deeds, done by a wife without the huſband's conſent, are null; neither can ſhe ſue in any action without the huſband's concurrence. Where the huſband refuſes, or by reaſon of forfeiture, *&c.* cannot concur; or where the action is to be brought againſt the huſband himſelf, for performing his part of the marriage-articles; the judge will authoriſe her to ſue in her own name. The effects ariſing from this curatorial power diſcover themſelves even before marriage, upon the publication of banns; after which the bride, being no longer *ſui juris*, can contract no debt, nor do any deed, either to the prejudice of her future huſband, nor even to her own.

13. If the huſband ſhould either withdraw from his wife, or turn her out of doors; or if, continuing in family with her, he ſhould by ſevere treatment endanger her life; the Commiſſaries will authoriſe a ſeparation *a menſa et toro*, and give a ſeparate alimony to the wife, ſuitable to her huſband's eſtate, from the time of ſuch ſeparation, until either a reconciliation or a ſentence of divorce.

14. Certain obligations of the wife are valid, notwithſtanding her being *ſub cura mariti*; *ex. gr.* obligations ariſing from delict; for wives have no privilege to commit crimes. But if the puniſhment reſolves into a pecuniary mulct, the execution of it muſt, from her incapacity to fulfil, be ſuſpended till the diſſolution of the marriage, unleſs the wife has a ſeparate eſtate exempted from the *jus mariti*.

15. Obligations ariſing from contract, affect either the perſon or the eſtate The law has been ſo careful to protect wives, while *ſub cura mariti*, that all perſonal obligations granted by a wife, though with the huſband's conſent, as bonds, bills, *&c.* are null; with the following exceptions: 1. Where the wife gets a ſeparate *peculium* or ſtock, either from her father or a ſtranger, for her own or her children's alimony, ſhe may grant perſonal obligations in relation to ſuch ſtock; and by ſtronger reaſon, perſonal obligations granted by a wife are good, when her perſon is actually withdrawn from her huſband's power, by a judicial ſeparation. 2. A wife's perſonal obligation, granted in the form of a deed *inter vivos*, is valid, if it is not to take effect till her death. 3. Where the wife is by the huſband *præpoſita negotiis*, entruſted with the management, either of a particular branch of buſineſs, or of his whole affairs, all the contracts ſhe enters into in the exerciſe of her *præpoſitura*, are effectual, even though they be not reduced to writing, but ſhould ariſe merely *ex re*, from furniſhings made to her: But ſuch obligations have no force againſt the wife; it is the huſband only, by whoſe commiſſion ſhe acts, who is thereby obliged.

16. A wife, while ſhe remains in family with her huſband, is conſidered as *præpoſita negotiis domeſticis*; and conſequently may provide things proper for the family, for the price whereof the huſband is liable, though they ſhould be miſapplied, or though the huſband ſhould have given her money to provide them elſewhere. A huſband, who ſuſpects that his wife may hurt his fortune by high living, may uſe the remedy of inhibition againſt her; by which all perſons are interpelled from contracting with her, or giving her credit. After the completing of this diligence, whereby the *præpoſitura* falls, the wife cannot bind the huſband, unleſs for ſuch reaſonable furniſhings as he cannot inſtruct that he provided her with *aliunde*. As every man, and conſequently every huſband, has a right to remove his managers at pleaſure, inhibition may paſs at the ſuit of the huſband againſt the wife, though he ſhould not offer to juſtify that meaſure by an actual proof of the extravagance or profuſeneſs of her temper.

17. As to rights granted by the wife affecting her eſtate; ſhe has no moveable eſtate, except her *paraphernalia*; and theſe ſhe may alien or impignorate, with conſent of the huſband. She can, without the huſband, bequeath by teſtament her ſhare of the goods in communion; but ſhe cannot diſpoſe of them *inter vivos*. A wife can lawfully oblige herſelf, in relation to her heritable eſtate, with conſent of her huſband; for though her perſon is in ſome ſenſe ſunk by the marriage, ſhe continues capable of holding a real eſtate; and in ſuch obligations, her eſtate is conſidered, and not her perſon A huſband, though he be curator to his wife, can, by his acceptance or intervention, authoriſe rights granted by her in his own favour; for a huſband's curatory is not intended only for the wife's advantage, but is conſidered as a mutual benefit to both.

18. All donations, whether by the wife to the huſband, or by the huſband to the wife, are revocable by the donor; but if the donor dies without revocation, the right becomes abſolute. Where the donation is not pure, it is not ſubject to revocation: Thus, a grant made by the huſband, in conſeqvence of the natural obligation that lies upon him to provide for his wife, is not revocable, unleſs in ſo far as it exceeds the meaſure of a rational ſettlment; neither are remuneratory grants revocable, where mutual grants are made in conſideration of each other, except where an onerous cauſe is ſimulated, or where what is given *hinc inde* bears no proportion to each other. All voluntary contracts of ſeparation, by which the wife is provided in an yearly alimony, are effectual as to the time paſt, but revocable either by the huſband or wife.

19. As wives are in the ſtrongeſt degree ſubject to the influence of their huſbanda, third parties, in whoſe favours they had made grants, were frequently vexed with actions of reduction, as if the grant had been extorted from the wife, through the force or fear of the

huſband. To ſecure the grantees againſt this danger, ratifications were introduced, whereby the wife, appearing before a judge, declares upon oath, her huſband not preſent, that ſhe was not induced to grant the deed *ex vi aut metu*. A wife's ratification is not abſolutely neceſſary for ſecuring the grantee: Law indeed allows the wife to bring reduction of any deed ſhe has not ratified, upon the head of force or fear; of which, if ſhe brings ſufficient evidence, the deed will be ſet aſide; but if ſhe fails in the proof, it will remain effectual to the receiver.

20. Marriage, like other contracts, might, by the Roman law, be diſſolved by the contrary conſent of parties; but, by the law of Scotland, it cannot be diſſolved till death, except by divorce, proceeding either upon the head of adultery, or of wilful deſertion.

21. Marriage is diſſolved by death, either within year and day from its being contracted, or after year and day. If it is diſſolved within year and day, all rights granted in conſideration of the marriage (unleſs guarded againſt in the contract) become void, and things return to the ſame condition in which they ſtood before the marriage: with this reſtriction, that the huſband is conſidered as a *bona fide* poſſeſſor, in relation to what he has conſumed upon the faith of his right; but he is liable to repay the tocher, without any deduction in conſideration of his family expence during the marriage. If things cannot be reſtored on both ſides, equity hinders the reſtoring of one party, and not the other.

22. Upon the diſſolution of a marriage, after year and day, the ſurviving huſband becomes the irrevocable proprietor of the tocher and the wife, where ſhe ſurvives, is intitled to her jointure, or to her legal proviſions. She has alſo right to mournings, ſuitable to the huſband's quality; and to alimony from the day of his death, till the term at which her liferent proviſion, either legal or conventional, commences. If a living child be procreated of the marriage, the marriage has the ſame effect as if it had ſubſiſted beyond the year. A day is adjected to the year, *in majorem evidentiam*, that it may clearly appear that the year itſelf is elapſed; and therefore, the running of any part of the day, after the year, has the ſame effect as if the whole were elapſed. The legal right of courteſy competent to the ſurviving huſband is explained below, Tit. xvi 28.

23. Divorce is ſuch a ſeparation of married perſons, during their lives, as looſes them from the nuptial tie, and leaves them at freedom to intermarry with others. But neither adultery, nor wilful deſertion, are grounds which muſt neceſſarily diſſolve marriage; they are only handles, which the injured party may take hold of, to be free. Cohabitation, therefore, by the injured party, after being in the knowledge of the acts of adultery, implies a paſſing from the injury; and no divorce can proceed, which is carried on by colluſion betwixt the parties, leſt, contrary to the firſt inſtitution of marriage, they might diſengage themſelves by their own conſent: and though after divorce, the guilty perſon, as well as the innocent, may contract ſecond marriages; yet in the caſe of divorce upon adultery, marriage is by ſpecial ſtatute prohibited betwixt the two adulterers.

24. Where either party has deſerted from the other for four years together, that other may ſue for adherence. If this has no effect, the church is to proceed, firſt by admonition, then by excommunication; all which previous ſteps are declared to be a ſufficient ground for purſuing a divorce. *De praxi*, the Commiſſaries pronounce ſentence in the adherence, after one year's deſertion; but four years muſt intervene between the firſt deſertion and the decree of divorce.

25. The legal effects of divorce on the head of deſertion are, that the offending huſband ſhall reſtore the tocher, and forfeit to the wife all her proviſions, legal and conventional; and on the other hand, the offending wife ſhall forfeit to the huſband her tocher, and all the rights that would have belonged to her, in the caſe of her ſurvivance. This was alſo eſteemed the rule in divorces upon adultery. But by a deciſion of the court of Seſſion 1762, founded on a tract of ancient deciſions recovered from the records, the offending huſband was allowed to retain the tocher.

Tit. 7. *Of Minors, and their Tutors and Curators.*

1. The ſtages of life principally diſtinguiſhed in law are, *pupillarity*, *puberty* or *minority*, and *majority*. A child is under pupillarity, from the birth till fourteen years of age, if a male, and till twelve, if a female. Minority begins where pupillarity ends, and continues till majority, which, by the law of Scotland, is the age of twenty-one years complete, both in males and females: But minority, in a large ſenſe, includes all under age, whether pupils, or *puberes*. Becauſe pupils cannot in any degree act for themſelves, and minors ſeldom with diſcretion, pupils are put by law under the power of tutors, and minors may put themſelves under the direction of curators. Tutory is a power and faculty to govern the perſon, and adminiſter the eſtate of a pupil. Tutors are either nominate, of law, or dative.

2. A tutor nominate is he who is named by a father, in his teſtament or other writing, to a lawful child. Such tutor is not obliged to give caution for the faithful diſcharge of his office; becauſe his fidelity is preſumed to have been ſufficiently known to the father.

3. If there be no nomination by the father, or if the tutors nominate do not accept, or if the nomination falls by death or otherwiſe, there is place for a tutor of law. This ſort of tutory devolves upon the next agnate; by which we underſtand he who is neareſt related by the father, though females intervene.

4. Where there are two or more agnates equally near to the pupil, he who is intitled to the pupil's legal ſucceſſion falls to be preferred to the others. But as the law ſuſpects, that he may not be over careful to preſerve a life which ſtands in the way of his own intereſt, this ſort of tutor is excluded from the cuſtody of the pupil's perſon, which is commonly committed to the mother, while a widow, until the pupil be ſeven years old; and, in default of the mother, to the next cognate, *i. e.* the nigheſt relation by the mother. The tutor of law muſt be at leaſt twenty-five years of age. He is ſerved or declared by a jury of ſworn men, who are called upon a brief iſſu-

ing from the Chancery, which is directed to any judge having juriſdiction. He muſt give ſecurity before he enters upon the management.

5. If no tutor of law demands the office, any perſon, even a ſtranger, may apply for a tutory-dative. But becauſe a tutor in law ought to be allowed a competent time to deliberate whether he will ſerve or not, no tutory-dative can be given till the elapſing of a year from the time at which the tutor of law had firſt a right to ſerve. It is the king alone, as the father of his country, who gives tutors-dative, by his court of exchequer; and no gift of tutory can paſs in exchequer, without the citation or conſent of the next of kin to the pupil, both by the father and mother, nor till the tutor give ſecurity, recorded in the books of exchequer. There is no room for a tutor of law, or tutor-dative, while a tutor nominate can be hoped for: and tutors of law, or dative, even after they have begun to act, may be excluded by the tutor nominate, as ſoon as he offers to accept, unleſs he has expreſsly renounced the office. If a pupil be without tutors of any kind, the court of Seſſion will, at the ſuit of any kinſman, name a factor (ſteward) for the management of the pupil's eſtate.

6. After the years of pupillarity are over, the minor is conſidered as capable of acting by himſelf if he has confidence enough of his own capacity and prudence. The only two caſes in which curators are impoſed upon minors are, firſt, where they are named by the father, in a ſtate of health. 2. Where the father is himſelf alive; for a father is *ipſo jure*, without any ſervice, adminiſtrator, that is, both tutor and curator of law to his children, in relation to whatever eſtate may fall to them during their minority. This right in the father does not extend to grand-children, nor to ſuch even of his immediate children as are foriſfamiliated. Neither has it place in ſubjects which are left by a ſtranger to the minor, excluſive of the father's adminiſtration. If the minor chuſes to be under the direction of curators, he muſt raiſe and execute a ſummons, citing at leaſt two of his next of kin, to appear before his own judge-ordinary, upon nine days warning. At the day and place of appearance, he offers to the judge a liſt of thoſe whom he intends for his curators: ſuch of them as reſolve to undertake the office, muſt ſign their acceptance, and give caution; upon which an act of curatory is extracted.

7. Theſe curators are ſtyled *ad negotia*, to diſtinguiſh them from another ſort called curators *ad lites*, who are authoriſed by the judge to concur with a pupil or minor in actions of law, either where he is without tutors and curators, or where his tutors or curators are parties to the ſuit. This ſort is not obliged to give caution, becauſe they have no intermeddling with the minor's eſtate: they are appointed for a ſpecial purpoſe; and when that is over, their office is at an end. Women are capable of being tutors and curators, under the following reſtrictions; 1. The office of a female tutor or curator falls by her marriage, even though the nomination ſhould provide otherwiſe; 2. No woman can be tutor of law. Papiſts are declared incapable of tutory or curatory. Where the minor has more tutors and curators than one, who are called in the nomination to the joint management, they muſt all concur in every act of adminiſtration: where a certain number is named for a quorum, that number muſt concur: where any one is named *ſine quo non*, no act is valid without that one's ſpecial concurrence. But if they are named without any of theſe limitations, the concurrence of the majority of the nominees then alive is ſufficient.

8. In this, tutory differs from curatory, that as pupils are incapable of conſent, they have no perſon capable of acting; which defect the tutor ſupplies: but a minor *pubes* can act for himſelf. Hence, the tutor ſubſcribes alone all deeds of adminiſtration: but in curatory, it is the minor who ſubſcribes as the proper party; the curator does no more than conſent. Hence alſo, the perſons of pupils are under the power, either of their tutors or of their neareſt cognates; but the minor, after pupillarity, has the diſpoſal of his own perſon, and may reſide where he pleaſes. In moſt other particulars, the nature, the powers, and the duties of the two offices coincide. Both tutors and curators muſt, previous to their adminiſtration, make a judicial inventory, ſubſcribed by them and the next of kin, before the minor's judge-ordinary, of his whole eſtate, perſonal and real; of which, one ſubſcribed duplicate is to be kept by the tutors or curators themſelves; another, by the next of kin on the father's ſide; and a third, by the next of kin on the mother's. If any eſtate belonging to the minor ſhall afterwards come to their knowledge, they muſt add it to the inventory within two months after their attaining poſſeſſion thereof. Should they neglect this, the minor's debtors are not obliged to make payment to them; they may be removed from their offices as ſuſpected, and they are intitled to no allowance for the ſums diſburſed by them in the minor's affairs, except the expence laid out upon the minor's entertainment, upon his lands and houſes, and upon completing his titles.

9. Tutors and curators cannot grant leaſes of the minor's lands, to endure longer than their own office; nor under the former rental, without either a warrant from the court of Seſſion, or ſome apparent neceſſity.

10. They have power to ſell the minor's moveables; but cannot ſell their pupil's land eſtate, without the authority of a judge. But the alienation of heritage by a minor, with conſent of his curators, is valid.

11. Tutors and curators cannot, contrary to the nature of their truſt, authoriſe the minor to do any deed for their own benefit; nor can they acquire any debt affecting the minor's eſtate: and, where a tutor or curator makes ſuch acquiſition in his own name, for a leſs ſum than the right is intitled to draw, the benefit thereof accrues to the minor.

12. By the Roman law, tutory and curatory, being *munera publica*, might be forced upon every one who had not a relevant ground of excuſe; but, with us, the perſons named to theſe offices may either accept or decline; and where a father, in *liege pouſtie*, names certain perſons both as tutors and curators to his children, though they have acted as tutors, they may decline the office of curatory. Tutors and curators having once accepted, are liable *in diligence*, that is, are accountable for the conſequences of their neglect in any part of their

duty from the time of their acceptance. They are accountable *ſinguli in ſolidum*, i. e. every one of them is anſwerable, not only for his own diligence, but for that of his co-tutors; and any one may be ſued without citing the reſt: But he who is condemned in the whole, has action of relief againſt his co-tutors.

13. From this obligation to diligence, we may except, 1. Fathers or adminiſtrators in law, who, from the preſumption that they act to the beſt of their power for their children, are liable only for actual intromiſſions. 2. Tutors and curators named by the father, with the ſpecial proviſos, that they ſhall be liable barely for intromiſſions, not for omiſſions; and that each of them ſhall be liable only for himſelf, and not *in ſolidum* for the co-tutors: But this power of exemption from diligence, is limited to the eſtate deſcending from the father himſelf. Tutors or curators are not intitled to any ſalary or allowance for pains, unleſs a ſalary has been expreſsly contained in the teſtator's nomination; for their office is preſumed gratuitous.

14. Though no perſon is obliged to accept the office of tutor or curator, yet having once accepted, he cannot throw it up or renounce it, without ſufficient cauſe; but, if he ſhould be guilty of miſapplying the minor's money, or fail in any other part of his duty, he may be removed at the ſuit of the minor's next in kin, or by a co-tutor, or co-curator. Where the miſconduct proceeds merely from indolence, or inattention, the court, in place of removing the tutor, either join a curator with him, or, if he be a tutor-nominate, they oblige him to give caution for his paſt and future management.

15. The offices of tutory and curatory expire by the pupil's attaining the age of puberty, or the minor's attaining the age of twenty-one years complete; and by the death either of the minor, or of his tutor or curator.

16. Deeds either by pupils, or by minors having curators without their conſent, are null; but they oblige the granters, in as far as relates to ſums profitably applied to their uſe. A minor under curators can indeed make a teſtament by himſelf; but whatever is executed in the form of a deed *inter vivos*, requires the curator's conſent. Deeds by a minor who has no curators, are as effectual as if he had curators, and ſigned them with their conſent; he may even alien his heritage, without the interpoſition of a judge.

17. Minors may be reſtored againſt all deeds granted in their minority, that are hurtful to them. Deeds, in themſelves void, need not the remedy of reſtitution; but where hurtful deeds are granted by a tutor in his pupil's affairs, or by a minor who has no curators, as theſe deeds ſubſiſt in law, reſtitution is neceſſary: And even where a minor, having curators, executes a deed hurtful to himſelf with their conſent, he has not only action againſt the curators, but he has the benefit of reſtitution againſt the deed itſelf. The minor cannot be reſtored, if he does not raiſe and execute a ſummons for reducing the deed, *ex capite minorennitatis et læſionis*, before he be twenty-five years old. Theſe four years, between the age of twenty-one and twenty-five, called *quadriennium utile*, are indulged to the minor, that he may have a reaſonable time, from that period, when he is firſt preſumed to have the perfect uſe of his reaſon, to conſider with himſelf what deeds done in his minority have been truly prejudicial to him.

18. Queſtions of reſtitution are proper to the court of Seſſion. Two things muſt be proved by the minor, in order to the reduction of the deed; 1. That he was minor when it was ſigned; 2. That he is hurt or leſed by the deed. This leſion muſt not proceed merely from accident; for the privilege of reſtitution was not intended to exempt minors from the common miſfortunes of life; it muſt be owing to the imprudence or negligence of the minor, or his curator.

19. A minor cannot be reſtored againſt his own delict or fraud. 2. Reſtitution is excluded, if the minor, at any time after majority, has approved of the deed, either by a formal ratification, or tacitly by payment of intereſt, or by other acts inferring approbation. 3. A minor, who has taken himſelf to buſineſs, as a merchant ſhopkeeper, *&c* cannot be reſtored againſt any deed granted by him, in the courſe of that buſineſs, eſpecially if he was *proximus majorennitati* at ſigning the deed. 4. According to the more common opinion, a minor cannot be reſtored in a queſtion againſt a minor, unleſs ſome groſs unfairneſs ſhall be qualified in the bargain.

20. The privilege of reſtitution does not always die with the minor himſelf. 1. If a minor ſucceeds to a minor, the time allowed for reſtitution is governed by the minority of the heir, not of the anceſtor. 2. If a minor ſucceeds to a major, who was not full twenty-five, the privilege continues with the heir during his minority; but he cannot avail himſelf of the *anni utiles*, except in ſo far as they were unexpired at the anceſtor's death. 3. If a major ſucceeds to a minor, he has only the *quadriennium utile* after the minor's death; and if he ſucceeds to a major dying within the *quadriennium*, no more of it can be profitable to him than what remained when the anceſtor died,

21. No minor can be compelled to ſtate himſelf as a defender, in any action, whereby his heritable eſtate flowing from aſcendants may be evicted from him, by one pretending a preferable right.

22. This privilege is intended merely to ſave minors from the neceſſity of diſputing upon queſtions of preference; it does not therefore take place, 1. Where the action is purſued on the father's falſhood or delict. 2. Upon his obligation to convey heritage. 3. On his liquid bond for a ſum of money, though ſuch action ſhould have the effect to carry off the minor's eſtate by adjudication. 4. Nor in actions purſued by the minor's ſuperior, upon feudal caſualties. 5. This privilege cannot be pleaded in bar of an action which had been firſt brought againſt the father, and is only continued againſt the minor; nor where the father was not in the peaceable poſſeſſion of the heritable ſubject at his death. Before the minor can plead it, he muſt be ſerved heir to his father. The perſons of pupils are protected from impriſonment on civil debts.

23. Curators are given, not only to minors, but in general to every one who, either through defect of judgment, or unfitneſs of diſpoſition, is incapable of

rightly managing his own affairs. Of the firſt ſort, are idiots and furious perſons. Idiots, or *fatui*, are entirely deprived of the faculty of reaſon. The diſtemper of the furious perſon does not conſiſt in the defect of reaſon, but in an overheated imagination, which obſtructs the application of reaſon to the purpoſes of life. Curators may be alſo granted to lunatics, and even to perſons dumb and deaf, though they are of ſound judgment, where it appears that they cannot exert it in the management of buſineſs. Every perſon, who is come of age, and is capable of acting rationally, has a natural right to conduct his own affairs. The only regular way, therefore, of appointing this ſort of curators, is by a jury ſummoned upon a brief from the chancery; which is not, like the brief of common tutory, directed to any judge-ordinary, but to the judge of the ſpecial territory where the perſon alledged to be fatuous or furious reſides; that if he is truly of ſound judgment, he may have an opportunity to oppoſe it: And, for this reaſon, he ought to be made a party to the brief. The curatory of idiots and furious perſons belongs to the neareſt agnate; but a father is preferred to the curatory of his fatuous ſon, and the huſband to that of his fatuous wife, before the agnate.

24. A clauſe is inſerted in the brief, for inquiring how long the fatuous or furious perſon has been in that condition; and the verdict to be pronounced by the inqueſt, is declared a ſufficient ground, without farther evidence, for reducing all deeds granted after the period at which it appeared by the proof that the fatuity or furioſity began. But, as fatuous and furious perſons are, by their very ſtate, incapable of being obliged, all deeds done by them may be declared void, upon proper evidence of their fatuity at the time of ſigning, though they ſhould never have been cognoſced idiots by an inqueſt.

25. We have ſome few inſtances of the Sovereign's giving curators to idiots, where the next agnate did not claim; but ſuch gifts are truly deviations from our law, ſince they paſs without an inquiry into the ſtate of the perſon upon whom the curatory is impoſed. Hence the curator of law to an idiot, ſerving *quandocunque*, is preferred as ſoon as he offers himſelf, before the curator-dative. This ſort of curatory does not determine by the lucid intervals of the perſon *ſub cura*; but it expires by his death, or perfect return to a ſound judgment; which laſt ought regularly to be declared by the ſentence of a judge.

26. Perſons, let them be ever ſo profuſe, or liable to be impoſed upon, if they have the exerciſe of reaſon, can effectually oblige themſelves, till they are fettered by law. Interdiction is a legal reſtraint laid upon ſuch perſons from ſigning any deed to their own prejudice, without the conſent of their curators or interdictors.

27. There could be no interdiction, by our ancient practice, without a previous inquiry into the perſon's condition. But as there were few who could bear the ſhame that attends judicial interdiction, however neceſſary the reſtraint might have been, voluntary interdiction has received the countenance of law; which is generally executed in the form of a bond, whereby the granter obliges himſelf to do no deed that may affect his eſtate, without the conſent of certain friends therein mentioned. Though the reaſons inductive of the bond ſhould be but gently touched in the recital, the interdiction ſtands good. Voluntary interdiction, though it be impoſed by the ſole act of the perſon interdicted, cannot be recalled at his pleaſure: But it may be taken off, 1. By a ſentence of the court of Seſſion, declaring, either that there was, from the beginning, no ſufficient ground for the reſtraint; or that the party is, ſince the date of the bond, become *rei ſuæ providus*. 2. It falls, even without the authority of the Lords, by the joint act of the perſon interdicted, and his interdictors, concurring to take it off. 3. Where the bond of interdiction requires a certain number as a quorum, the reſtraint ceaſes, if the interdictors ſhall be by death reduced to a leſſer number.

28. Judicial interdiction is impoſed by a ſentence of the court of Seſſion. It commonly proceeds on an action brought by a near kinſmen to the party; and ſometimes from the *nobile officium* of the court, when they perceive, during the pendency of a ſuit, that any of the litigants is, from the facility of his temper, ſubject to impoſition. This ſort muſt be taken off by the authority of the ſame court that impoſed it.

29. An interdiction need not be ſerved againſt the perſon interdicted; but it muſt be executed, or publiſhed by a meſſenger, at the market-croſs of the juriſdiction where he reſides, by publicly reading the interdiction there, after three oyeſſes made for convocating the lieges. A copy of this execution muſt be affixed to the croſs; and thereafter, the interdiction, with its execution, muſt be regiſtred in the books, both of the juriſdiction where the perſon interdicted reſides, and where his lands lie, or in the general regiſter of the ſeſſion, within forty days from the publication. An interdiction, before it is regiſtred, has no effect againſt third parties, though they ſhould be in the private knowledge of it; but it operates againſt the interdictors themſelves, as ſoon as it is delivered to them.

30. An interdiction, duly regiſtred, has this effect, that all deeds, done thereafter, by the perſon interdicted, without the conſent of his interdictors, affecting his heritable eſtate, are ſubject to reduction. Regiſtration, in the general regiſter, ſecures all his lands from alienation, where-ever they lie; but where the interdiction is recorded in the regiſter of a particular ſhire, it covers no lands, except thoſe ſituated in that ſhire. But perſons interdicted have full power to diſpoſe of their moveables, not only by teſtament, but by preſent deeds of alienation: And creditors, in perſonal bonds granted after interdiction, may uſe all execution againſt their debtor's perſon and moveable eſtate; ſuch bonds being only ſubject to reduction, in ſo far as diligence againſt the heritable eſtate may proceed upon them.

31. All onerous or rational deeds granted by the perſon interdicted, are as effectual, even without the conſent of the interdictor, as if the granter had been laid under no reſtraint; but he cannot alter the ſucceſſion of his heritable eſtate, by any ſettlement, let it be ever ſo rational. No deed, granted with conſent of the interdictors, is reducible, though the ſtrongeſt leſion or prejudice to the granter ſhould appear: The only remedy competent, in ſuch caſe, is an action by the granter againſt his interdic-

tors, for making up to him what he has loſt through their undue conſent. It is no part of the duty of interdictors, to receive ſums, or manage any eſtate; they are given merely *ad auctoritatem præſtandam*, to interpoſe their authority to reaſonable deeds; and ſo are accountable for nothing but their fraud or fault, in conſenting to deeds hurtful to the perſon under their care.

32. The law concerning the ſtate of children falls next to be explained. Children are either born in wedlock, or out of it. All children, born in lawful marriage or wedlock, are preſumed to be begotten by the perſon to whom the mother is married; and conſequently to be lawful children. This preſumption is ſo ſtrongly founded, that it cannot be defeated but by direct evidence that the mother's huſband could not be the father of the child, *e.g.* where he is impotent, or was abſent from the wife till within ſix lunar months of the birth. The canoniſts indeed maintain, that the concurring teſtimony of the huſband and wife that the child was not procreated by the huſband, is ſufficient to elide this legal preſumption for legitimacy: but it is an agreed point, that no regard is to be paid to ſuch teſtimony, if it be made after they have owned the child to be theirs. A father has the abſolute right of diſpoſing of his childrens perſon, of directing their education, and of moderate chaſtiſement; and even after they become *puberes*, he may compel them to live in family with him, and to contribute their labour and induſtry, while they continue there, towards his ſervice. A child who gets a ſeparate ſtock from the father for carrying on any trade or employment, even though he ſhould continue in the father's houſe, may be ſaid to be emancipated or foriſfamiliated, in ſo far as concerns that ſtock; for the profits ariſing from it are his own. Foriſfamiliation, when taken in this ſenſe, is alſo inferred by the child's marriage, or by his living in a ſeparate houſe, with his father's permiſſion or goodwill. Children, after their full age of twenty-one years, become, according to the general opinion, their own maſters; and from that period are bound to the father only by the natural ties of duty, affection, and gratitude. The mutual obligations between parents and children to maintain each other, are explained afterwards, Tit. 20.

33. Children, born out of wedlock, are ſtyled natural children, or baſtards. Baſtards may be legitimated or made lawful, either, 1. By the ſubſequent intermarriage of the mother of the child with the father. And this ſort of legitimation, intitles the child to all the rights of lawful children. The ſubſequent marriage, which produces legitimation, is conſidered by the law to have been entered into when the child legitimated was begotten; and hence, if he be a male, he excludes, by his right of primogeniture, the ſons procreated after the marriage, from the ſucceſſion of the father's heritage, though theſe ſons were lawful children from the birth. Hence alſo, thoſe children only can be thus legitimated, who are begotten of a woman whom the father might at that period have lawfully married. 2. Baſtards are legitimated by letters of legitimation from the ſovereign. See Tit. 29.

34. As to the power of maſters over their ſervants: All ſervants now enjoy the ſame rights and privileges with other ſubjects, unleſs in ſo far as they are tied down by their engagements of ſervice. Servants are either neceſſary or voluntary. Neceſſary are thoſe whom law obliges to work without wages, of whom immediately. Voluntary ſervants engage without compulſion, either for mere ſubſiſtence, or alſo for wages. Thoſe who earn their bread in this way, if they ſhould ſtand off from engaging, may be compelled to it by the Juſtices of the peace, who have power to fix the rate of their wages.

35. Colliers, coal-bearers, and ſalters, and other perſons neceſſary to collieries and ſaltworks, as they are particularly deſcribed by act 1661, are tied down to perpetual ſervice at the works to which they have once entered. Upon a ſale of the works, the right of their ſervice is transferred to the new proprietor. All perſons are prohibited to receive them into their ſervice, without a teſtimonial from their laſt maſter; and if they deſert to another work, and are redemanded within a year thereafter, he who has received them is obliged to return them within twenty-four hours, under a penalty. But though the proprietor ſhould neglect to require the deſerter within the year, he does not, by that ſhort preſcription, loſe his property in him. Colliers, &c. where the colliery to which they are aſtricted, is either given up, or not ſufficient for their maintenance, may lawfully engage with others; but if that work ſhall be again ſet a-going, the proprietor may reclaim them back to it.

36. The poor make the loweſt claſs or order of perſons. Indigent children may be compelled to ſerve any of the king's ſubjects without wages, till their age of thirty years. Vagrants and ſturdy beggars may be alſo compelled to ſerve any manufacturer. And becauſe few perſons were willing to receive them into their ſervice, public work-houſes are ordained to be built for ſetting them to work. The poor who cannot work, muſt be maintained by the pariſhes in which they were born; and where the place of their nativity is not known, that burden falls upon the pariſhes where they have had their moſt common reſort, for the three years immediately preceeding their being apprehended, or their applying for the public charity. Where the contributions collected at the churches to which they belong, are not ſufficient for their maintenance, they are to receive badges from the miniſter and kirk ſeſſion, in virtue of which they may aſk alms at the dwelling houſes of the inhabitants of the pariſh.

Tit. 8. *Of the Diviſion of Rights, and the ſeveral ways by which a Right may be acquired.*

The things or ſubjects to which perſons have right, are the ſecond object of law. The right of enjoying and diſpoſing of a ſubject at one's pleaſure, is called property. Proprietors are reſtrained by law from uſing their property emulouſly to their neighbour's prejudice. Every ſtate or ſovereign has a power over private property, called, by ſome lawyers, *dominium eminens*, in virtue of which, the proprietor may be compelled to ſell his property for an adequate price, where an evident utility on the part of the public demands it.

2. Certain things are by nature itſelf incapable of appropriation, as the air, the light, the ocean, &c.; none

of which can be brought under the power of any one perſon, though their uſe be common to all: Others are by law exempted from private commerce, in reſpect of the uſes to which they are deſtined. Of this laſt kind are, 1. *Res publicæ*, as navigable rivers, highways, bridges, *&c.*: the right of theſe is veſted in the King, chiefly for the benefit of his people, and they are called *regalia*. 2. *Res univerſitatis*, things which belong in property to a particular corporation or ſociety, and whoſe uſe is common to every individual in it; but both property and uſe are ſubject to the regulations of the ſociety; as town-houſes, corporation-halls, market-places, church-yards, *&c.* The lands or other revenue belonging to a corporation do not fall under this claſs, but are *juris privati*.

3 Property may be acquired, either by occupation or acceſſion; and tranſferred by tradition or preſcription: But preſcription, being alſo a way of loſing property, falls to be explained under a ſeparate title. OCCUPATION, or occupancy, is the appropriating of things which have no owner, by apprehending them, or ſeizing their poſſeſſion. This was the original method of acquiring property, and continued, under certain reſtrictions, the doctrine of the Roman law, *Quod nullius eſt, fit occupantis*; but it can have no room in the feudal plan, by which the King is looked on as the original proprietor of all the lands within his dominions.

4. Even in that ſort of moveable goods which are preſumed to have once had an owner, this rule obtains by the law of Scotland, *Quod nullius eſt, fit domini regis*. Thus, the right of treaſures hid under ground, is not acquired by occupation, but accrues to the King. Thus alſo, where one finds ſtrayed cattle or other moveables, which have been loſt by the former owner, the finder acquires no right in them, but muſt give public notice thereof; and if within year and day after ſuch notice, the proprietor does not claim his goods, they fall to the King, Sheriff, or other perſon, to whom the King has made a grant of ſuch eſcheats.

5. In that ſort of moveables which never had an owner, as wild beaſts, fowls, fiſhes, or pearls found on the ſhore, the original law takes place, that he who firſt apprehends, becomes proprietor; in ſo much, that though the right of hunting, fowling, and fiſhing, be reſtrained by ſtatute, under certain penalties, yet all game, even what is catched in contravention of the law, becomes the property of the catcher, unleſs where the confiſcation thereof is made part of the penalty: But whales thrown in or killed on our coaſts, belong neither to thoſe who kill them, nor to the proprietor of the grounds on which they are caſt, but to the King, providing they are ſo large as that they cannot be drawn by a wane with ſix oxen.

6. ACCESSION is that way of acquiring property, by which, in two things which have a connection with, or dependence on one another, the property of the principal thing draws after it the property of its acceſſory. Thus the owner of a cow becomes the owner of the calf; a houſe belongs to the owner of the ground on which it ſtands, though built with materials belonging to, and at the charge of another. The Romans excepted from this rule the caſe of paintings drawn on another man's board or canvas, in conſideration of the excellency of the art; which exception our practice has for a like reaſon extended to ſimilar caſes.

7. Under acceſſion is comprehended SPECIFICATION; by which is meant, a perſon's making a new ſpecies or ſubject, from materials belonging to another. Where the new ſpecies can be again reduced to the matter of which it was made, law conſiders the former maſs as ſtill exiſting; and therefore, the new ſpecies, as an acceſſory to the former ſubject, belongs to the proprietor of that ſubject: But where the thing made cannot be ſo reduced, as in the caſe of wine, which cannot be again turned into grapes, there is no place for the *fictio juris*; and therefore the workmanſhip draws after it the property of the materials.

8. Though the new ſpecies ſhould be produced from the COMMIXTION or confuſion of different ſubſtances belonging to different proprietors, the ſame rule holds; but where the mixture is made by the common conſent of the owners, ſuch conſent makes the whole a common property, according to the ſhares that each proprietor had formerly in the ſeveral ſubjects. Where things of the ſame ſort are mixed without the conſent of the proprietors, which cannot again be ſeparated, *e. g.* two hogſheads of wine, the whole likewiſe becomes a common property; but in the after-diviſion, regard ought to be had to the different quality of the wines: If the things ſo mixed admit of a ſeparation, *e. g.* two flocks of ſheep, the property continues diſtinct.

9. Property is carried from one to another by TRADITION; which is the delivery of poſſeſſion by the proprietor, with an intention to tranſfer the property to the receiver. Two things are therefore requiſite, in order to the tranſmitting of property in this way: 1. The intention or conſent of the former owner to tranſfer it on ſome proper title of alienation, as ſale, exchange, gift, *&c.* 2. The actual delivery in purſuance of that intention. The firſt is called the *cauſa*, the other the *modus tranſferendi dominii*: Which laſt is ſo neceſſary to the acquiring of property, that he who gets the laſt right, with the firſt tradition, is preferred, according to the rule, *Traditionibus, non nudis pactis, tranſferuntur rerum dominia*.

10. Tradition is either real, where the *ipſa corpora* of moveables are put into the hands of the receiver; or ſymbolical, which is uſed where the thing is incapable of real delivery, or even when actual delivery is only inconvenient. Where the poſſeſſion or cuſtody of the ſubject has been before with him to whom the property is to be tranſferred, there is no room for tradition.

11. Poſſeſſion, which is eſſential both to the acquiſition and enjoyment of property, is defined, the detention of a thing, with a deſign or *animus* in the detainer of holding it as his own. It cannot be acquired by the ſole act of the mind, without real detention; but, being once acquired, it may be continued *ſolo animo*. Poſſeſſion is either natural, or civil. Natural poſſeſſion is, when one poſſeſſes by himſelf: Thus, we poſſeſs lands by cultivating them and reaping their fruits, houſes by inhabiting them, moveables by detaining them in our hands. Civil poſſeſſion is our holding the thing, either by the ſole act

of the mind, or by the hands of another who holds it in our name: Thus, the owner of a thing lent poſſeſſes it by the borrower; the proprietor of lands, by his tackſman, truſtee, or ſteward; *&c.* The ſame ſubject cannot be poſſeſſed entirely, or *in ſolidum*, by two different perſons at one and the ſame time; and therefore poſſeſſion by an act of the mind ceaſes, as ſoon as the natural poſſeſſion is ſo taken up by another, that the former poſſeſſor is not ſuffered to re-enter. Yet two perſons may, in the judgment of law, poſſeſs the ſame ſubject, at the ſame time, on different rights: thus, in the caſe of a pledge, the creditor poſſeſſes it in his own name, in virtue of the right of impignoration; while the proprietor is conſidered as poſſeſſing, in and through the creditor, in ſo far as is neceſſary for ſupporting his right of property. The ſame doctrine holds in liferenters, tackſmen, and, generally, in every caſe where there are rights affecting a ſubject, diſtinct from the property.

12. A *bona fide* poſſeſſor is he, who, though he is not really proprietor of the ſubject, yet believes himſelf proprietor on probable grounds. A *mala fide* poſſeſſor knows, or is preſumed to know, that what he poſſeſſes is the property of another. A poſſeſſor *bona fide* acquired right, by the Roman law, to the fruits of the ſubject poſſeſſed, that had been reaped and conſumed by himſelf, while he believed the ſubjects his own. By our cuſtoms, perception alone, without conſumption, ſecures the poſſeſſor: Nay, if he has ſown the ground, while his *bona fides* continued, he is intitled to reap the crop, *propter curam et culturam*. But this doctrine does not reach to civil fruits, *e. g.* the intereſt of money, which the *bona fide* receiver muſt reſtore, together with the principal, to the owner.

13. *Bona fides* neceſſarily ceaſeth by the *conſcientia rei alienæ* in the poſſeſſor, whether ſuch conſciouſneſs ſhould proceed from legal interpellation, or private knowledge. *Mala fides* is ſometimes induced, by the true owner's bringing his action againſt the poſſeſſor, ſometimes not till litiſconteſtation, and, in caſes uncommonly favourable, not till ſentence be pronounced againſt the poſſeſſor.

14. The property of moveable ſubjects is preſumed by the bare effect of poſſeſſion, until the contrary be proved; but poſſeſſion of an immoveable ſubject, though for a century of years together, if there is no ſeiſin, does not create even a preſumptive right to it: *Nulla ſaſina, nulla terra.* Such ſubject is conſidered as caduciary, and ſo accrues to the ſovereign. Where the property of a ſubject is conteſted, the lawful poſſeſſor is intitled to continue his poſſeſſion, till the point of right be diſcuſſed; and, if he has loſt it by force or ſtealth, the judge will, upon ſummary application, immediately reſtore it to him.

15. Where a poſſeſſor has ſeveral rights in his perſon, affecting the ſubject poſſeſſed, the general rule is, that he may aſcribe his poſſeſſion to which of them he pleaſes; but one cannot aſcribe his poſſeſſion to a title other than that on which it commenced, in prejudice of him from whom his title flowed.

Tit. 9. *Of heritable and moveable Rights.*

For the better underſtanding the doctrine of this title, it muſt be known, that by the law of Scotland, and indeed of moſt nations of Europe, ſince the introduction of feus, where ever there are two or more in the ſame degree of conſanguinity to one who dies inteſtate, and who are not all females, ſuch rights belonging to the deceaſed as are either properly feudal, or have any reſemblance to feudal rights, deſcend wholly to one of them, who is conſidered as his proper heir; the others, who have the name of next of kin or executors, muſt be contented with that portion of the eſtate which is of a more periſhable nature. Hence has ariſen the diviſion of rights to be explained under this title: the ſubjects deſcending to the heir, are ſtyled heritable; and thoſe that fall to the next of kin, moveable.

2. All rights of, or affecting lands, under which are comprehended houſes, mills, fiſhings, teinds; and all rights of ſubjects that are *fundo anexa*, whether compleated by ſeiſin or not, are heritable *ex ſua natura*. On the other hand, every thing that moves itſelf, or can be moved, and in general whatever is not united to land, is moveable; as houſehold-furniture, corns, cattle, caſh, arrears of rent and of intereſt, even though they ſhould be due on a right of annualrent: For though the arrears laſt mentioned are ſecured on land, yet being preſently payable, they are conſidered as caſh.

3. Debts, (*nomina debitorum*), when due by bill, promiſſory note, or account, are moveable. When conſtituted by bond, they do not all fall under any one head; but are divided into heritable and moveable, by the following rules. All debts conſtituted by bond bearing an obligation to infeſt the creditor in any heritable ſubject in ſecurity of the principal ſum and annualrent, or annualrent only, are heritable; for they not only carry a yearly profit, but are ſecured upon land.

4. Bonds merely perſonal, though bearing a clauſe of intereſt, are moveable as to ſucceſſion; i. e. they go not to the heir, but to the next of kin or executors: but they are heritable with reſpect to the fiſk, and to the rights of huſband and wife; that is, though, by the general rule, moveable rights fall under the communion of goods conſequent upon marriage, and the moveables of denounced perſons fall to the crown or fiſk, by ſingle eſcheat, yet ſuch bonds do neither, but are heritable in both reſpects.

5. Bonds taken payable to heirs and aſſignees, ſecluding executors, are heritable in all reſpects, from the deſtination of the creditor. But a bond, which is made payable to heirs, without mention of executors, deſcends, not to the proper heir in heritage, though heirs are mentioned in the bond, but to the executor; for the word *heir*, which is a generic term, points out him who is to ſucceed by law in the right; and the executor, being the heir *in mobilibus*, is conſidered as the perſon to whom ſuch bond is taken payable But where a bond is taken to heirs-male, or to a ſeries of heirs, one after another, ſuch bond is heritable, becauſe its deſtination neceſſarily excludes executors.

6 Subjects originally moveable become heritable: 1. By the proprietor's deſtination. Thus, a jewel, or any other moveable ſubject may be provided to the heir, from the right competent to every proprietor to ſettle his property on whom he pleaſes. 2. Moveable

rights may become heritable, by the ſupervening of an heritable ſecurity: Thus, a ſum due by a perſonal bond becomes heritable, by the creditor's accepting an heritable right for ſecuring it, or by adjudging upon it,

7. Heritable rights do not become moveable by acceſſory moveable ſecurities, the heritable right being in ſuch caſe the *jus nobilius*, which draws the other after it.

8 Certain ſubjects partake, in different reſpects, of the nature both of heritable and moveable. Perſonal bonds are moveable in reſpect of ſucceſſion, but heritable as to the fiſk, and huſband and wife. All bonds, whether merely perſonal, or even heritable, on which no ſeiſin has followed, may be affected at the ſuit of creditors, either by adjudication, which is a diligence proper to heritage; or by arreſtment, which is peculiar to moveables. Bonds ſecluding executors, though they deſcend to the creditor's heir, are payable by the debtor's executors, without relief againſt the heir; ſince the debtor's ſucceſſion cannot be affected by the deſtination of the creditor.

9. All queſtions, whether a right be heritable or moveable, muſt be determined according to the condition of the ſubject at the time of the anceſtor's death. If it was heritable at that period, it muſt belong to the heir; if moveable, it muſt fall to the executor, without regard to any alterations that may have affected the ſubject in the intermediate period between the anceſtor's death and the competition.

Tit. 10. *Of the Conſtitution of heritable Rights by Charter and Seiſin.*

HERITABLE rights are governed by the feudal law, which owed its origin, or at leaſt its firſt improvements, to the Longobards; whoſe kings, upon having penetrated into Italy, the better to preſerve their conqueſts, made grants to their principal commanders of great part of the conquered provinces, to be again ſubdivided by them among the lower officers, under the conditions of fidelity and military ſervice.

2. The feudal conſtitutions and uſages were firſt reduced into writing, about the year 1150, by two lawyers of Milan, under the title of *Conſuetudines Feudorum*. None of the German Emperors appear to have expreſsly confirmed this collection by their authority; but it is generally agreed, that it had their tacit approbation, and was conſidered as the cuſtomary feudal law of all the countries ſubject to the empire. No other country has ever acknowledged theſe books for their law; but each ſtate has formed to itſelf ſuch a ſyſtem of feudal rules, as beſt agreed with the genius of its own conſtitution. In feudal queſtions, therefore, we are governed, in the firſt place, by our own ſtatutes and cuſtoms; where theſe fail us, we have regard to the practice of neighbouring countries, if the genius of their law appears to be the ſame with ours; and ſhould the queſtion ſtill remain doubtful, we may have recourſe to thoſe written books of the feus, as to the original plan on which all feudal ſyſtems have proceeded.

3. This military grant got the name, firſt of *beneficium*, and afterwards of *feudum;* and was defined a gratuitous right to the property of lands, made under the conditions of fealty and military ſervice, to be performed to the granter by the receiver; the radical right of the lands ſtill remaining in the granter. Under lands, in this definition, are comprehended all rights or ſubjects ſo connected with land, that they are deemed a part thereof; as houſes, mills, fiſhings, juriſdictions, patronages, *&c.* Though feus in their original nature were gratuitous, they ſoon became the ſubject of commerce; ſervices of a civil or religious kind were frequently ſubſtituted in place of military; and now, of a long time, ſervices of every kind have been entirely diſpenſed with, in certain feudal tenures. He who makes the grant is called the ſuperior, and he who receives it the vaſſal. The ſubject of the grant is commonly called the feu; though that word is at other times, in our law, uſed to ſignify one particular tenure. See Tit. 11. The intereſt retained by the ſuperior in the feu is ſtyled *dominium directum*, or the ſuperiority; and the intereſt acquired by the vaſſal, *dominium utile*, or the property. The word *fee* is promiſcuouſly applied to both.

4. Allodial goods are oppoſed to feus; by which are underſtood, goods enjoyed by the owner, independent of a ſuperior. All moveable goods are allodial; lands only are ſo, when they are given without the condition of fealty or homage. By the feudal ſyſtem, the ſovereign, who is the fountain of feudal rights, reſerves to himſelf the ſuperiority of all the lands of which he makes the grant; ſo that, with us, no lands are allodial, except thoſe of the King's own property, the ſuperiorities which the King reſerves in the property-lands of his ſubjects, and manſes and glebes, the right of which is compleated by the preſbytery's deſignation, without any feudal grant.

5. Every perſon who is in the right of an immoveable ſubject, provided he has the free adminiſtration of his eſtate, and is not debarred by ſtatute, or by the nature of his right, may diſpoſe of it to another. Nay, a vaſſal, though he has only the *dominium utile*, can ſubfeu his property to a ſubvaſſal by a ſubaltern right, and thereby raiſe a new *dominium directum* in himſelf, ſubordinate to that which is in his ſuperior; and ſo *in infinitum*. The vaſſal who thus ſubfeus, is called the ſubvaſſal's immediate ſuperior, and the vaſſal's ſuperior is the ſubvaſſal's mediate ſuperior.

6. All perſons who are not diſabled by law, may acquire and enjoy feudal righs. Papiſts cannot purchaſe a land eſtate by any voluntary deed. Aliens, who owe allegiance to a foreign prince, cannot hold a feudal right without naturalization; and therefore, where ſuch privilege was intended to be given to favoured nations or perſons, ſtatutes of naturalization were neceſſary, either general, or ſpecial; or at leaſt, letters of naturalization by the ſovereign.

7. Every heritable ſubject, capable of commerce, may be granted in feu. From this general rule is excepted, 1. The annexed property of the Crown, which is not alienable without a previous diſſolution in parliament. 2. Tailzied lands, which are deviſed under condition that they ſhall not be aliened. 3. An eſtate *in hereditate jacente* cannot be effectually aliened by the heir-apparent (*i. e.* not entered); but ſuch alienation

becomes effectual upon his entry, the ſupervening right accruing in that caſe to the purchaſer; which is a rule applicable to the alienation of all ſubjects not belonging to the vender at the time of the ſale.

8. The feudal right, or, as it is called, inveſtiture, is conſtituted by charter and ſeiſin. By the charter, we underſtand that writing which contains the grant of the feudal ſubject to the vaſſal, whether it be executed in the proper form of a charter, or of a diſpoſition. Charters by ſubject-ſuperiors are granted, either, 1. *A me de ſuperiore meo*, when they are to be holden, not of the granter himſelf, but of his ſuperior. This ſort is called a public holding, becauſe vaſſals were in ancient times publicly received in the ſuperior's court before the *pares curiæ* or co-vaſſals. Or, 2. *De me*, where the lands are to be holden of the granter. Theſe were called ſometimes baſe rights, from *bas*, *lower*: and ſometimes private, becauſe before the eſtabliſhment of our records, they were eaſily concealed from third parties; the nature of all which will be more fully explained, Tit. 14. An original charter is that by which the fee is firſt granted: A charter by progreſs is a renewed diſpoſition of that fee to the heir or aſſignee of the vaſſal. All doubtful clauſes in charters by progreſs ought to be conſtrued agreeably to the original grant; and all clauſes in the original charter are underſtood to be implied in the charters by progreſs, if there be no expreſs alteration.

9. The firſt clauſe in an original charter, which follows immediately after the name and deſignation of the granter, is the narrative or recital, which expreſſes the cauſes inductive of the grant. If the grant be made for a valuable conſideration, it is ſaid to be onerous; if for love and favour, gratuitous. In the diſpoſitive clauſe of a charter, the ſubjects made over are deſcribed either by ſpecial boundaries or march-ſtones, (which is called a bounding charter), or by ſuch other characters as may ſufficiently diſtinguiſh them. A charter regularly carries right to no ſubjects but what are contained in this clauſe, though they ſhould be mentioned in ſome other clauſe of the charter.

10. The clauſe of *tenendas* (from its firſt words, *tenendas prædictas terras*) expreſſes the particular tenure by which the lands are to be holden. The clauſe of *reddendo* (from the words, *reddendo inde annuatim*) ſpecifies the particular duty or ſervice which the vaſſal is to pay or perform to the ſuperior.

11. The clauſe of warrandice is that by which the granter obliges himſelf that the right conveyed ſhall be effectual to the receiver. Warrandice is either perſonal or real. Perſonal warrandice, where the granter is only bound perſonally, is either, 1. Simple, that he ſhall grant no deed in prejudice of the right; and this ſort, which is confined to future deeds, is implied even in donations. 2. Warrandice from fact and deed, by which the granter warrants that the right neither has been, nor ſhall be hurt by any fact of his. Or, 3. Abſolute warrandice *contra omnes mortales*, whereby the right is warranted againſt all legal defects in it, which may carry it off from the receiver, either wholly or in part. Where a ſale of lands proceeds upon an onerous cauſe, the granter is liable in abſolute warrandice, though no warrandice be expreſſed; but in aſſignations to debts or decrees, no higher warrandice than from fact and deed is implied.

12. Gratuitous grants by the Crown imply no warrandice; and though warrandice ſhould be expreſſed, the clauſe is ineffectual, from a preſumption, that it has crept in by the negligence of the Crown's officers. But where the Crown makes a grant, not *jure coronæ*, but for an adequate price, the ſovereign is in the ſame caſe with his ſubjects.

13. Abſolute warrandice, in caſe of eviction, affords an action to the grantee, againſt the granter, for making up to him all that he ſhall have ſuffered through the defect of the right; and not ſimply for his indemnification, by the granter's repayment of the price to him. But as warrandice is penal, and conſequently *ſtricti juris*, it is not eaſily preſumed, nor is it incurred from every light ſervitude that may affect the ſubject, far leſs does it extend to burdens which may affect the ſubject poſterior to the grant, nor to thoſe impoſed by public ſtatute, whether before or after, unleſs ſpecially warranted againſt.

14. Real warrandice is either, 1. Expreſs, whereby, in ſecurity of the lands principally conveyed, other lands, called warrandice-lands, are alſo made over, to which the receiver may have recourſe in caſe the principal lands be evicted. Or, 2. Tacit, which is conſtituted by the exchange or excambion of one piece of ground with another; for, if the lands exchanged are carried off from either of the parties, the law itſelf, without any paction, gives that party immediate recourſe upon his own firſt lands, given in exchange for the lands evicted.

15 The chapter concludes with a precept of ſeiſin, which is the command of the ſuperior granter of the right to his bailie, for giving ſeiſin or poſſeſſion to the vaſſal, or his attorney, by delivering to him the proper ſymbols. Any perſon, whoſe name may be inſerted in the blank, left in the precept for that purpoſe, can execute the precept as bailie; and whoever has the precept of ſeiſin in his hands, is preſumed to have a power of attorney from the vaſſal, for receiving poſſeſſion in his name.

16. A ſeiſin is the inſtrument or atteſtation of a notary, that poſſeſſion was actually given by the ſuperior or his bailie, to the vaſſal or his attorney; which is conſidered as ſo neceſſary a ſolemnity, as not to be ſuppliable, either by a proof of natural poſſeſſion, or even of the ſpecial fact that the vaſſal was duly entered to the poſſeſſion by the ſuperior's bailie.

17. The ſymbols, by which the delivery of poſſeſſion is expreſſed, are, for lands, earth and ſtone; for rights of annualrent payable forth of land, it is alſo earth and ſtone, with the addition of a penny money; for parſonage teinds, a ſheaf of corn; for juriſdictions, the book of the court; for patronages, a pſalm-book, and the keys of the church; for fiſhings, net and coble; for mills, clap and happer, *&c.* The ſeiſin muſt be taken upon the ground of the lands, except where there is a ſpecial diſpenſation in the charter from the Crown.

18 All ſeiſins muſt be regiſtred within ſixty days after their date, either in the general regiſter of ſeiſins at Edinburgh, or in the regiſter of the particular ſhire appointed by the act 1617; which, it muſt be obſerved, is not, in every caſe, the ſhire within which the lands lie. Burgage

gage ſeiſins are ordained to be regiſtered in the books of the borough.

19. Unregiſtred ſeiſins are ineffectual againſt third parties, but they are valid againſt the granters and their heirs. Seiſins regularly recorded, are preferable, not according to their own dates, but the dates of their regiſtration.

20. Seiſin neceſſarily ſuppoſes a ſuperior by whom it is given; the right therefore which the ſovereign, who acknowledges no ſuperior, has over the whole lands of Scotland, is conſtituted, *jure coronæ*, without ſeiſin. In ſeveral parcels of land, that lie contiguous to one another, one ſeiſin ſerves for all, unleſs the right of the ſeveral parcels be either holden of different ſuperiors, or derived from different authors, or enjoyed by different tenures under the ſame ſuperior. In diſcontiguous lands, a ſeparate ſeiſin muſt be taken on every parcel, unleſs the ſovereign has united them into one tenandry, by a charter of union; in which caſe, if there is no ſpecial place expreſſed, a ſeiſin taken on any part of the united lands will ſerve for the whole, even though they be ſituated in different ſhires. The only effect of union is, to give the diſcontiguous lands the ſame quality as if they had been contiguous, or naturally united; union, therefore, does not take off the neceſſity of ſeparate ſeiſins, in lands holden by different tenures, or the rights of which flow from different ſuperiors, theſe being incapable of natural union.

21. The privilege of barony carries a higher right than union does, and conſequently includes union in it as the leſſer degree. This right of barony can neither be given, nor tranſmitted, unleſs by the Crown; but the quality of ſimple union, being once conferred on lands by the ſovereign, may be communicated by the vaſſal to a ſubvaſſal. Though part of the lands united or erected into a barony, be ſold by the vaſſal to be holden *a me*, the whole union is not thereby diſſolved: what remains unſold retains the quality.

22. A charter, not perfected by ſeiſin, is a right merely perſonal, which does not transfer the property, (ſee Tit. xx. 1.) and a ſeiſin of itſelf bears no faith, without its warrant: It is the charter and ſeiſin joined together that conſtitutes the feudal right, and ſecures the receiver againſt the effect of all poſterior ſeiſins, even though the charters on which they proceed ſhould be prior to his.

23. No quality which is deſigned as a lien or real burden on a feudal right, can be effectual againſt ſingular ſucceſſors, if it be not inſerted in the inveſtiture. If the creditors in the burden are not particularly mentioned, the burden is not real; for no perpetual unknown incumbrance can be created upon lands. Where the right itſelf is granted with the burden of the ſum therein mentioned, or where it is declared void, if the ſum be not paid againſt a day certain, the burden is real; but where the receiver is ſimply obliged by his acceptance to make payment, the clauſe is effectual only againſt him and his heirs.

Tit. 11. *Of the ſeveral kinds of Holding.*

FEUDAL ſubjects are chiefly diſtinguiſhed by their different manners of holding, which were either ward, blanch, feu, or burgage. Ward-holding, which is now aboliſhed by 20. *Geo.* II. *c.* 50. was that which was granted for military ſervice. Its proper *reddendo* was, *ſervices*, or *ſervices uſed and wont*; by which laſt was meant the performance of ſervice whenever the ſuperior's occaſions required it. As all feudal rights were originally held by this tenure, ward-holding was *in dubio*. Hence, though the *reddendo* had contained ſome ſpecial ſervice, or yearly duty, the holding was preſumed ward, if another holding was not particularly expreſſed.

2. Feu holding is that whereby the vaſſal is obliged to pay to the ſuperior a yearly rent in money or grain, and ſometimes alſo in ſervices proper to a farm, as ploughing, reaping, carriages for the ſuperior's uſe, *&c. nomine feudi firmæ*. This kind of tenure was introduced for the encouragement of agriculture, the improvement of which was conſiderably obſtructed by the vaſſal's obligation to military ſervice. It appears to have been a tenure known in Scotland as far back as *leges burgorum*.

3. Blanch-holding is that whereby the vaſſal is to pay to the ſuperior an eluſory yearly duty, as a penny money, a roſe, a pair of gilt ſpurs, *&c.* merely in acknowledgment of the ſuperiority, *nomine albæ firmæ*. This duty, where it is a thing of yearly growth, if it be not demanded within the year, cannot be exacted thereafter; and where the words, *ſi petatur tantum*, are ſubjoined to the *reddendo*, they imply a releaſe to the vaſſal, whatever the quality of the duty may be, if it is not aſked within the year.

4. Burgage holding is that, by which boroughs-royal hold of the ſovereign the lands which are contained in their charters of erection. This, in the opinion of *Craig*, does not conſtitute a ſeparate tenure, but is a ſpecies of ward-holding; with this ſpeciality, that the vaſſal is not a private perſon, but a community: And indeed, watching and warding, which is the uſual ſervice contained in the *reddendo* of ſuch charters, might be properly enough ſaid, ſome centuries ago, to have been of the military kind. As the royal borough is the King's vaſſal, all burgage-holders hold immediately of the Crown: The magiſtrates therefore, when they receive the reſignations of the particular burgeſſes, and give ſeiſin to them, act, not as ſuperiors, but as the King's bailies ſpecially authoriſed thereto.

5. Feudal ſubjects, granted to churches, monaſteries, or other ſocieties for religious or charitable uſes, are ſaid to be mortified, or granted *ad manum mortuam*; either becauſe all caſualties muſt neceſſarily be loſt to the ſuperior, where the vaſſal is a corporation, which never dies: or becauſe the property of theſe ſubjects is granted to a dead hand, which cannot transfer it to another. In lands mortified in times of Popery to the church, whether granted to prelates for the behoof of the church, or *in puram eleemoſynam*; the only ſervices preſtable by the vaſſal were prayers, and ſinging of maſſes for the ſouls of the deceaſed, which approaches nearer to blanch-holding than ward. The purpoſes of ſuch grants having been, upon the reformation, declared ſuperſtitious, the lands mortified were annexed to the Crown: But mortifications

to univerſities, hoſpitals, *&c.* were not affected by that annexation; and lands may, at this day, be mortified to any lawful purpoſe, either by blanch or by feu holding.

Tit. 12. *Of the Caſualties due to the Superior.*

The right of the ſuperior continues unimpaired, notwithſtanding the feudal grant, unleſs in ſo far as the *dominium utile*, or property, is conveyed to his vaſſal. The ſuperiority carries a right to the ſervices and annual duties contained in the *reddendo* of the vaſſal's charter. The duty payable by the vaſſal is a *debitum fundi*; *i. e.* it is recoverable, not only by a perſonal action againſt himſelf, but by a real action againſt the lands.

2. Beſides the conſtant fixed rights of ſuperiority, there are others, which, becauſe they depend upon uncertain events, are called caſualties.

3. The caſualties proper to a ward holding, while that tenure ſubſiſted, were ward, recognition, and marriage, which it is now unneceſſary to explain, as by the late ſtatutes 20 and 25 *Geo.* II. for aboliſhing ward-holdings, the tenure of the lands holden ward of the Crown or Prince is turned into *blanch*, for payment of one penny Scots yearly, *ſi petatur tantum*: and the tenure of thoſe holden of ſubjects, into *feu*, for payment of ſuch yearly feu-duty in money, victual, or cattle, in place of all ſervices, as ſhall be fixed by the court of Seſſion. And accordingly that court, by act of ſederunt Feb. 8. 1749, laid down rules for aſcertaining the extent of theſe feu-duties.

4. The only caſualty, or rather forfeiture, proper to feu-holdings, is the loſs or tinſel of the feu-right, by the neglect of payment of the feu duty for two full years. Yet where there is no conventional irritancy in the feu-right, the vaſſal is allowed to purge the legal irritancy at the bar; that is, he may prevent the forfeiture, by making payment before ſentence: but where the legal irritancy is fortified by a conventional, he is not allowed to purge, unleſs where he can give a good reaſon for the delay of payment.

5. The caſualties common to all holdings are, non-entry, relief, liferent-eſcheat, diſclamation, and purpreſture. **Non-entry** is that caſualty which ariſes to the ſuperior out of the rents of the feudal ſubject, through the heir's neglecting to renew the inveſtiture after his anceſtor's death. The ſuperior is intitled to this caſualty, not only where the heir has not obtained himſelf infeſt, but where his retour is ſet aſide upon nullities. The heir, from the death of the anceſtor, till he be cited by the ſuperior in a proceſs of general declarator of non-entry, loſes only the retoured duties of his lands, (ſee next parag.); and he forfeits theſe, though his delay ſhould not argue any contempt of the ſuperior, becauſe the caſualty is conſidered to fall, as a condition implied in the feudal right, and not as a penalty of tranſgreſſion: But, where the delay proceeds not from the heir, but from the ſuperior, nothing is forfeited.

6. For underſtanding the nature of retoured duties, it muſt be known, that there was anciently a general valuation of all the lands in Scotland, deſigned both for regulating the proportion of public ſubſidies, and for aſcertaining the quantity of non-entry and relief-duties payable to the ſuperior; which appears, by a contract betwixt K. R. Bruce and his ſubjects *anno* 1327, preſerved in the library of the faculty of advocates, to have been ſettled at leaſt as far back as the reign of Alexander III. This valuation became in the courſe of time, by the improvement of agriculture, and perhaps alſo by the heightning of the nominal value of our money, from the reign of Robert I. downwards to that of James III. much too low a ſtandard for the ſuperior's caſualties: Wherefore, in all ſervices of heirs, the inqueſt came at laſt to take proof likewiſe of the preſent value of the lands contained in the brief (*quantum nunc valent*) in order to fix theſe caſualties. The firſt was called the old, and the other the new extent. Though both extents were ordained to be ſpecified in all retours made to the Chancery upon brieves of inqueſt; yet by the appellation of retoured duties in a queſtion concerning caſualties, the new extent is always underſtood. The old extent continued the rule for levying public ſubſidies, till a tax was impoſed by new proportions, by ſeveral acts made during the uſurpation. By two acts of Cromwell's parliament, held at Weſtminſter 1656, impoſing taxations on Scotland, the rates laid upon the ſeveral counties are preciſely fixed. The ſubſidy granted by the act of convention 1667, was levied on the ſeveral counties, nearly in the ſame proportions that were fixed by the uſurper in 1656; and the ſums to which each county was ſubjected were ſubdivided among the individual land holders in that county, according to the valuations already ſettled, or that ſhould be ſettled by the commiſſion appointed to carry that act into execution. The rent fixed by theſe valuations is commonly called the valued rent; according to which the land tax, and moſt of the other public burdens, have been levied ſince that time.

7. In feu-holdings, the feu-duty is retoured as the rent, becauſe the feu duty is preſumed to be, and truly was at firſt, the rent. The ſuperior therefore of a feu-holding gets no non-entry, before citation in the general declarator; for he would have been intitled to the yearly feu-duty, though the fee had been full, *i. e.* though there had been a vaſſal infeſt in the lands. The ſuperior of teinds gets the fifth part of the retoured duty as non-entry, becauſe the law conſiders teinds to be worth a fifth part of the rent. In rights of annualrent which are holden of the granter, the annualrenter becomes his debtor's vaſſal; and the annualrent contained in the right is retoured to the blanch or other duty contained in the right before declarator.

8. It is becauſe the retoured duty is the preſumed rent, that the non-entry is governed by it. If therefore no retour of the lands in non-entry can be produced, nor any evidence brought of the retoured duty, the ſuperior is intitled to the real, or at leaſt to the valued rent, even before citation. In lands formerly holden ward of the King, the heir, in place of the retoured duties, is ſubjected only to the annual payment of one *per cent.* of the valued rent.

9. The heir, after he is cited by the ſuperior in the action of general declarator, is ſubjected to the full rents

till his entry, becauſe his neglect is leſs excuſable after citation. The decree of declarator, proceeding on this action, intitles the ſuperior to the poſſeſſion, and gives him right to the rents, downward from the citation. As this ſort of non-entry is properly penal, our law has always reſtricted it to the retoured duties, if the heir had a probable excuſe for not entering.

10. Non entry does not obtain in burgage-holdings, becauſe the incorporation of inhabitants holds the whole incorporated ſubjects of the King; and there can be no non-entry due in lands granted to communities, becauſe there the vaſſal never dies: This covers the right of particulars from non-entry; for if non-entry be excluded with regard to the whole, it cannot obtain with regard to any part. It is alſo excluded, as to a third of the lands, by the terce, during the widow's life; and as to the whole of them, by the courteſy, during the life of the huſband. But it is not excluded by a precept of ſeiſin granted to the heir, till ſeiſin be taken thereon.

11. RELIEF is that caſualty which intitles the ſuperior to an acknowledgement or conſideration from the heir, for receiving him as vaſſal. It is called relief, becauſe, by the entry of the heir, his fee is relieved out of the hands of the ſuperior. It is not due in feu-holdings flowing from ſubjects, unleſs where it is expreſſed in the charter by a ſpecial clauſe for doubling the feu-duty at the entry of an heir; but in feu-rights, holden of the crown, it is due, though there ſhould be no ſuch clauſe in the charter. The ſuperior can recover this caſualty, either by a poinding of the ground, as a *debitum fundi*, or by a perſonal action againſt the heir. In blanch and feu-holdings, where this caſualty is expreſsly ſtipulated, a year's blanch or feu-duty is due in name of relief, beſide the current year's duty payable in name of blanch or feu-farm.

12. ESCHEAT (from *echeoir, to happen* or *fall*) is that forfeiture which falls through a perſon's being denounced rebel. It is either ſingle or liferent. Single eſcheat, though it does not accrue to the ſuperior, muſt be explained in this place, becauſe of its coincidence with liferent.

13. After a debt is conſtituted, either by a formal decree, or by regiſtration of the ground of debt, which to the ſpecial effect of execution, is in law accounted a decree; the creditor may obtain letters of horning, iſſuing from the ſignet, commanding meſſengers to charge the debtor to pay or perform his obligation, within a day certain. Where horning proceeds on a formal decree of the Seſſion, the time indulged by law to the debtor is fifteen days; if upon a decree of the commiſſion of teinds or admiral, it is ten; and upon the decrees of all inferior judges, fifteen days. Where it proceeds on a regiſtred obligation, which ſpecifies the number of days, that number muſt be the rule; and, if no preciſe number be mentioned, the charge muſt be given on fifteen days, which is the term of law, unleſs where ſpecial ſtatute interpoſes; as in bills, upon which the debtor may be charged on ſix days.

14. The meſſenger muſt execute theſe letters (and indeed all ſummonſes) againſt the debtor, either perſonally, or at his dwelling houſe; and, if he get not acceſs to the houſe, he muſt ſtrike ſix khocks at the gate, and thereafter affix to it a copy of his execution. If payment be not made within the days mentioned in the horning, the meſſenger, after proclaiming three oyeſſes at the market-croſs of the head borough, of the debtor's domicile, and reading the letters there, blows three blaſts with a horn, by which the debtor is underſtood to be proclaimed rebel to the King for contempt of his authority; after which, he muſt affix a copy of the execution to the market-croſs: This is called the publication of the diligence, or a denounciation at the horn. Where the debtor is not in Scotland, he muſt be charged on ſixty days, and denounced at the market croſs of Edinburgh, and pier and ſhore of Leith.

15. Denunciation, if regiſtered within fifteen days, either in the Sheriff's books, or in the general regiſter, drew after it the rebel's ſingle eſcheat, *i. e.* the forfeiture of his moveables to the Crown. Perſons denounced rebels have not a *perſona ſtandi in judicio*; they can neither ſue nor defend in any action. But this incapacity, being unfavourable, is perſonal to the rebel, and cannot be pleaded againſt his aſſignee.

16. Perſons cited to the court of Juſticiary may be alſo denounced rebels, either for appearing there with too great a number of attendants; or, if they fail to appear, they are declared fugitives from the law. Single eſcheat falls without denunciation, upon ſentence of death pronounced in any criminal trial; and by ſpecial ſtatute, upon one's being convicted of certain crimes, though not capital; as perjury, bigamy, deforcement, breach of arreſtment, and uſury. By the late act aboliſhing wardholdings, the caſualties both of ſingle and liferent eſcheat are diſcharged, when proceeding upon denunciation for civil debts; but they ſtill continue, when they ariſe from criminal cauſes. All moveables belonging to the rebel at the time of his rebellion, (whether proceeding upon denunciation, or ſentence in a criminal trial), and all that ſhall be afterwards acquired by him until relaxation, fall under ſingle eſcheat. Bonds bearing intereſt, becauſe they continue heritable *quoad fiſcum*, fall not under it, nor ſuch fruits of heritable ſubjects as become due after the term next enſuing the rebellion, theſe being reſerved for the liferent eſcheat.

17. The King never retains the right of eſcheat to himſelf, but makes it over to a donatory, whoſe gift is not perfected, till, upon an action of general declarator, it be declared that the rebel's eſcheat has fallen to the crown by his denunciation, and that the right of it is now transferred to the purſuer by the gift in his favour: Every creditor therefore of the rebel, whoſe debt was contracted before rebellion, and who has uſed diligence before declarator, is preferable to the donatory. But the eſcheat cannot be affected by any debt contracted, nor by any voluntary deed of the rebel after rebellion.

18. The rebel, if he either pays the debt charged for, or ſuſpends the diligence, may procure letters of relaxation from the horn, which, if publiſhed in the ſame place, and regiſtred fifteen days thereafter in the ſame regiſter with the denunciation, have the effect to reſtore him to his former ſtate; but they have no retroſpect, as to the

moveables already fallen under eſcheat, without a ſpecial clauſe for that purpoſe.

19. The rebel, if he continues unrelaxed for year and day after rebellion, is conſtrued to be civilly dead: And therefore, where he holds any feudal right, his ſuperiors, as being without a vaſſal, are entitled, each of them, to the rents of ſuch of the lands belonging to the rebel as holds of himſelf, during all the days of the rebel's natural life, by the caſualty of LIFERENT-ESCHEAT; except where the denunciation proceeds upon treaſon or proper rebellion, in which caſe the liferent falls to the King.

20. It is that eſtate only, to which the rebel has a proper right of liferent in his own perſon, that falls under his liferent eſcheat.

21. Though neither the ſuperior nor his donatory can enter into poſſeſſion in conſequence of this caſualty, till decree of declarator; yet that decree, being truly declaratory, has a retroſpect, and does not ſo properly confer a new right, as declare the right formerly conſtituted to the ſuperior, by the civil death of his vaſſal. Hence, all charters or heritable bonds, though granted prior to the rebellion, and all adjudications, though led upon debts contracted before that period, are ineffectual againſt the liferent-eſcheat, unleſs ſeiſin be taken thereon within year and day after the granter's rebellion.

22. Here, as in ſingle eſcheat, no debt contracted after rebellion can hurt the donatory, nor any voluntary right granted after that period, though in ſecurity or ſatiſfaction of prior debts.

23. DISCLAMATION is that caſualty whereby a vaſſal forfeits his whole feu to his ſuperior, if he diſowns or diſclaims him without ground, as to any part of it. PURPRESTURE draws likewiſe a forfeiture of the whole feu after it, and is incurred by the vaſſal's incroaching upon any part of his ſuperior's property, or attempting, by building, incloſing, or otherwiſe, to make it his own. In both theſe feudal delinquencies, the leaſt colour of excuſe ſaves the vaſſal.

24. All grants from the crown, whether charters, gifts of caſualties, or others, proceed on ſignatures which paſs the ſignet. When the King reſided in Scotland, all ſignatures were ſuperſcribed by him; but, on the acceſſion of James VI. to the crown of England, a cachet or ſeal was made, having the King's name engraved on it, in purſuance of an act of the Privy Council, *April* 4. 1603, with which all ſignatures were to be afterwards ſealed, that the Lords of exchequer were impowered to paſs; and theſe powers are transferred to the court of Exchequer, which was eſtabliſhed in Scotland after the union of the two kingdoms in 1707. Grants of higher conſequence, as remiſſions of crimes, gifts proceeding upon forfeiture, and charters of *novodamus*, muſt have the King's ſign-manual for their warrant.

25. If lands holding of the Crown were to be conveyed, the charter paſſed, before the union of the kingdoms in 1707, by the great ſeal of Scotland; and now by a ſeal ſubſtituted in place thereof. Grants of church-dignities, during epiſcopacy, paſſed alſo by the great ſeal; and the commiſſions to all the principal officers of the Crown, as Juſtice Clerk, King's Advocate, Solicitor, *&c.* do ſo at this day. All rights which ſubjects may tranſmit by ſimple aſſignation, the King tranſmits by the privy ſeal; as gifts of moveables, or of caſualties that require no ſeiſin. The quarter ſeal, otherwiſe called the teſtimonial of the great ſeal, is appended to gifts of tutory, commiſſions of brieves iſſuing from the chancery, and letters of preſentation to lands holding of a ſubject, proceeding upon forfeiture, baſtardy, or *ultimus hæres*.

26. Seals are to royal grants, what ſubſcription is to rights derived from ſubjects, and give them authority: They ſerve alſo as a check to gifts procured (*ſubreptione vel obreptione*) by concealing the truth, or expreſſing a falſehood; for, where this appears, the gift may be ſtopped before paſſing the ſeals, though the ſignature ſhould have been ſigned by the King. All rights paſſing under the great or privy ſeal muſt be regiſtered in the regiſters of the great or privy ſeal *reſpectivé*, before appending the ſeal.

Tit. 13. *Of the Right which the Vaſſal acquires by getting the Feu.*

UNDER the *dominium utile* which the vaſſal acquires by the feudal right, is comprehended the property of whatever is conſidered as part of the lands, whether of houſes, woods, incloſures, *&c.* above ground; or of coal, limeſtone, minerals, *&c.* under ground. Mills have, by the generality of our lawyers, been deemed a ſeparate tenement, and ſo not carried by a charter or diſpoſition, without either a ſpecial clauſe conveying mills, or the erection of the lands into a barony. Yet it is certain, that, if a proprietor builds a mill on his own lands, it will be carried by his entail, or by a retour, without mentioning it, although the lands are not erected into a barony. If the lands diſponed be aſtricted, or thirled to another mill, the purchaſer is not allowed to build a new corn-mill on his property, even though he ſhould offer ſecurity that it ſhall not hurt the thirle; which is introduced for preventing daily temptations to fraud.

2. Proprietors are prohibited to build dove-cotes, unleſs their yearly rent, lying within two miles thereof, extend to ten chalders of victual. A purchaſer of lands, with a dove-cote, is not obliged to pull it down, though he ſhould not be qualified to build one; but, if it becomes ruinous, he cannot rebuild it. The right of brewing, though not expreſſed in the grant, is implied in the nature of property; as are alſo the rights of fiſhing, fowling, and hunting, in ſo far as they are not reſtrained by ſtatute.

3. There are certain rights naturally conſequent on property, which are deemed to be reſerved by the crown as *regalia*: unleſs they be ſpecially conveyed. Gold and ſilver mines are of this ſort: The firſt univerſally; and the other, where three half-pennies of ſilver can be extracted from the pound of lead, by act 1424, (three half-pennies at that time was equal to about two ſhillings five pennies of our preſent Scots money.) Theſe were by our ancient law annexed to the Crown; but they are now diſſolved from it; and every proprietor is intitled to a grant of the mines within his own lands, with the burden of delivering to the crown a tenth of what ſhall be brought up.

4. Salmon-fiſhing is likewiſe a right underſtood to be reſerved by the Crown, if it be not expreſsly granted; but forty years poſſeſſion thereof, where the lands are either erected into a barony, or granted with the general clauſe of fiſhings, eſtabliſh as the full right of the ſalmon fiſhing in the vaſſal. A charter of lands, within which any of the king's foreſts lie, does not carry the property of ſuch foreſt to the vaſſal.

5. All the ſubjects, which were by the Roman law accounted *res publicæ*, as rivers, high ways, ports, &c. are, ſince the introduction of feus, held to be *inter regalia*, or *in patrimonio principis*; and hence incroachment upon a highway is ſaid to infer purpreſture. No perſon has the right of a free port without a ſpecial grant, which implies a power in the grantee to levy anchorage and ſhore-dues, and an obligation upon him to uphold the port in good condition. In this claſs of things, our forefathers reckoned fortalices, or ſmall places of ſtrength, originally built for the defence of the country, either againſt foreign invaſions, or civil commotions; but theſe now paſs with the lands in every charter,

6. The vaſſal acquires right by his grant, not only to the lands ſpecially contained in the charter, but to thoſe that have been poſſeſſed forty years as pertinent thereof. But, 1. If the lands in the grant are marked out by ſpecial limits, the vaſſal is circumſcribed by the tenor of his own right, which excludes every ſubject without theſe limits from being pertinent of the lands. 2. A right poſſeſſed under an expreſs infeftment is preferable, *cæteris paribus*, to one poſſeſſed only as pertinent, 3 Where neither party is infeſt *per expreſſum*, the mutual promiſcuous poſſeſſion by both, of a ſubject as pertinent, reſolves into a commonty of the ſubject poſſeſſed: But if one of the parties has exerciſed all the acts of property of which the ſubject was capable, while the poſſeſſion of the other was confined to paſturage only, or to caſting feal and divot, the firſt is to be deemed ſole proprietor, and the other to have merely a right of ſervitude.

7. As barony is a *nomen univerſitatis*, and unites the ſeveral parts contained in it into one individual right, the general conveyance of a barony carries with it all the different tenements of which it conſiſts, though they ſhould not be ſpecially enumerated, (and this holds, even without erection into a barony, in lands that have been united under a ſpecial name.) Hence likewiſe, the poſſeſſion by the vaſſal of the ſmalleſt part of the barony lands preſerves to him the right of the whole.

8. The vaſſal is intitled, in conſequence of his property, to levy the rents of his own lands, and to recover them from his tenants by an action for rent before his own court; and from all other poſſeſſors and intromitters, by an action of mails and duties before the Sheriff. He can alſo remove from his lands, tenants who have no leaſes, and he can grant tacks or leaſes to others. A tack is a contract of location, whereby the uſe of land or any other immoveable ſubject, is ſet to the leſſee or tackſman for a certain yearly rent, either in money, the fruits of the ground, or ſervices. It ought to be reduced into writing, as it is a right concerning lands; tacks therefore, that are given verbally, to endure for term of years, are good againſt neither party, for more than one year. An obligation to grant a tack is as effectual againſt the granter, as a formal tack. A liferenter, having a temporary property in the fruits, may grant tacks to endure for the term of his own liferent.

9. The tackſman's right is limited to the fruits which ſpring up annually from the ſubject ſet, either naturally, or by the induſtry of the tackſman; he is not therefore intitled to any of the growing timber above ground, and far leſs to the minerals, coal, clay, &c. under ground, the uſe of which conſumes the ſubſtance. Tacks are, like other contracts, perſonal rights in their own nature, and conſequently ineffectual againſt ſingular ſucceſſors in the lands; but, for the encouragement of agriculture, they were, by act 1449, declared effectual to the tackſman for the full time of their endurance, into whoſe hands ſoever the lands might come.

10. To give a written tack the benefit of this ſtatute, it muſt mention the ſpecial tack duty payable to the proprietor, which though ſmall, if it be not eluſory, ſecures the tackſman; and it muſt be followed by poſſeſſion, which ſupplies the want of a ſeiſin. If a tack does not expreſs the term of entry, the entry will commence at the next term after its date, agreeable to the rule, *Quod purè debetur, præſenti die debetur*. If it does not mention the iſh, *i. e* the term at which it is to determine, it is good for one year only; but, if the intention of parties to continue it for more than one year, ſhould appear from any clauſe in the tack, it is ſuſtained for two years as the *minimum*. Tacks granted to perpetuity, or with an indefinite iſh, have not the benefit of the ſtatute. Tacks of houſes within borough do not fall within this act

11. Tacks neceſſarily imply a *delectus perſonæ*, a choice by the ſetter of a proper perſon for his tenant. Hence the conveyance of a tack, which is not granted to aſſignees, is ineffectual without the landlord's conſent. A right of tack, though it be heritable. falls under the *jus mariti*, becauſe it cannot be ſeparated from the labouring cattle and implements of tillage, which are moveable ſubjects. A tack therefore granted to a ſingle woman without the liberty of aſſigning, falls by her marriage. becauſe the marriage, which is a legal conveyance thereof to the huſband, cannot be annulled. This implied excluſion of aſſignees, is however limited to voluntary, and does not extend to neceſſary aſſignments, as an adjudication of a tack by the tackſman's creditor; but a tack, expreſsly excluding aſſignees, cannot be carried even by adjudication. But tackſmen may ſubſet, unleſs ſubtenants are expreſsly excluded; and liferent tacks, becauſe they import a higher degree of right in the tackſman, than tacks for a definite term, may be aſſigned, unleſs aſſignees be ſpecially excluded.

12. If neither the ſetter nor tackſman ſhall properly diſcover their intention to have the tack diſſolved at the term fixed for its expiration, they are underſtood, or preſumed. to have entered into a new tack upon the ſame terms with the former, which is called *tacit relocation*, and continues till the landlord warns the tenant to remove, or the tenant renounces his tack to the landlord: This obtains alſo in the caſe of moveable tenants, who poſſeſs from year to year without written tacks.

13. In tacks of land, the ſetter is commonly bound to

put all the houſes and office houſes, neceſſary for the farm, in good condition at the tenant's entry; and the tenant muſt keep them and leave them ſo at his removal. But in tacks of houſes, the ſetter muſt not only deliver to the tenant the ſubject ſet, in tenantable repair at his entry, but uphold it in that repair during the whole years of the tack.

14. If the inclemency of the weather, inundation, or calamity of war, ſhould have brought upon the crop an extraordinary damage (*plus quam tolerabile*), the landlord had, by the Roman law, no claim for any part of the tack-duty: If the damage was more moderate, he might exact the full rent. It is no where defined, what degree of ſterility or devaſtation makes a loſs not to be borne; but the general rule of the Roman law ſeems to be made ours. Tenants are obliged to pay no public burdens, to which they are not expreſsly bound by their tacks, except mill-ſervices.

15. Tacks may be evacuated during their currency, 1. In the ſame manner as feu-rights, by the tackſman's running in arrear of his tack-duty for two years together. This irritancy may be prevented by the tenant's making payment at the bar before ſentence. 2. Where the tenant either runs in arrear of one year's rent, or leaves his farm uncultivated at the uſual ſeaſon; in which caſe he may be ordained to give ſecurity for the arrears, and for the rent of the five following crops, if the tack ſhall ſubſiſt ſo long; otherwiſe, to remove, as if the tack were at an end. 3. Tacks may be evacuated at any time, by the mutual conſent of parties.

16. The landlord, when he intends to remove a tenant whoſe tack is expiring, or who poſſeſſes without a tack, muſt, upon a precept ſigned by himſelf, warn the tenant forty days preceding the term of Whitſunday, at or immediately preceding the iſh, perſonally, or at his dwelling houſe, to remove at that term, with his family and effects. This precept muſt be alſo executed on the ground of the lands, and thereafter read in the pariſh-church where the lands lie, after the morning ſervice, and affixed to the moſt patent door thereof. Whitſunday, though it be a moveable feaſt, is, in queſtions of removing, fixed to the 15th of May. In warnings from tenements within borough, it is ſufficient that the tenant be warned forty days before the iſh of the tack, whether it be Whitſunday or Martinmas; and in theſe the ceremony of chalking the door is ſuſtained as warning, when proceeding upon a verbal order from the proprietor.

17. This proceſs of warning was preciſely neceſſary for founding an action of removing againſt tenants, till act of ſederunt of the court of Seſſion, *Dec.* 14. 1756, which leaves it in the option of the proprietor, either to uſe the former method, or to bring his action of removing before the Judge ordinary; which, if it be called forty days before the ſaid term of Whitſunday, ſhall be held as equal to a warning. Where the tenant is bound, by an expreſs clauſe of his tack, to remove at the iſh without warning, ſuch obligation is, by the ſaid act, declared to be a ſufficient warrant for letters of horning, upon which, if the landlord charge his tenant forty days before the ſaid Whitſunday, the judge is authoriſed to eject him within ſix days after the term of removing expreſſed in the tack.

18. Actions of removing might, even before this act of ſederunt, have been purſued without any previous warning, 1. Againſt vicious poſſeſſors, *i. e.* perſons who had ſeized the poſſeſſion by force, or who, without any legal title, had intruded into it, after the laſt poſſeſſor had given it up. 2. Againſt poſſeſſors who had a naked tolerance. 3. Againſt tenants who had run in arrear of rent, during the currency of their tacks. 4. Again ſuch as had ſold their lands, and yet continued to poſſeſs after the term of the purchaſer's entry. Upon the ſame ground, warning was not required, in removings againſt poſſeſſors of liferented lands, after the death of the liferenter who died in the natural poſſeſſion: But if he poſſeſſed by tenants, theſe tenants could not be diſturbed in their poſſeſſions till the next Whitſunday, that they might have time to look out for other farms; but they might be compelled to remove at that term, by an action of removing, without warning.

19. A landlord's title in a removing, let it be ever ſo lame, cannot be brought under queſtion by a tenant whoſe tack flows immediately from him; but, if he is to inſiſt againſt tenants not his own, his right muſt be perfected by infeftment, unleſs it be ſuch as requires no infeftment, as terce, *&c.*

20. The defender, in a removing, muſt, before offering any defence which is not inſtantly verified, give ſecurity to pay to the ſetter the violent profits, if they ſhould be awarded againſt him. Theſe are ſo called, becauſe the law conſiders the tenant's poſſeſſion after the warning as violent. They are eſtimated, in tenements within borough, to double the rent; and in lands, to the higheſt profits the purſuer could have made of them, by poſſeſſing them either by a tenant, or by himſelf.

21. If the action of removing ſhall be paſſed from, or if the landlord ſhall, after uſing warning, accept of rent from the tenant, for any term ſubſequent to that of the removal, he is preſumed to have changed his mind, and tacit relocation takes place. All actions of removing againſt the principal or original tackſman, and decrees thereupon, if the order be uſed, which is ſet forth *ſupra*, § 17. are, by the act of ſederunt 1755, declared to be effectual again the aſſignees to the tack, or ſubtenants.

22. The landlord has, in ſecurity of his tack-duty, over and above the tenant's perſonal obligation, a tacit pledge or hypothec, not only in the fruits, but in the cattle paſturing on the ground. The corn, and other fruits, are hypothecated for the rent of that year whereof they are the crop; for which they remain affected, though the landlord ſhould not uſe his right for years together.

23. The whole cattle on the ground, conſidered as a quantity, are hypothecated for a year's rent, one after another ſucceſſively. The landlord may apply this hypothec payment of the paſt year's rent, at any time within three months from the laſt conventional term of payment, after which it ceaſes for that year. As the tenant may increaſe the ſubject of this hypothec, by purchaſing oxen, ſheep, *&c.* ſo he can impair it, by ſelling part of his ſtock; but if the landlord ſuſpects the tenant's management, he may, by ſequeſtration or poinding, make his right, which was before general upon the whole ſtock, ſpecial upon every individual. A ſuperior has alſo a hy-

pothec for his feu-duty, of the ſame kind with that juſt explained.

24. In tacks of houſes, breweries, ſhops, and other tenements, which have no natural fruits, the furniture and other goods brought into the ſubject ſet are hypothecated to the landlord for one year's rent. But the tenant may by ſale impair this hypothec, as he might that of cattle in rural tenements; and indeed, in the particular caſe of a ſhop, the tenant rents it for no other purpoſe, than as a place of ſale.

Tit. 14. *Of the Tranſmiſſion of Rights, by Confirmation and Reſignation.*

A VASSAL may tranſmit his feu either to univerſal ſucceſſors, as heirs; or to ſingular ſucceſſors, *i. e.* thoſe who acquire by gift, purchaſe, or other ſingular title. This laſt ſort of tranſmiſſion is either voluntary, by diſpoſition; or neceſſary, by adjudication.

2. By the firſt feudal rules, no ſuperior could be compelled to receive any vaſſal in the lands, other than the heir expreſſed in the inveſtiture; for the ſuperior alone had the power of aſcertaining to what order of heirs the fee granted by himſelf was to deſcend. But this right of refuſal in the ſuperior did not take place, 1. In the caſe of creditors appriſers or adjudgers, whom ſuperiors were obliged to receive upon payment of a year's rent. 2. In the caſe of purchaſers of bankrupt eſtates, who were put on the ſame footing with adjudgers. The Crown refuſes no voluntary diſponee, on his paying a compoſition to the exchequer of a ſixth part of the valued rent. Now ſuperiors are directed to enter all ſingular ſucceſſors (except incorporations) who ſhall have got from the vaſſal a diſpoſition, containing procuratory of reſignation; they always receiving the fees or caſualties that law entitles them to on a vaſſal's entry, *i. e.* a year's rent.

3. Baſe rights, *i. e.* diſpoſitions to be holden of the diſponer, are tranſmiſſions only of the property, the ſuperiority remaining as formerly. As this kind of right might, before eſtabliſhing the regiſters, have been kept quite concealed from all but the granter and receiver, a public right was preferable to it, unleſs cloathed with poſſeſſion: But as this diſtinction was no longer neceſſary after the eſtabliſhment of the records, all infeftments are declared preferable, according to the dates of their ſeveral regiſtrations; without reſpect to the former diſtinction of baſe and public, or of being cloathed and not cloathed with poſſeſſion.

4. Public rights, *i. e.* diſpoſitions to be holden of the granter's ſuperior, may be perfected either by confirmation or reſignation; and therefore, they generally contain both precept of ſeiſin and procuratory of reſignation. When the receiver is to complete his right in the firſt way, he takes ſeiſin upon the precept; but ſuch ſeiſin is ineffectual without the ſuperior's confirmation; for the diſponee cannot be deemed a vaſſal, till the ſuperior receive him as ſuch, or confirm the holding. By the uſual ſtyle in the tranſmiſſion of lands, the diſpoſition contains an obligation and precept of infeftment, both *a me* and *de me*, in the option of the diſponee; upon which, if ſeiſin is taken indefinitely, it is conſtrued in favour of the diſponee to be a baſe infeftment, becauſe a public right is null without confirmation: But, if the receiver ſhall afterwards obtain the ſuperior's confirmation, it is conſidered as if it had been from the beginning a public right.

5. Where two ſeveral public rights of the ſame ſubject are confirmed by the ſuperior, their preference is governed by the dates of the confirmations, not of the infeftments confirmed; becauſe it is the confirmation which compleats a public right.

6. Though a public right becomes, by the ſuperior's confirmation, valid from its date; yet if any mid impediment intervene betwixt that period and the confirmation, to hinder the two from being conjoined, *e. g.* if the granter of a public right ſhould afterwards grant a baſe right to another, upon which ſeiſin is taken before the ſuperior's confirmation of the firſt, the confirmation will have effect only from its own date; and conſequently the baſe right firſt compleated, will carry the *property* of the lands preferable to the public one.

7. Reſignation is that form of law, by which a vaſſal ſurrenders his feu to his ſuperior; and it is either *ad perpetuam remanentiam*, or *in favorem*. In reſignations *ad remanentiam*, where the feu is reſigned, to the effect that it may remain with the ſuperior, the ſuperior, who before had the ſuperiority, acquires, by the reſignation, the property alſo of the lands reſigned: and as his infeftment in the lands ſtill ſubſiſted, notwithſtanding the right by which he had given his vaſſal the property; therefore, upon the vaſſals reſignation, the ſuperior's right of property revives, and is conſolidated with the ſuperiority, without the neceſſity of a new infeftment; but the inſtrument of reſignation muſt be recorded.

8. Reſignations *in favorem* are made, not with an intention that the property reſigned ſhould remain with the ſuperior, but that it ſhould be again given by him, in favour either of the reſigner himſelf, or of a third party; conſequently the fee remains in the reſigner, till the perſon in whoſe favour reſignation is made gets his right from the ſuperior perfected by ſeiſin. And becauſe reſignations *in favorem*, are but incompleat perſonal deeds, our law has made no proviſion for recording them. Hence, the firſt ſeiſin on a ſecond reſignation is preferable to the laſt ſeiſin upon the firſt reſignation; but the ſuperior, accepting a ſecond reſignation, whereupon a prior ſeiſin may be taken in prejudice of the firſt reſignatory, is liable in damages.

9. By our former deciſions, one who was veſted with a perſonal right of lands, *i. e.* a right not compleated by ſeiſin, effectually diveſted himſelf by diſponing it to another; after which, no right remained in the diſponer, which could be carried by a ſecond diſpoſition, becauſe a perſonal right is no more than a *jus obligationis*, which may be tranſferred by any deed ſufficiently expreſſing the will of the granter. But this doctrine, at the ſame time that it rendered the ſecurity of the records extremely uncertain, was not truly applicable to ſuch rights as required ſeiſin to complete them; and therefore it now obtains, that the granter even of a perſonal right of lands, is not ſo diveſted by conveying the right to one perſon, but that he may effectually make it over afterwards to another;

nother; and the preference between the two does not depend on the dates of the diſpoſitions, but on the priority of the ſeiſins following upon them.

Tit. 15. *Of redeemable Rights.*

AN heritable right is ſaid to be redeemable, when it contains a right of reverſion, or return, in favour of the perſon from whom the right flows. Reverſions are either legal, which ariſe from the law itſelf, as in adjudications, which law declares to be redeemable within a certain term after their date; or conventional, which are conſtituted by the agreement of parties, as in wadſets, rights of annualrent, and rights in ſecurity. A wadſet (from wad or pledge) is a right, by which lands, or other heritable ſubjects, are impignorated by the proprietor to his creditor, in ſecurity of his debt; and, like other heritable rights, is perfected by ſeiſin. The debtor, who grants the wadſet, and has the right of reverſion, is called the reverſer; and the creditor, receiver of the wadſet, is called the wadſetter.

Wadſets, by the preſent practice, are commonly made out in the form of mutual contracts, in which one party ſells the land, and the other grants the right of reverſion. When the right of reverſion is thus incorporated in the body of the wadſet, it is effectual without regiſtration; becauſe the ſingular ſucceſſor in the wadſet is, in that caſe, ſufficiently certified of the reverſion, though it be not regiſtred, by looking into his own right, which bears it *in gremio*. But where the right of reverſion is granted in a ſeparate writing, it is ineffectual againſt the ſingular ſucceſſor of the wadſetter, unleſs it be regiſtred in the regiſter of ſeiſins within 60 days after the date of the ſeiſin upon the wadſet.

3. Rights of reverſion are generally eſteemed *ſtricti juris*; yet they go to heirs, though heirs ſhould not be mentioned, unleſs there be ſome clauſe in the right, diſcovering the intention of parties, that the reverſion ſhould be perſonal to the reverſer himſelf. In like manner, though the right ſhould not expreſs a power to redeem from the wadſetter's heir, as well as from himſelf, redemption will be competent againſt the heir. All our lawyers have affirmed, that reverſions cannot be aſſigned, unleſs they are taken to aſſignees; but from the favour of legal diligence, they may be adjudged.

4. Reverſions commonly leave the reverſer at liberty to redeem the lands *quandocunqe*, without reſtriction in point of time; but a clauſe is adjected to ſome reverſions, that if the debt be not paid againſt a determinate day, the right of reverſion ſhall be irritated, and the lands ſhall become the irredeemable property of the wadſetter. Nevertheleſs, the irritancy being penal, as in wadſets, the ſum lent falls always ſhort of the value of the lands, and the right of redemption is by indulgence continued to the reverſer, even after the term has expired, while the irritancy is not declared. But the reverſer, if he does not take the benefit of this indulgence, within forty years after the lapſe of the term, is cut out of it by preſcription.

5. If the reverſer would redeem his lands, he muſt uſe an order of redemption againſt the wadſetter: the firſt ſtep of which is premonition (or notice given under form of inſtrument) to the wadſetter, to appear at the time and place appointed by the reverſion, then and there to receive payment of his debt, and thereupon to renounce his right of wadſet. In the voluntary redemption of a right of wadſet holden baſe, a renunciation duly regiſtred re-eſtabliſhes the reverſer in the full right of the lands. Where the wadſet was granted to be holden of the granter's ſuperior, the ſuperior muſt receive the reverſer, on payment of a year's rent, if he produce a diſpoſition from the wadſetter, containing procuratory of reſignation. If, at executing the wadſet, the ſuperior has granted letters of regreſs, *i. e.* an obligation again to enter the reverſer upon redemption of the lands, he will be obliged to receive him, without payment of the year's rent. But letters of regreſs will not have this effect againſt ſingular ſucceſſors in the ſuperiority, if they are not regiſtred in the regiſter of reverſions. All wadſets that remain perſonal righis, are extinguiſhed by ſimple diſcharges, though they ſhould not be recorded.

6. If the wadſetter either does not appear at the time and place appointed, or refuſes the redemption-money, the reverſer muſt conſign it under form of inſtrument, in the hands of the perſon thereto appointed in the right of reverſion; or, if no perſon be named, in the hands of the clerk to the bills, a clerk of ſeſſion, or any reſponſal perſon. An inſtrument of conſignation, with the conſignatory's receipt of the money conſigned, compleats the order of redemption, ſtops the farther currency of intereſt againſt the reverſer, and founds him in an action for declaring the order to be formal, and the lands to be redeemed in conſequence of it.

7. After decree of declarator is obtained, by which the lands are declared to return to the debtor, the conſigned money, which comes in place of the lands, becomes the wadſetter's, who therefore can charge the conſignatory upon letters of horning to deliver it up to him; but, becauſe the reverſer may, at any time before decree, paſs from his order, as one may do from any other ſtep of diligence, the conſigned ſums continue to belong to the reverſer, and the wadſetter's intereſt in the wadſet continues heritable till that period.

8. If the wadſetter chuſes to have his money rather than the lands, he muſt require from the reverſer, under form of inſtrument, the ſums due by the wadſet, in terms of the right. The wadſet ſums continue heritable, notwithſtanding requiſition, which may be paſſed from by the wadſetter even after the reverſer has conſigned the redemption money in conſequence thereof.

9. Wadſets are either proper or improper. A proper wadſet is that whereby it is agreed, that the uſe of the land ſhall go for the uſe of the money; ſo that the wadſetter takes his hazard of the rents, and enjoys them without accounting, in ſatisfaction, or *in ſolutum* of his intereſt.

10. In an improper wadſet, the reverſer, if the rent ſhould fall ſhort of the intereſt, is taken bound to make up the deficiency; if it amounts to more, the wadſetter is obliged to impute the excreſcence towards extinction of the capital: And, as ſoon as the whole ſums, principal and intereſt, are extinguiſhed by the wadſetter's poſ-

ſeſſion, he may be compelled to renounce, or diveſt himſelf in favour of the reverſer.

11. If the wadſetter be intitled by his right to enjoy the rents without accounting, and if at the ſame time the reverſer be ſubjected to the hazard of their deficiency, ſuch contract is juſtly declared uſurious; and alſo in all proper wadſets wherein any unreaſonable advantage has been taken of the debtor, the wadſetter muſt, during the not requiſition of the ſum lent, either quit his poſſeſſion to the debtor, upon his giving ſecurity to pay the intereſt, or ſubject himſelf to account for the ſuplus-rents, as in improper wadſets.

12. Infeftments of annualrent, the nature of which has been explained, are alſo redeemable rights. A right of annualrent does not carry the property of the lands, but it creates a real *nexus* or burden upon the property, for payment of the intereſt or annualrent contained in the right; and conſequently, the bygone intereſts due upon it are *debita fundi*. The annualrenter may therefore either inſiſt in a real action for obtaining letters of poinding the ground, or ſue the tenant in a perſonal action towards the payment of his paſt intereſt: And in a competition for thoſe rents, the annualrenter's preference will not depend on his having uſed a poinding of the ground, for his right was compleated by the ſeiſin; and the power of poinding the ground, ariſing from that antecedent right, is *meræ facultatis*, and need not be exerciſed, if payment can be otherwiſe got. As it is only the intereſt of the ſum lent which is a burden upon the lands, the annualrenter, if he wants his principal ſum, cannot recover it either by poinding or by a perſonal action againſt the debtor's tenants, but muſt demand it from the debtor himſelf, on his perſonal obligation in the bond, either by requiſition, or by a charge upon letters of horning, according as the right is drawn.

13. Rights of annualrent, being ſervitudes upon the property, and conſequently conſiſtent with the right of property in the debtor, may be extinguiſhed without reſignation.

14. Infeftments in ſecurity are another kind of redeemable rights (now frequently uſed in place of rights of annualrent), by which the receivers are infeft in the lands themſelves, and not ſimply in an annualrent forth of them, for ſecurity of the principal ſums, intereſt, and penalty, contained in the rights. If an infeftment in ſecurity be granted to a creditor, he may thereupon enter into the immediate poſſeſſion of the lands or annualrent for his payment. They are extinguiſhed as rights of annualrent.

15. All rights of annualrent, rights in ſecurity, and generally whatever conſtitutes a real burden on the fee, may be the ground of an adjudication, which is preferable to all adjudications, or other diligences, intervening between the date of the right and of the adjudication deduced on it; not only for the principal ſum contained in the right, but alſo for the whole paſt intereſt contained in the adjudication. This preference ariſes from the nature of real debts, or *debita fundi*; but in order to obtain it for the intereſt of the intereſt accumulated in the adjudication, ſuch adjudication muſt proceed on a proceſs of poinding the ground.

Tit. 16. *Of Servitudes.*

SERVITUDE is a burden affecting lands, or other heritable ſubjects, whereby the proprietor is either reſtrained from the full uſe of what is his own, or is obliged to ſuffer another to do ſomething upon it. Servitudes are either natural, legal, or conventional. Nature itſelf may be ſaid to conſtitute a ſervitude upon inferior tenements, whereby they muſt receive the water that falls from thoſe that ſtand on higher ground. Legal ſervitudes are eſtabliſhed by ſtatute or cuſtom, from conſiderations of public policy; among which may be numbered the reſtraints laid upon the proprietors of tenements within the city of Edinburgh. There is as great a variety of conventional ſervitudes, as there are ways by which the exerciſe of property may be reſtrained by paction in favour of another.

2. Conventional ſervitudes are conſtituted, either by grant, where the will of the party burdened is expreſſed in writing, or by preſcription, where his conſent is preſumed from his acquieſcence in the burden for 40 years. A ſervitude conſtituted by writing, or grant, is not effectual againſt the granter's ſingular ſucceſſors, unleſs the grantee has been in the uſe or exerciſe of his right: But they are valid againſt the granter and his heirs, even without uſe. In ſervitudes that may be acquired by preſcription, forty years exerciſe of the right is ſufficient, without any title in writing, other than a charter and ſeiſin of the lands, to which the ſervitude is claimed to be due.

3. Servitudes conſtituted by grant are not effectual, in a queſtion with the ſuperior of the tenement burdened with the ſervitude, unleſs his conſent be adhibited; for a ſuperior cannot be hurt by his vaſſal's deed: But, where the ſervitude is acquired by preſcription, the conſent of the ſuperior, whoſe right afforded him a good title to interrupt, is implied. A ſervitude by grant, though followed only by a partial poſſeſſion, muſt be governed, as to its extent, by the tenor of the grant; but a ſervitude by preſcription is limited by the meaſure or degree of the uſe had by him who preſcribes; agreeably to the maxim, *tantum præſcriptum quantum poſſeſſum.*

4. Servitudes are either predial or perſonal. Predial ſervitudes are burdens impoſed upon one tenement, in favour of another tenement. That to which the ſervitude is due is called the dominant, and that which owes it is called the ſervient tenement. No perſon can have right to a predial ſervitude, if he is not proprietor of ſome dominant tenement that may have benefit by it; for that right is annexed to a tenement, and ſo cannot paſs from one perſon to another, unleſs ſome tenement goes along with it.

5. Predial ſervitudes are divided into rural ſervitudes, or of lands; and urban ſervitudes, or of houſes. The rural ſervitudes of the Romans were *iter*, *actus*, *via*, *aquæductus*, *aquæhauſtus*, and *jus paſcendi pecoris*. Similar ſervitudes may be conſtituted with us, of a foot-road, horſe-road, cart-road, dams, and aqueducts, watering of cattle, and paſturage. The right of a highway is not a ſervitude conſtituted in favour of a particular tenement, but is a right common to all travellers. The care

of high-ways, bridges, and ferries, is committed to the ſheriffs, juſtices of peace, and commiſſioners of ſupply in each ſhire.

6. Common paſturage, or the right of feeding one's cattle upon the property of another, is ſometimes conſtituted by a general clauſe of paſturage in a charter or diſpoſition, without mentioning the lands burdened; in which caſe, the right comprehends whatever had been formerly appropriated to the lands diſponed out of the granter's own property, and likewiſe all paſturage due to them out of other lands. When a right of paſturage is given to ſeveral neighbouring proprietors, on a moor or common belonging to the granter, indefinite as to the number of cattle to be paſtured, the extent of their ſeveral rights is to be proportioned according to the number that each of them can fodder in winter upon his own dominant tenement.

7. The chief ſervitudes of houſes among the Romans were thoſe of ſupport, *viz. tigni immittendi*, and *oneris ferendi*. The firſt was the right of fixing in our neighbour's wall a joiſt or beam from our houſe: The ſecond was that of reſting the weight of one's houſe upon his neighbour's wall.

8. With us, where different floors or ſtories of the ſame houſe belong to different perſons, as is frequent in the city of Edinburgh, the property of the houſe cannot be ſaid to be entirely divided; the roof remains a common roof to the whole, and the area on which the houſe ſtands ſupports the whole; ſo that there is a communication of property, in conſequence of which the proprietor of the ground floor muſt, without the conſtitution of any ſervitude, uphold it for the ſupport of the upper, and the owner of the higheſt ſtory muſt uphold that as a cover to the lower. Where the higheſt floor is divided into garrets among the ſeveral proprietors, each proprietor is obliged, according to this rule, to uphold that part of the roof which covers his own garret.

9. No proprietor can build, ſo as to throw the rain-water falling from his own houſe, immediately upon his neighbour's ground, without a ſpecial ſervitude, which is called of *ſtillicide*; but, if it falls within his own property, though at the ſmalleſt diſtance from the march, the owner of the inferior tenement muſt receive it.

10. The ſervitudes *altius non tollendi, et non officiendi luminibus vel proſpectui*, reſtrain proprietors from raiſing their houſes beyond a certain height, or from making any building whatſoever that may hurt the light or proſpect of the dominant tenement. Theſe ſervitudes cannot be conſtituted by preſcription alone; for, though a proprietor ſhould have built his houſe ever ſo low, or ſhould not have built at all upon his grounds for forty years together, he is preſumed to have done ſo for his own conveniency or profit; and therefore cannot be barred from afterwards building a houſe on his property, or raiſing it to what height he pleaſes, unleſs he be tied down by his own conſent.

11. We have two predial ſervitudes to which the Romans were ſtrangers, *viz.* that of fewel or feal and divot, and of thirlage. The firſt is a right, by which the owner of the dominant tenement may turn up peats, turfs, feals, or divots, from the ground of the ſervient, and carry them off either for fewel, or thatch, or the other uſes of his own tenement.

12. **Thirlage** is that ſervitude, by which lands are aſtricted, or thirled, to a particular mill, and the poſſeſſors bound to grind their grain there, for payment of certain multures and ſequels, as the agreed price of grinding. In this ſervitude, the mill is the dominant tenement, and the lands aſtricted (which are called alſo the thirle or ſucken) the ſervient. Multure is the quantity of grain or meal payable to the proprietor of the mill, or to the multurer his tackſman. The ſequels are the ſmall quantities given to the ſervants, under the name of knaveſhip, bannock, and lock or gowpen. The quantities paid to the mill by the lands not aſtricted, are generally proportioned to the value of the labour, and are called out-town or out-ſucken multures; but thoſe paid by the thirle are ordinarily higher, and are called in-town or in-ſucken multures.

13. Thirlage may be conſtituted by a land-holder, when, in the diſpoſition of certain lands, he aſtricts them to his own mill; or when, in the diſpoſition of a mill, he aſtricts his own lands to the mill diſponed, or when, in letting his lands, he makes it a condition in the tacks. The grant of a mill with the general clauſe of multures, without ſpecifying the lands aſtricted, conveys the thirlage of all the lands formerly aſtricted to that mill, whether they were the property of the granter, or of a third party.

14. A leſs formal conſtitution ſerves to aſtrict barony-lands to the mill of the barony, than is neceſſary in any other thirlage; which perhaps proceeds from the effects of the union between the two. Hence, if a baron makes over the mill of a barony, *cum multuris*, or *cum aſtrictis multuris*, it infers an aſtriction of the barony lands to the mill conveyed, even of ſuch as had been before ſold to another for a certain duty *pro omni alio onere*. But if, prior to the baron's conveyance of his mill *cum multuris*, he had ſold any part of the barony-lands to another *cum multuris*, the firſt purchaſer's lands are not aſtricted by the poſterior grant; for a right of lands with the multures, implies a freedom of theſe lands from thirlage.

15. Thirlage is either, 1. Of grindable corns; or, 2. Of all growing corns; or, 3. Of the *invecta et illata*, *i. e.* of all the grain brought within the thirle, though of another growth. Where the thirlage is of grindable grain, it is in practice reſtricted to the corns which the tenants have occaſion to grind, either for the ſupport of their families, or for other uſes; the ſurplus may be carried out of the thirle unmanufactured, without being liable in multure. Where it is of the *grana creſcentia*, the whole grain growing upon the thirle is aſtricted, with the exceptions, 1. Of ſeed and horſe-corn, which are deſtined to uſes inconſiſtent with grinding; and, 2. Of the farm-duties due to the landlord, if they are deliverable in grain not grinded. But, if the rent be payable in meal, flour, or malt, the grain of which theſe are made muſt be manufactured in the dominant mill.

16. The thirlage of *invecta et illata* is ſeldom conſtituted but againſt the inhabitants of a borough or village, that they ſhall grind all the unmanufactured grain they import thither at the dominant mill. Multure, therefore, cannot be exacted in a thirlage of *invecta et illata*, for

flour or oat-meal brought into the ſervient tenement, unleſs the importer had brought it in grain, and grinded it at another mill. The ſame grain that owes multure, as *granum creſcens*, to the mill in whoſe thirle it grew, if it ſhall be afterwards brought within a borough where the *invecta et illata* are thirled, muſt pay a ſecond multure to the proprietor of that dominant tenement; but, where the right of theſe two thirlages is in the ſame proprietor, he cannot exact both. Where lands are thirled of general terms, without expreſſing the particular nature in the ſervitude, the lighteſt thirlage is preſumed, from the favour of liberty; but in the aſtriction of a borough or village, where there is no growing grain which can be the ſubject of thirlage, the aſtriction of *invecta et illata* muſt be neceſſarily underſtood.

17. Thirlage, in the general caſe, cannot be eſtabliſhed by preſcription alone, for *iis quæ ſunt meræ facultatis non præſcribitur;* but where one has paid for forty years together the heavy inſucken multures, the ſlighteſt title in writing will ſubject his lands. Thirlage may be, contrary to the common rule, conſtituted by preſcription alone, 1. Where one pays to a mill a certain ſum, or quantity of grain yearly, in name of multure, whether he grinds at it or not (called dry multure.) 2. In mills of the King's property; which is conſtituted *jure coronæ*, without titles in writing; and, where he derives right from another, his titles are more liable to be loſt. This is extended in practice to mills belonging to church-lands, where thirty years poſſeſſion is deemed equivalent to a title in writing, from a preſumption that their rights were deſtroyed at the reformation. Though thirlage itſelf cannot be conſtituted by mere poſſeſſion, the proportion of multure payable to the dominant tenement may be ſo fixed.

18. The poſſeſſors of the lands aſtricted, are bound to uphold the mill, repair the dam-dykes and aqueducts, and bring home the millſtones. Theſe ſervices, though not expreſſed in the conſtitution, are implied.

19. Servitudes, being reſtraints upon property, are *ſtricti juris:* They are not therefore preſumed, if the acts upon which they are claimed can be explained conſiſtently with freedom; and, when ſervitudes are conſtituted, they ought to be uſed in the way leaſt burdenſome to the ſervient tenement. Hence, one who has a ſervitude of peats upon his neighbour's moſs, is not at liberty to extend it for the uſe of any manufacture which may require an extraordinary expence of fewel; but muſt confine it to the natural uſes of the dominant tenement.

20. Servitudes are extinguiſhed, 1. *Confuſione*, when the ſame perſon comes to be proprietor of the dominant and ſervient tenements; for *res ſua nemini ſervit*, and the uſe the proprietor thereafter makes of the ſervient tenement is not *jure ſervitutis*, but is an act of property. 2. By the periſhing, either of the dominant or ſervient tenement. 3. Servitudes are loſt *non utendo*, by the dominant tenement neglecting to uſe the right for forty years; which is conſidered as a dereliction of it, though he, who has the ſervient tenement, ſhould have made no interruption, by doing acts contrary to the ſervitude.

21. Perſonal ſervitudes are thoſe by which the property of a ſubject is burdened, in favour, not of a tenement, but of a perſon. The only perſonal ſervitude known in our law, is uſufruct or liferent; which is a right to uſe and enjoy a thing during life, the ſubſtance of it being preſerved. A liferent cannot therefore be conſtituted upon things which periſh in the uſe; and though it may upon ſubjects which gradually wear out by time, as houſehold-furniture, *&c.* yet, with us, it is generally applied to heritable ſubjects. He, whoſe property is burdened, is uſually called the fiar.

22. Liferents are divided into conventional and legal. Conventional liferents are either ſimple, or by reſervation. A ſimple liferent, or by a ſeparate conſtitution, is that which is granted by the proprietor in favour of another: And this ſort, contrary to the nature of predial ſervitudes, requires ſeiſin in order to affect ſingular ſucceſſors; for a liferent of lands is, in ſtrict ſpeech, not a ſervitude, but a right reſembling property, which conſtitutes the liferenter vaſſal for life; and ſingular ſucceſſors have no way of diſcovering a liferent-right, which perhaps is not yet commenced, but by the records; whereas, in predial ſervitudes, the conſtant uſe of the dominant tenement makes them public. The proper right of liferent is intranſmiſſible, *oſſibus uſufructuarii inhæret:* When the profits of the liferented ſubject are tranſmitted to another, the right becomes merely perſonal, for it intitles the aſſignee to the rent, not during his own life, but his cedent's, and is therefore carried by ſimple aſſignation, without ſeiſin.

23. A liferent by reſervation, is that which a proprietor reſerves to himſelf in the ſame writing by which he conveys the fee to another. It requires no ſeiſin; for the granter's former ſeiſin, which virtually included the liferent, ſtill ſubſiſts as to the liferent which is expreſsly reſerved. In conjunct infeſtments taken to huſband and wife, the wife's right of conjunct fee reſolves, in the general caſe, into a liferent.

24. Liferents by law, are the terce and the courteſy. The terce (*tertia*) is a liferent competent by law to widows, who have not accepted of ſpecial proviſions, in the third of the heritable ſubjects, in which their huſbands died infeſt; and takes place only where the marriage has ſubſiſted for year and day, or where a child has been born alive of it.

25. The terce is not limited to lands, but extends to teinds, and to ſervitudes and other burdens affecting lands; thus, the widow is intitled, in the right of her terce, to a liferent of the third of the ſums ſecured, either by rights of annualrent, or by rights in ſecurity. In improper wadſets, the terce is a third of the ſum lent: In thoſe that are proper, it is a third of the wadſet-lands; or in caſe of redemption, a third of the redemption money. Neither rights of reverſion, ſuperiority, nor patronage, fall under the terce; for none of theſe have fixed profits, and ſo are not proper ſubjects for the widow's ſubſiſtence; nor tacks, becauſe they are not feudal rights. Burgage-tenements are alſo excluded from it, the reaſon of which is not ſo obvious. Since the huſband's ſeiſin is both the meaſure and ſecurity of the terce, ſuch debts or diligences alone, as exclude the huſband's ſeiſin, can prevail over it.

26. Where a terce is due out of lands burdened with

a prior terce ſtill ſubſiſting, the ſecond tercer has only right to a third of the two thirds that remain unaffected by the firſt terce. But upon the death of the firſt widow, whereby the lands are diſburdened of her terce, the leſſer terce becomes enlarged, as if the firſt had never exiſted. A widow, who has accepted of a ſpecial proviſion from her huſband, is thereby excluded from the terce, unleſs ſuch proviſion ſhall contain a clauſe that ſhe ſhall have right to both.

27. The widow has no title of poſſeſſion, and ſo cannot receive the rents in virtue of her terce, till ſhe be ſerved to it; and in order to this, ſhe muſt obtain a brief out of the chancery, directed to the Sheriff, who calls an inqueſt, to take proof that ſhe was wife to the deceaſed; and that the deceaſed died infeſt in the ſubjects contained in the brief. The ſervice or ſentence of the jury, finding theſe points proved, does, without the neceſſity of a retour to the chancery, intitle the wife to enter into the poſſeſſion; but ſhe can only poſſeſs with the heir *pro indiviſo*, and ſo cannot remove tenants, till the ſheriff kens her to her terce, or divides the lands between her and the heir. In this diviſion, after determining by lot or kavil, whether to begin by the ſun or the ſhade, *i. e.* by the eaſt or the weſt, the ſheriff ſets off the two firſt acres for the heir, and the third for the widow. Sometimes the diviſion is executed, by giving one entire farm to the widow, and two of equal value to the heir. The widow's right is not properly conſtituted by this ſervice; it was conſtituted before, by the huſband's ſeiſin, and fixed by his death; the ſervice only declares it, and ſo intitles her to the third part of the rents *retro* to her huſband's death, preferable to any rights that may have affected the lands in the intermediate period between that and her own ſervice. The relict, if ſhe was reputed to be lawful wife to the deceaſed, muſt be ſerved, notwithſtanding any objections by the heir againſt the marriage, which may be afterwards tried by the commiſſary.

28. Courteſy is a liferent given by law, to the ſurviving huſband, of all his wife's heritage in which ſhe died infeſt, if there was a child of the marriage born alive. A marriage, though of the longeſt continuance, gives no right to the courteſy, if there was no iſſue of it. The child born of the marriage muſt be the mother's heir: If ſhe had a child of a former marriage, who is to ſucceed to her eſtate, the huſband has no right to the courteſy while ſuch child is alive; ſo that the courteſy is due to the huſband, rather as father to an heir, than as huſband to an heireſs. Heritage is here oppoſed to conqueſt, and ſo is to be underſtood only of the heritable rights to which the wife ſucceeded as heir to her anceſtors, excluding what ſhe herſelf had acquired by ſingular titles.

29. Becauſe the huſband enjoys the liferent of his wife's whole heritage, on a lucrative title, he is conſidered as her temporary repreſentative, and ſo is liable in payment of all the yearly burdens chargeable on the ſubject, and of the current intereſt of all her debts, real and perſonal, to the value of the yearly rent he enjoys by the courteſy. The courteſy needs no ſolemnity to its conſtitution: That right which the huſband had to the rents of his wife's eſtate, during the marriage, *jure mariti*, is continued with him after her death, under the name of courteſy, by an act of the law itſelf. As in the terce, the huſband's ſeiſin is the ground and meaſure of the wife's right; ſo in the courteſy, the wife's ſeiſin is the foundation of the huſband's; and the two rights are, in all other reſpects, of the ſame nature; if it is not that the courteſy extends to burgage holdings, and to ſuperiorities.

30. All liferenters muſt uſe their right *ſalva rei ſubſtantia*: Whatever therefore is part of the fee itſelf, cannot be encroached on by the liferenter, *e g.* woods or growing timber, even for the neceſſary uſes of the liferented tenement. But, where a coppice or *ſilva cædua* has been divided into hags, one of which was in uſe to be cut annually by the proprietor, the liferenter may continue the former yearly cuttings; becauſe theſe are conſidered as the annual fruits the ſubject was intended to yield, and ſo the proper ſubject of a liferent.

31. Liferenters are bound to keep the ſubject liferented in proper repair. They are alſo burdened with the alimony of the heir, where he has not enough for maintaining himſelf. The bare right of apparency founds the action againſt the liferenter. It is a burden perſonal to the liferenter himſelf, and cannot be thrown upon his adjudging creditors, as coming in his place by their diligences. Liferenters are alſo ſubjected to the payment of the yearly ceſſes, ſtipends, *&c.* falling due during their right, and to all other burdens that attend the ſubject liferented.

32. Liferent is extinguiſhed by the liferenter's death. That part of the rents which the liferenter had a proper right to, before his death, falls to his executors; the reſt, as never having been *in bonis* of the deceaſed, goes to the fiar. Martinmas and Whitſunday are, by our cuſtom, the legal terms of the payment of rent: Conſequently, if a liferenter of lands ſurvives the term of Whitſunday, his executors are intitled to the half of that year's rent, becauſe it was due the term before his death; and if he ſurvives the Martinmas, they have right to the whole. If the liferenter, being in the natural poſſeſſion, and having firſt ſowed the ground, ſhould die, even before the Whitſunday, his executors are intitled to the whole crop, in reſpect that both ſeed and induſtry were his. In a liferent of money conſtituted by a moveable bond, the executors have a right to the intereſt, down to the very day of the liferenter's death, where no terms are mentioned for the payment thereof; but in the caſe of an heritable bond, or of a money liferent ſecured on land, the intereſts of liferenter and fiar (or of heir and executor, for the ſame rules ſerve to fix the intereſts of both) are both governed by the legal terms of land-rent, without regard to the conventional.

Tit. 17. *Of Teinds.*

1. Teinds, or tithes, are that liquid proportion of our rents or goods, which is due to churchmen, for performing divine ſervice, or exerciſing the other ſpiritual functions proper to their ſeveral offices. Moſt of the canoniſts affirm, that the preciſe proportion of a tenth, not only of the fruits of the ground, but of what is acquired by perſonal induſtry, is due to the Chriſtian clergy, of divine right, which they therefore call the proper pa-

trimony of the church; though it is certain that tithes, in their infancy, were given, not to the clergy alone, but to lay-monks who were called *pauperes*, and to other indigent perſons. Charles the Great was the firſt ſecular Prince who acknowledged this right in the church. It appears to have been received with us, as far back as David I.

2. The perſon employed by a cathedral church or monaſtery to ſerve the cure in any church annexed, was called a vicar, becauſe he held the church, not in his own right, but in the right or *vice* of his employers; and ſo was removeable at pleaſure, and had no ſhare of the benefice, other than what they thought fit to allow him: But, in the courſe of time, the appellation of vicar was limited to thoſe who were made perpetual, and who got a ſtated ſhare of the benefice for their incumbency; from whence aroſe the diſtinction of benefices into parſonages and vicarages.

3. Parſonage-teinds are the teinds of corn; and they are ſo called becauſe they are due to the parſon or other titular of the benefice. Vicarage-teinds are the ſmall teinds of calves, lint, hemp, eggs, *&c.* which were commonly given by the titular to the vicar who ſerved the cure in his place. The firſt ſort was univerſally due, unleſs in the caſe of their infeudation to laics, or of a pontifical exemption; but, by the cuſtoms of almoſt all Chriſtendom, the leſſer teinds were not demanded where they had not been in uſe to be paid. By the practice of Scotland, the teinds of animals; or of things produced from animals, as lamb[illegible]ool, calves, are due though not accuſtomed to be paid; but roots, herbs, *&c.* are not tithable, unleſs uſe of payment be proved: neither are perſonal teinds, *i. e.* the tenth of what one acquires by his own induſtry, acknowledged by our law; yet they have been found due, when ſupported by 40 years poſſeſſion.

4. The parſon who was entitled to the teind of corns, made his right effectual either by accepting of a certain number of teind-bolls yearly from the proprietor, in ſatisfaction of it; or more frequently, by drawing or ſeparating upon the field his own tenth part of the corns, after they were reaped, from the ſtock or the remaining nine tenths of the crop, and carrying it off to his own granaries; which is called drawn teind.

5. After the reformation, James VI. conſidered himſelf as proprietor of all the church-lands; partly becauſe the purpoſes for which they had been granted were declared ſuperſtitious; and partly, in conſequence of the reſignations which he, and Q. Mary his mother, had procured from the beneficiaries: and even as to the teinds, tho' our reformed clergy alſo claimed them as the patrimony of the church, our ſovereign did not ſubmit to that doctrine farther than extended to a competent proviſion for miniſters. He therefore erected or ſecularised ſeveral abbacies and priories into temporal lordſhips; the grantees of which were called ſometimes lords of erection, and ſometimes titulars, as having by their grants the ſame title to the erected benefices, that the monaſteries had formerly.

6. As the Crown's revenue ſuffered greatly by theſe erections, the temporality of all church benefices (*i. e.* church lands) was, by 1587, *c.* 29. annexed to the crown. That ſtatute excepts from the annexation ſuch benefices as were eſtabliſhed before the reformation in laymen, whoſe rights the legiſlature had no intention to weaken. Notwithſtanding this ſtatute, his Majeſty continued to make farther erections, which were declared null by 1592, *c.* 119. with an exception of ſuch as had been made in favour of lords of parliament, ſince the general act of annexation in 1587.

7. K. Charles I. ſoon after his ſucceſſion, raiſed a reduction of all theſe erections, whether ganted before or after the act of annexation, upon the grounds mentioned at length by Mr Forbes in his treatiſe of tithes, p. 159. At laſt the whole matter was referred to the King himſelf by four ſeveral ſubmiſſions or compromiſes, in which the parties on one ſide were the titulars and their tackſmen, the biſhops with the inferior clergy, and the royal boroughs, for the intereſt they had in the teinds that were gifted for the proviſion of miniſters, ſchools, or hoſpitals within their boroughs; and, on the other part, the proprietors who wanted to have the leading of their own teinds. The ſubmiſſion by the titulars contained a ſurrender into his Majeſty's hands of the ſuperiorities of their ſeveral erections.

8. Upon each of theſe ſubmiſſions his Majeſty pronounced ſeparate decrees arbitral, dated Sept. 2. 1629, which are ſubjoined to the acts of parliament of his reign. He made it lawful to proprietors to ſue the titulars for a valuation, and if they thought fit for a ſale alſo, of their teinds, before the commiſſioners named or to be named for that purpoſe. The rate of teind, when it was poſſeſſed by the proprietor jointly with the ſtock, for payment of a certain duty to the titular, and ſo did not admit a ſeparate valuation, was fixed at a fifth part of the conſtant yearly rent, which was accounted a reaſonable *ſurrogatum*, in place of a tenth of the increaſe. Where it was drawn by the titular, and conſequently might be valued ſeparately from the ſtock, it was to be valued as its extent ſhould be aſcertained upon a proof before the commiſſioners; but in this laſt valuation, the King directed the fifth part to be deducted from the proved teind, in favour of the proprietor, which was therefore called the King's eaſe. The proprietor ſuing for a valuation gets the leading of his own teinds as ſoon as his ſuit commences; providing he does not allow proteſtation to be extracted againſt him for not inſiſting.

9. Where the proprietor inſiſted alſo for a ſale of his teinds, the titular was obliged to ſell them at nine years purchaſe of the valued teind-duty. If the purſuer had a tack of his own teinds, not yet expired; or if the defender was only tackſmen of the teinds, and ſo could not give the purſuer an heritable right; an abatement of the price was to be granted accordingly by the commiſſioners.

10. There is no proviſion in the decrees-arbitral, for ſelling the teinds granted for the ſuſtentation of miniſters, univerſities, ſchools or hoſpitals; becauſe theſe were to continue, as a perpetual fund, for the maintenance of the perſons or ſocieties to whom they were appropriated; and they are expreſsly declared not ſubject to ſale, by 1690. *c.* 30.—1693, *c.* 23. By the laſt of theſe acts, it is alſo pro-

vided, that the teinds belonging to biſhops, which had then fallen to the crown, upon the aboliſhing of epiſcopacy, ſhould not be ſubject to ſale as long as they remained with the Crown not diſpoſed of; nor thoſe which the the proprietor, who had right both to ſtock and teind, reſerved to himſelf, in a ſale or feu of the lands. But, though none of theſe teinds can be ſold, they may be valued.

11. The King, by the decrees arbitral, declared his own right to the ſuperiorities of erection which had been reſigned to him by the ſubmiſſion, reſerving to the titulars the feu-duties thereof, until payment by himſelf to them of one thouſand merks Scots for every chalder of feu victual, and for each hundred merks of feu-duty, which right of redeeming the feu-duties was afterwards renounced by the Crown. If the church-vaſſal ſhould conſent to hold his lands of the titular, he cannot thereafter recur to the Ccrown as his immediate ſuperior.

12. In explaining what the conſtant rent is, by which the teind muſt be valued, the following rules are obſerved. The rent drawn by the proprietor, from the ſale of ſubjects, that are more properly parts of the land than of the fruits, *e. g.* quarries, minerals, moſſes, *&c.* is to be deducted from the rental of the lands; and alſo the rent of ſupernumerary houſes, over and above what is neceſſary for agriculture; and the additional rent that may be paid by the tenant, in conſideration of the proprietor's undertaking any burden that law impoſes on the tenant, *e. g.* upholding the tenant's houſes, becauſe none of theſe articles are paid properly on account of the fruits. Orchards muſt alſo be deducted, and mill-rent, becauſe the profits of a mill ariſe from induſtry; and the corns manufactured there ſuffer a valuation, as rent payable by the tenant; and therefore ought not to be valued a ſecond time againſt the titular as mill-rent. The yearly expence of culture ought not to be deducted; for no rent can be proudced without it: But, if an improvement of rent is made at an uncommon expence, *e. g.* by draining a lake, the proprietor is allowed a reaſonable abatement on that account.

13. Notwithſtanding the ſeveral ways of miſapplying parochial teinds in the times of popery, ſome few benefices remained entire in the hands of the parſons. The miniſters planted in theſe, after the reformation, continued to have the full right to them, as proper beneficiaries; but a power was afterwards granted to the patron, to redeem the whole teind from ſuch beneficiaries, upon their getting a competent ſtipend modified to them; which teind ſo redeemed, the patron is obliged to ſell to the proprietor, at ſix years purchaſe.

14. Some teinds are more directly ſubject to an allocation for the miniſter's ſtipend, than others. The teinds, in the hands of the lay titular, fall firſt to be allocated, who, ſince he is not capable to ſerve the cure in his own perſon, ought to provide one who can; and if the titular, in place of drawing the teind, has ſet it in tack, the tack-duty is allocated: This ſort is called free teind. Where the tack-duty, which is the titular's intereſt in the teinds, falls ſhort, the tack itſelf is burdened, or, in other words, the ſurplus teind over and above the tack-duty: But, in this caſe, the commiſſioners are empowered to recompenſe the tackſman, by prorogating his tack for ſuch a number of years as they ſhall judge equitable. Where this likewiſe proves deficient, the allocation falls on the teinds, heritably conveyed by the titular, unleſs he has warranted his grant againſt future augmentations; in which caſe, the teinds of the lands belonging in property to the titular himſelf muſt be allocated in the firſt place.

15. Where there is ſufficiency of free teinds in a pariſh, the titular may allocate any of them he ſhall think fit for the miniſter's ſtipend, ſince they are all his own; unleſs there has been a previous decree of locality: And this holds, though the ſtipend ſhould have been paid immemorially out of the teinds of certain particular lands. This right was frequently abuſed by titulars, who, as ſoon as a proprietor had brought an action of ſale of his teinds, allocated the purſuer's full teind for the ſtipend, whereby ſuch action became ineffectual: It was therefore provided, that after citation in a ſale of teinds it ſhall not be in the titular's power to allocate the purſuer's teinds ſolely, but only in proportion with the other teinds in the pariſh.

16. Miniſters glebes are declared free from the payment of teind. Lands *cum decimis incluſis* are alſo exempted from teind. But in order to exempt lands from payment of teind, it is neceſſary that the proprietor prove his right thereto, *cum decimis incluſis*, as far back as the above act of annexation 1587.

17. Teinds are *debita fructuum*, not *fundi*. The action therefore for bygone teinds is only perſonal, againſt thoſe who have intermeddled; unleſs where the titular is infeft in the lands, in ſecurity of the valued teind-duty. Where a tenant is, by his tack, bound to pay a joint duty to his landlord for ſtock and teind, without diſtinguiſhing the rent of each, his defence of a *bona fide* payment of the whole to the landlord has been ſuſtained in a ſuit at the inſtance of a laic titular, but repelled where a churchman was purſuer. In both caſes the proprietor who receives ſuch rent is liable as intermeddler.

18. In tacks of teinds, as of lands, there is place for tacit relocation; to ſtop the effect of which, the titular muſt obtain and execute an inhibition of teinds againſt the tackſman, which differs much from inhibition of lands (explained under the next title), and is intended merely to interpel or inhibit the tackſman from farther intermeddling. This diligence of inhibition may alſo be uſed at the ſuit of the titular, againſt any other poſſeſſor of the teinds; and if the tackſman or poſſeſſor ſhall intermeddle after the inhibition is executed, he is liable in a ſpuilzie.

19. Lands and teinds paſs by different titles: A diſpoſition of lands therefore, though granted by one who has alſo right to the teind, will not carry the teind, unleſs it ſhall appear from ſpecial circumſtances that a ſale of both was deſigned by the parties. In lands *cum decimis incluſis*, where the teinds are conſolidated with the ſtock, the right of both muſt neceſſarily go together in all caſes.

Tit. 18. *Of Inhibitions.*

The conſtitution and tranſmiſſion of feudal rights being explained, and the burdens with which they are chargeable, it remains to be conſidered, how theſe rights may be affected at the ſuit of creditors, by legal diligence. Diligences are certain forms of law, whereby a creditor endeavours to make good his payment, either by affecting the perſon of his debtor, or by ſecuring the ſubjects belonging to him from alienation, or by carrying the property of theſe ſubjects to himſelf. They are either real or perſonal. Real diligence is that which is proper to heritable or real rights; perſonal, is that by which the perſon of the debtor may be ſecured, or his perſonal eſtate affected. Of the firſt ſort we have two, *viz.* Inhibition and Adjudication.

2. Inhibition is a perſonal prohibition, which paſſes by letters under the ſignet, prohibiting the party inhibited to contract any debt, or do any deed, by which any part of his lands may be aliened or carried off, in prejudice of the creditor inhibiting. It muſt be executed againſt the debtor, perſonally, or at his dwelling houſe, as ſummonſes, and thereafter publiſhed and regiſtred in the ſame manner with interdictions, (ſee Tit. vii. 30.)

3. Inhibition may proceed, either upon a liquid obligation, or even on an action commenced by a creditor for making good a claim not yet ſuſtained by the judge; which laſt is called inhibition upon a depending action. The ſummons, which conſtitutes the dependence, muſt be executed againſt the debtor before the letters of inhibition paſs the ſignet; for no ſuit can be ſaid to depend againſt one, till he be cited in it as a defender: But the effect of ſuch inhibition is ſuſpended, till decree be obtained in the action againſt the debtor; and in the ſame manner, inhibitions on conditional debts have no effect, till the condition be purified. Inhibitions are not granted, without a trial of the cauſe, when they proceed on conditional debts. And though, in other caſes, inhibitions now paſs of courſe, the Lords are in uſe to ſtay, or recal them, either on the debtor's ſhewing cauſe why the diligence ſhould not proceed, or even *ex officio* where the ground of the diligence is doubtful.

4. Though inhibitions, by their uniform ſtyle, diſable the debtor from ſelling his moveable as well as his heritable eſtate, their effect has been long limited to heritage, from the interruption that ſuch an embargo upon moveables muſt have given to commerce; ſo that debts contracted after inhibition may be the foundation of diligence, againſt the debtor's perſon and moveable eſtate. An inhibition ſecures the inhibiter againſt the alienation, not only of the lands that belonged to his debtor when he was inhibited, but of thoſe that he ſhall afterwards acquire; but no inhibition can extend to ſuch after-purchaſes as lie in a juriſdiction where the inhibition was not regiſtred; for it could not have extended to theſe, tho' they had been made prior to the inhibition.

5. This diligence only ſtrikes againſt the voluntary debts or deeds of the inhibited perſon: It does not reſtrain him from granting neceſſary deeds, *i. e.* ſuch as he was obliged to grant anterior to the inhibition, ſince he might have been compelled to grant theſe before the inhibiter had acquired any right by his diligence. By this rule, a wadſetter or annualrenter might, after being inhibited, have effectually renounced his right to the reverſer, on payment, becauſe law could have compelled him to it; but to ſecure inhibiters againſt the effect of ſuch alienations, it is declared by act of ſederunt of the court of Seſſion, Feb. 19. 1680, that, after intimation of the inhibition to the reverſer, no renunciation or grant of redemption ſhall be ſuſtained, except upon declarator of redemption brought by him, to which the inhibiter muſt be made a party.

6. An inhibition is a diligence ſimply prohibitory, ſo that the debt, on which it proceeds, continues perſonal after the diligence; and conſequently, the inhibitor, in a queſtion with anterior creditors whoſe debts are not ſtruck at by the inhibition, is only preferable from the period at which his debt is made real by adjudication: And where debts are contracted on heritable ſecurity, though poſterior to the inhibition, the inhibiter's debt, being perſonal, cannot be ranked with them; he only draws back from the creditors ranked the ſums contained in his diligence. The heir of the perſon inhibited is not reſtrained from alienation, by the diligence uſed againſt his anceſtor; for the prohibition is perſonal, affecting only the debtor againſt whom the diligence is uſed.

7. Inhibitions do not, of themſelves, make void the poſterior debts or deeds of the perſon inhibited; they only afford a title to the uſer of the diligence to ſet them aſide, if he finds them hurtful to him: And even where a debt is actually reduced *ex capite inhibitionis*, ſuch reduction, being founded ſolely in the inhibiter's intereſt, is profitable to him alone, and cannot alter the natural preference of the other creditors.

8. Inhibitions may be reduced, upon legal nullities, ariſing either from the ground of debt, or the form of diligence. When payment is made by the debtor to the inhibiter, the inhibition is ſaid to be purged. Any creditor, whoſe debt is ſtruck at by the inhibition, may, upon making payment to the inhibiter, compel him to aſſign the debt and diligence in his favour, that he may make good his payment the more effectually againſt the common debtor.

Tit. 19. *Of Compriſings, Adjudications, and Judicial Sales.*

HERITABLE rights may be carried from the debtor to the creditor, either by the diligence of appriſing (now adjudication), or by a judicial ſale carried on before the court of Seſſion. Appriſing, or compriſing, was the ſentence of a ſheriff, or of a meſſenger who was ſpecially conſtituted ſheriff for that purpoſe, by which the heritable rights belonging to the debtor were ſold for payment of the debt due to the appriſer; ſo that appriſings were, by their original conſtitution, proper ſales of the debtor's lands, to any purchaſer who offered. If no purchaſer could be found, the ſheriff was to appriſe or tax the value of the lands by an inqueſt, (whence came the name of appriſing), and to make over to the creditor lands to the value of the debt.

2. That creditors may have acceſs to affect the eſtate of their deceaſed debtor, though the heir ſhould ſtand off from entering, it is made lawful (by 1540, *c.* 106.) for any creditor to charge the heir of his debtor to enter to his anceſtor,

year and day being paſt after the anceſtor's death, within forty days after the charge; and, if the heir fails, the creditor may proceed to appriſe his debtor's lands, as if the heir had been entered. Cuſtom has ſo explained this ſtatute, that the creditor may charge the heir, immediately after the death of his anceſtor, provided letters of appriſing be not raiſed till after the expiry both of the year and of the forty days next enſuing the year, within which the heir is charged to enter. But this ſtatute relates only to ſuch charges on which appriſing is to be led againſt the anceſtor's lands; for, in thoſe which are to be barely the foundation of a common ſummons or proceſs againſt the heir, action will be ſuſtained if the year be elapſed from the anceſtor's death before the execution of the ſummons, though the forty days ſhould not be alſo expired. Though the ſtatute authoriſes ſuch charges againſt majors only, practice has alſo extended it againſt minors, and the rule is extended to the caſe where the heir is the debtor. One muſt, in this matter, diſtinguiſh between a general and a ſpecial charge. A general charge ſerves only to fix the repreſentation of the heir who is charged, ſo as to make the debt his, which was formerly his anceſtor's: But a ſpecial charge makes up for the want of a ſervice, explained Tit. xxvii. 25. and ſtates the heir, *fictione juris*, in the right of the ſubjects to which he is charged to enter. Where therefore the heir is the debtor, a general charge for fixing the repreſentation againſt him is unneceſſary, ſince the only concern of the creditor is, that his debtor make up titles to the anceſtor's eſtate, which is done by a ſpecial charge: But where the deceaſed was the debtor, the creditor muſt firſt charge his heir to enter in general, that it may be known whether he is to repreſent the debtor; if he does not enter within forty days, the debt may be fixed againſt him by a decree of conſtitution, on which he muſt be charged to enter heir in ſpecial, upon forty days more; and theſe muſt be elapſed before the creditor can proceed to appriſe.

3. Appriſings in courſe of time underwent ſeveral changes in their form and effect, till at length, by act 1672, *c.* 19. adjudications were ſubſtituted in their place, which directed to proceed againſt debtors by way of action before the court of Seſſion. By that ſtatute, ſuch part of the debtor's lands is to be adjudged as is equivalent to the principal ſum and intereſt of the debt, with the compoſition due to the ſuperior and expences of infeftment, and a fifth part more in reſpect the creditor is obliged to take land for his money. The debtor muſt deliver to the creditor a valid right of the lands to be adjudged, or tranſumpts thereof, renounce the poſſeſſion in his favour, and ratify the decree of adjudication: And law conſiders the rent of the lands as preciſely commenſurated to the intereſt of the debt; ſo that the adjudger lies under no obligation to account for the ſurplus rents. In this, which is called a ſpecial adjudication, the legal or time within which the debtor may redeem, is declared to be five years; and the creditor attaining poſſeſſion upon it can uſe no farther execution againſt the debtor, unleſs the lands be evicted from him.

4. Where the debtor does not produce a ſufficient right to the lands, or is not willing to renounce the poſſeſſion, and ratify the decree, (which is the caſe that has moſt frequently happened), the ſtatute makes it lawful for the creditor to adjudge all right belonging to the debtor in the ſame manner, and under the ſome reverſion of ten years, as he could, by the former laws, have appriſed it. In this laſt kind, which is called a general adjudication, the creditor muſt limit his claim to the principal ſum, intereſt, and penalty, without demanding a fifth part more. But no general adjudication can be inſiſted on, without libelling in the ſummons the other alternative of a ſpecial adjudication; for ſpecial adjudications are introduced by the ſtatute in the place of appriſings; and it is only where the debtor refuſes to comply with the terms thereof that the creditor can lead a general adjudication.

5. Abbreviates are ordained to be made of all adjudications, which muſt be recorded within ſixty days after the date of the decree. In every other reſpect, general adjudications have the ſame effects that appriſings had; adjudgers in poſſeſſion are accountable for the ſurplus rents; a citation in adjudications renders the ſubject litigious; ſuperiors are obliged to enter adjudgers; the legal of adjudications does not expire during the debtor's minority, *&c.* Only it may be obſerved, that though appriſings could not proceed before the term of payment, yet where the debtor is *vergens ad inopiam*, the court *ex nobili officio* admit adjudication for the debt before it be payable. But this ſort being founded ſolely in equity, ſubſiſts merely as a ſecurity, and cannot carry the property to the creditor by any length of time.

6. There are two kinds of adjudication, which took place at the ſame time with appriſings, and ſtill obtain; *viz.* adjudications on a decree *cognitionis cauſa*, otherwiſe called *contra hereditatem jacentem*, and adjudications in implement. Where the debtor's apparent heir, who is charged to enter, formally renounces the ſucceſſion, the creditor may obtain a decree *cognitionis cauſa*; in which, though the heir renouncing is cited for the ſake of form, no ſentence condemnatory can be pronounced againſt him, in reſpect of his renunciation; the only effect of it is to ſubject the *hereditas jacens* to the creditor's diligence.

7. Adjudications *contra hereditatem jacentem*, carry not only the lands themſelves that belonged to the deceaſed, but the rents thereof fallen due ſince his death; for theſe, as an acceſſory to the eſtate belonging to the deceaſed, would have deſcended to the heir if he had entered, which rule is applied to all adjudications led on a ſpecial charge. This ſort of adjudication is declared redeemable within ſeven years, by any co-adjudging creditor, either of the deceaſed debtor, or of the heir renouncing. The heir himſelf, who renounces, cannot be reſtored againſt his renunciation, nor conſequently redeem, if he be not a minor. But even a major may redeem indirectly, by granting a ſimulate bond to a confident perſon; the adjudication upon which, when conveyed to himſelf, is a good title to redeem all other adjudications againſt the lands belonging to his anceſtor.

8. Adjudications in implement are deduced againſt thoſe who have granted deeds without procuratory of reſignation or precept of ſeiſin, and refuſe to diveſt themſelves;

to the end that the ſubject conveyed may be effectually veſted in the grantee. Theſe adjudications may be alſo directed againſt the heir of the granter, upon a charge to enter. Here there is no place for a legal reverſion; for, as the adjudication is led for completing the right of a ſpecial ſubject, it muſt carry that ſubject as irredeemably as if the right had been voluntarily completed.

9. All adjudications led within year and day of that one which has been made firſt effectual by ſeiſin (where ſeiſin is neceſſary) or exact diligence for obtaining ſeiſin, are preferable *pari paſſu*. The year and day runs from the date of the adjudication, and not of the ſeiſin or diligence for obtaining it. After the days of that period, they are preferable according the their dates. All the co adjudgers within the year are preferable *pari paſſu* as if one adjudication had been led for all their debts. This makes the ſeiſin or diligence on the firſt adjudication a common right to the reſt, who muſt therefore be refund to the owner of that diligence his whole expence laid out in carrying on and completing it. And though that firſt adjudication ſhould be redeemed, the diligence upon it ſtill ſubſiſts as to the reſt. This *pari paſſu* preference, however, does not deſtroy the legal preference of adjudications led on *debita fundi*. See Tit. xv. 15. Nor does it take place in adjudications in implement.

10. Before treating of judicial ſales of bankrupts eſtates, the nature of ſequeſtration may be ſhortly explained, which is a diligence that generally uſhers in actions of ſale. Sequeſtration of lands is a judicial act of the court of Seſſion, whereby the management of an eſtate is put into the hands of a factor or ſteward named by the court, who gives ſecurity, and is to be accountable for the rents to all having intereſt. This diligence is competent, either where the right of the lands is doubtful, if it be applied for before either of the competitors has attained poſſeſſion; or where the eſtate is heavily charged with the debts: But, as it is an unfavourable diligence, it is not admitted, unleſs that meaſure ſhall appear neceſſary for the ſecurity of creditors. Subjects, not brought before the court by the diligence of creditors, cannot fall under ſequeſtration; for it is the competition of creditors which alone founds the juriſdiction of the court to take the diſputed ſubject into their poſſeſſion.

11. The court of Seſſion who decrees the ſequeſtration has the nomination of the factor, in which they are directed by the recommendation of the creditors. A factor appointed by the Seſſion, though the proprietor had not been infeft in the lands, has a power to remove tenants. Judicial factors muſt, within ſix months after extracting their factory, make up a rental of the eſtate, and a liſt of the arrears due by tenants, to be put into the hands of the clerk of the proceſs, as a charge againſt themſelves, and a note of ſuch alterations in the rental as may afterwards happen; and muſt alſo deliver to the clerk annually a ſcheme of their accounts, charge and diſcharge, under heavy penalties. They are, by the nature of their office, bound to the ſame degree of diligence that a prudent man adhibits in his own affairs; they are accountable for the intereſt of the rents, which they either have, or by diligence might have recovered, from a year after their falling due. As it is much in the power of thoſe factors to take advantage of the neceſſities of creditors, by purchaſing their debts at an undervalue, all ſuch purchaſes made either by the factor himſelf, or to his behoof, are declared equivalent to an acquitance or extinction of the debt. No factor can warrantably pay to any creditor, without an order of the court of Seſſion; for he is, by the tenor of his commiſſion, directed to pay the rents to thoſe who ſhall be found to have beſt right to them. Judicial factors are intitled to a ſalary, which is generally ſtated at five *per cent*. of their intromiſſions; but it is ſeldom aſcertained till their office expires, or till their accounting; that the court may modify a greater or ſmaller ſalary, or none, in proportion to the factor's integrity and diligence. Many caſes occur, where the court of Seſſion, without ſequeſtration, name a factor to preſerve the rents from periſhing; *e. g.* where an heir is deliberating whether to enter, where a minor is without tutors, where a ſucceſſion opens to a perſon reſiding abroad; in all which caſes, the factor is ſubjected to the rules laid down in act of ſederunt, Feb. 13. 1730.

12. The word *bankrupt* is ſometimes applied to perſons whoſe funds are not ſufficient for their debts; and ſometimes, not to the debtor, but to his eſtate. The court of Seſſion are empowered, at the ſuit of any real creditor, to try the value of a bankrupt's eſtate, and ſell it for the payment of his debts.

13. No proceſs of ſale, at the ſuit of a creditor, can proceed without a proof of the debtor's bankruptcy, or at leaſt that his lands are ſo charged with debts, that no prudent perſons will buy from him; and therefore the ſummons of ſale muſt comprehend the debtor's whole eſtate. The debtor, or his apparent heir, and all the real creditors in poſſeſſion, muſt be made parties to the ſuit; but it is ſufficient if the other creditors be called by an edictal citation. The ſummons of ſale contains a concluſion of ranking or preference of the bankrupt's creditors. In this ranking, firſt and ſecond terms are aſſigned to the whole creditors for exhibiting in court (or producing) their rights and diligences; and the decree of certification proceeding thereupon, againſt the writings not produced, has the ſame effect in favour of the creditors who have produced their rights, as if that decree had proceeded upon an action of reduction-improbation. See Tit xxx. 5. The ranking of theſe creditors muſt be concluded by an extracted decree, before the actual ſale. The irredeemable property of the lands is adjudged by the court to the higheſt offerer at the ſale. The creditors receiving payment muſt grant to the purchaſer abſolute warrandice, to the extent of the ſum received by them; and the lands purchaſed are declared diſburdened of all debts or deeds of the bankrupt, or his anceſtors, either on payment of the price by the purchaſer to the creditors according to their preference, or on conſignation of it, in caſe of their refuſal, in the hands of the magiſtrates of Edinburgh: The only remedy provided to ſuch creditors as judge themſelves hurt by the ſale of diviſion of the price, even though they ſhould be minors, is an action for recovering their ſhare of the price againſt the creditors who have received it.

14. The expence of theſe proceſſes is diſburſed by the factor out of the rents in his hands; by which the

whole burden of ſuch expence falls upon the poſterior creditors.

15. Apparent heirs are intitled to bring actions of ſale of the eſtates belonging to their anceſtors, whether bankrupt or not; the expence of which ought to fall upon the purſuer, if there is any excreſcence of the price, after payment of the creditors.

16. As proceſſes of ranking and ſale are deſigned for the common intereſt of all the creditors, no diligence carried on or completed during their pendency ought to give any preference in the competition; *pendente lite, nihil innovandum*.

17. It is a rule in all real diligences, that where a creditor is preferable on ſeveral different ſubjects, he cannot uſe his preference arbitrarily, by favouring one creditor more than another; but muſt allocate his univerſal or catholic debt proportionally againſt all the ſubjects or parties whom it affects. If it is material to ſuch creditor to draw his whole payment out of any one fund, he may apply his debt ſo as may beſt ſecure himſelf; but that inequality will be rectified, as to the poſterior creditors, who had likewiſe, by their rights and diligences, affected the ſubjects out of which he drew his payment, by obliging him to aſſign in their favour his right upon the ſeparate ſubjects which he did not uſe in the ranking; by which they may recur againſt theſe ſeparate ſubjects for the ſhares which the debt preferred might have drawn out of them. As the obligation to aſſign is founded merely in equity, the catholic creditor cannot be compelled to it, if his aſſigning ſhall weaken the preference of any ſeparate debt veſted in himſelf, affecting the ſpecial ſubject ſought to be aſſigned. But if a creditor upon a ſpecial ſubject ſhall acquire from another a catholic right, or a catholic creditor ſhall purchaſe a debt affecting a ſpecial ſubject, with a view of creating to the ſpecial debt a higher degree of preference than was naturally due to it, by an arbitrary application of the catholic debt, equity cannot protect him from aſſigning in favour of the creditor excluded by ſuch application, eſpecially if, prior to the purchaſe, the ſubject had become litigious by the proceſs of ranking; for tranſmiſſions ought not to hurt creditors who are no parties to them, nor to give the purchaſer any new right, which was not formerly in himſelf or his cedent.

Tit. 20. *Of Obligations and Contracts in general.*

The law of heritable rights being explained, moveable rights fall next to be conſidered, the doctrine of which depends chiefly on the nature of Obligations. An obligation is a legal tie, by which one is bound to pay or perform ſomething to another. Every obligation on the perſon obliged, implies an oppoſite right in the creditor, ſo that what is a burden in regard to the one is right with reſpect to the other; and all rights founded on obligation are called perſonal. There is this eſſential difference between a real and a perſonal right, that a *jus in re*, whether of property, or of an inferior kind as ſervitude, entitles the perſon veſted with it to poſſeſs the ſubject as his own; or if he is not in poſſeſſion, to demand it from the poſſeſſors; whereas the creditor in a perſonal right has only *jus ad rem*, or a right to compel the debtor to fulfil his obligation; without any right in the ſubject itſelf, which the debtor is bound to transfer to him. One cannot oblige himſelf, but by a preſent act of the will. A bare reſolution therefore, or purpoſe to be obliged, is alterable at pleaſure.

2. Obligations are either, firſt, merely natural, where one perſon is bound to another by the law of nature, but cannot be compelled by any civil action to the performance. Thus, though deeds granted by a minor having curators, without their conſent, are null, yet the minor is naturally obliged to perform ſuch deeds; and parents are naturally obliged to provide their children in reaſonable patrimonies. Natural obligations intitle the creditor to retain what he has got in virtue thereof, without being ſubjected to reſtore it. 2. Obligations are merely civil, which may be ſued upon by an action, but are elided by an exception in equity; this is the caſe of obligations granted through force or fear, &c. 3. Proper or full obligations, are thoſe which are ſupported both by equity and the civil ſanction.

3. Obligations may be alſo divided into, 1. Pure, to which neither day nor condition is adjected. Theſe may be exacted immediately. 2. Obligations (*ex die*), which have a day adjected to their performance. In theſe, *dies ſtatem cedit, ſed non venit*; a proper debt ariſes from the date of the obligation, becauſe it is certain that the day will exiſt; but the execution is ſuſpended, till the lapſe of that day. 3. Conditional obligations; in which there is no proper debt (*dies non cedit*) till the condition be purified, becauſe it is poſſible the condition may exiſt; and which therefore are ſaid to create only the hope of a debt; but the granter, even of theſe, has no right to reſile. An obligation, to which a day is adjected that poſſibly may never exiſt, implies a condition; *dies incertus pro conditione habetur*. Thus, in the caſe of a proviſion to a child, payable when he attains to the age of fourteen, if the child dies before that age, the proviſion falls.

4. Obligations, when conſidered with regard to their cauſe, were divided by the Romans, into thoſe ariſing from contract, quaſi contract, delict, and quaſi-delict: But there are certain obligations, even full and proper ones, which cannot be derived from any of theſe ſources, and to which Lord Stair gives the name of obediential. Such as the obligation on parents to aliment or maintain their children; which ariſes ſingly from the relation of parent and child, and may be enforced by the civil magiſtrate. Under parents are comprended the mother, grandfather, and grandmother, in their proper order. This obligation on parents extends to the providing of their iſſue in all the neceſſaries of life, and giving them ſuitable education. It ceaſes, when the children can earn a livelyhood by their own induſtry; but the obligation on parents to maintain their indigent children, and reciprocally on children to maintain their indigent parents, is perpetual. This obligation is, on the father's death, transferred to the eldeſt ſon, the heir of the family; who, as repreſenting the father, muſt aliment his younger brothers and ſiſters: The brothers are only intitled to alimony, till their age of twenty-one, after which they are preſumed able to do for themſelves; but the obligation

to maintain the ſiſters continues till their marriage. In perſons of lower rank, the obligation to aliment the ſiſters ceaſes after they are capable of ſubſiſting by any ſervice or employment.

5. All obligations, ariſing from the natural duty of reſtitution, fall under this claſs: Thus, things given upon the view of a certain event, muſt be reſtored, if that event does not afterwards exiſt: Thus alſo, things given *ob turpem cauſam*, where the turpitude is in the receiver and not in the giver, muſt be reſtored. And on the ſame principle, one upon whoſe ground a houſe is built or repaired by another, is obliged, without any covenant, to reſtore the expence laid out upon it, in ſo far as it has been profitable to him.

6. A contract is the voluntary agreement of two or more perſons, whereby ſomething is to be given or performed upon one part, for a valuable conſideration, either preſent or future, on the other part. Conſent, which is implied in agreement, is excluded, 1. By error in the eſſentials of the contract, for in ſuch caſe, the party does not properly contract, but errs or is deceived; And this may be alſo applied to contracts which take their riſe from fraud or impoſition. 2. Conſent is excluded by ſuch a degree of reſtraint upon any of the contracting parties, as extorts the agreement; for where violence or threatening are uſed againſt a perſon, his will has really no part in the contract.

7. Loan or *mutuum* is that contract which obliges a perſon, who has borrowed any fungible ſubject from another, to reſtore to him as much of the ſame kind, and of equal goodneſs. Whatever receives its eſtimation in number, weight, or meaſure, is a fungible, as corn, wine, current coin, *&c.* The only proper ſubjects of this contract are things which cannot be uſed, without either their extinction or alienation; hence, the property of the thing lent is neceſſarily transferred by delivery to the borrower, who conſequently muſt run all the hazards, either of its deterioration or its periſhing, according to the rule, *res perit ſuo domino*. Where the borrower neglects to reſtore, at the time and place agreed on, the eſtimation of the thing lent muſt be made according to its price at that time and in that place; becauſe it would have been worth ſo much to the lender, if the obligation had been duly performed. If there is no place nor time ſtipulated for, the value is to be ſtated according to the price that the commodity gave when and where it was demanded. In the loan of money, the value put on it by public authority, and not its intrinſic worth, is to be conſidered. This contract is obligatory only on one part; for the lender is ſubjected to no obligation: The only action therefore that it produces, is pointed againſt the borrower, that he may reſtore as much in quantity and quality as he borrowed, together with the damage the lender may have ſuffered through default of due performance.

8. Commodate is a ſpecies of loan, gratuitous on the part of the lender, where the thing lent may be uſed, without either its periſhing or its alienation. Hence, in this ſort of loan, the property continues with the lender: the only right the borrower acquires in the ſubject is its uſe, after which he muſt reſtore the individual thing that he borrowed: Conſequently, if the ſubject periſhes, it periſhes to the lender, unleſs it has periſhed by the borrower's fault. What degree of fault or negligence makes either of the contracting parties liable to the other in damages, is comprehended under the following rules. Where the contract gives a mutual benefit to both parties, each contracter is bound to adhibit a middle ſort of diligence, ſuch as a man of ordinary prudence uſes in his affairs. Where only one of the parties has benefit by the contract, that party muſt uſe exact diligence; and the other who has no advantage by it is accountable only for dole, or for groſs omiſſions which the law conſtrues to be dole. Where one employs leſs care on the ſubject of any contract which implies an exuberant truſt, than he is known to employ in his own affairs, it is conſidered as dole.

9. By theſe rules, the borrower in the contract of commodate muſt be exactly careful of the thing lent, and reſtore it at the time fixed by the contract, or after that uſe is made of it for which it was lent: If he puts it to any other uſe, or neglects to reſtore it at the time covenanted, and if the thing periſhes thereafter, even by mere accident, he is bound to pay the value. On the other part, the lender is obliged to reſtore to the borrower ſuch of the expences diſburſed by him on that ſubject, as aroſe from any uncommon accident, but not thoſe that naturally attend the uſe of it. Where a thing is lent gratuouſly, without ſpecifying any time of redelivery, it conſtitutes the contract of *precarium*, which is revokable at the lender's pleaſure, and, being entered into from a perſonal regard to the borrower, ceaſes by his death.

10. Depoſitation is a contract, by which one who has the cuſtody of a thing committed to him (the depoſitary), is obliged to reſtore it to the depoſitar. If a reward is bargained for by the depoſitary for his care, it reſolves into the contract of location. As this contract is gratuitous, the depoſitary is only anſwerable for the conſequences of groſs neglect; but after the depoſit is redemanded, he is accountable even for caſual misfortunes. He is intitled to a full indemnification for the loſſes he has ſuſtained by the contract, and to the recovery of all ſums expended by him on the ſubject.

11. An obligation ariſes without formal paction, barely by a traveller's entering into an inn, ſhip, or ſtable, and there depoſiting his goods, or putting up his horſes; whereby the innkeeper, ſhipmaſter, or ſtabler, is accountable, not only for his own facts and thoſe of his ſervants, (which is an obligation implied in the very exerciſe of theſe employments), but of the other gueſts or paſſengers; and, indeed, in every caſe, unleſs where the goods have been loſt *damno fatali*, or carried off by pirates or houſebreakers. Not only the maſters of ſhips but their employers, are liable each of them for the ſhare that he has in the ſhip; but by the preſent cuſtom of trading nations, the goods brought into a ſhip muſt have been delivered to the maſter or mate, or entered into the ſhip-books. Carriers fall within the intendment of this law; and practice has extended it to vintners within borough. The extent of the damage ſuſtained by the party may be proved by his own oath *in litem*.

12. Sequeſtration, whether voluntarily conſented to by the parties, or authoriſed by the judge, is a kind of

depoſit; but as the office of ſequeſtree, to whoſe care the ſubject in diſpute is committed, is not conſidered as gratuitous, he cannot throw it up at pleaſure, as a common depoſitary may do; and he is liable in the middle degree of diligence. Conſignation of money is alſo a depoſit. It may be made, either where the debt is called in queſtion by the debtor, as in ſuſpenſions; or where the creditor refuſes to receive his money, as in wadſets, *&c.* The riſk of the conſigned money lies on the conſigner, where he ought to have made payment, and not conſignation, or has conſigned only a part; or has choſen for conſignatory, a perſon neither named by the parties nor of good credit. The charger, or other creditor, runs the riſk, if he has charged for ſums not due, or has without good reaſon refuſed payment, by which refuſal the conſignation became neceſſary. It is the office of a conſignatory, to keep the money in ſafe cuſtody, till it be called for: If therefore he puts it out at intereſt, he muſt run the hazard of the debtor's inſolvency; but, for the ſame reaſon, though he ſhould draw intereſt for it, he is liable in none to the conſigner.

13. Pledge, when oppoſed to wadſet, is a contract, by which a debtor puts into the hands of his creditor a ſpecial moveable ſubject in ſecurity of the debt, to be redelivered on payment. Where a ſecurity is eſtabliſhed by law to the creditor, upon a ſubject which continues in the debtor's poſſeſſion, it has the ſpecial name of an hypothec. Tradeſmen and ſhip-carpenters have an hypothec on the houſe or ſhip repaired, for the materials and other charges of reparation; but not for the expence of building a new ſhip. Owners of ſhips have an hypothec on the cargo for the freight, heritors on the fruits of the ground, and landlords on the *invecta et illata*, for their rents. Writers alſo, and agents, have a right of hypothec, or more properly of retention, in their conſtituent's writings, for their claim of pains and diſburſements. A creditor cannot, for his own payment, ſell the ſubject impignorated, without applying to the judge-ordinary for a warrant to put it up to public ſale or roup; and to this application the debtor ought to be made a party.

Tit. 21. *Of Obligations by Word or Writ.*

The appellation of *verbal* may be applied to all obligations to the conſtitution of which writing is not eſſential, which includes both real and conſenſual contracts; but as theſe are explained under ſeparate titles, obligations *by word*, in the ſenſe of this rubric, muſt be reſtricted, either to promiſes, or to ſuch verbal agreements as have no ſpecial name to diſtinguiſh them. Agreement implies the intervention of two different parties, who come under mutual obligations to one another. Where nothing is to be given or performed but on one part, it is properly called a promiſe, which, as it is gratuitous, does not require the acceptance of him to whom the promiſe is made. An offer, which muſt be diſtinguiſhed from a promiſe, implies ſomething to be done by the other party; and conſequently is not binding on the offerer, till it be accepted, with its limitations or conditions, by him to whom the offer is made; after which, it becomes a proper agreement.

2. Writing muſt neceſſarily intervene in all obligations and bargains concerning heritable ſubjects, though they ſhould be only temporary; as tacks, which, when they are verbal, laſt but for one year. In theſe no verbal agreement is binding, though it ſhould be referred to the oath of the party; for, till writing is adhibited, law gives both parties a right to reſile, as from an unfiniſhed bargain; which is called *locus pœnitentiæ*. If, upon a verbal bargain of lands, part of the price ſhall be paid by him who was to purchaſe, the *interventus rei*, the actual payment of money, creates a valid obligation, and gives a beginning to the contract of ſale: And in general, where-ever matters are no longer entire, the right to reſile ſeems to be excluded. An agreement, whereby a real right is paſſed from, or reſtricted, called *pactum liberatorium*, may be perfected verbally; for freedom is favourable, and the purpoſe of ſuch agreement is rather to diſſolve than to create an obligation. Writing is alſo eſſential to bargains made under condition that they ſhall be reduced into writing; for in ſuch caſes, it is *pars contractus*, that, till writing be adhibited, both parties ſhall have liberty to withdraw. In the ſame manner, verbal or nuncupative teſtaments are rejected by our law; but verbal legacies are ſuſtained, where they do not exceed *L.* 100 *Scots*.

3. Anciently, when writing was little uſed, deeds were executed by the party appending his ſeal to them; in preſence of witneſſes. For preventing frauds that might happen by appending ſeals to falſe deeds, the ſubſcription alſo of the granter was afterwards required, and, if he could not write, that of a notary. As it might be of dangerous conſequence, to give full force to the ſubſcription of the parties by initials, which is more eaſily counterfeited; our practice, in order to ſuſtain ſuch ſubſcription, ſeems to require a proof, not only that the granter uſed to ſubſcribe in that way, but that *de facto* he had ſubſcribed the deed in queſtion; at leaſt, ſuch proof is required, if the inſtrumentary witneſſes be ſtill alive.

4. As a further check, it was afterwards provided that all writings carrying any heritable right, and other deeds of importance, be ſubſcribed by the principal parties, if they can ſubſcribe; otherwiſe, by two notaries, before four witneſſes ſpecially deſigned. The ſubſequent practice extended this requiſite of the deſignation of the witneſſes to the caſe where the parties themſelves ſubſcribed. Cuſtom has conſtrued obligations for ſums exceeding *L.* 100 *Scots*, to be obligations of importance. In a diviſible obligation, *ex. gr.* for a ſum of money, though exceeding *L.* 100, the ſubſcription of one notary is ſufficient, if the creditor reſtricts his claim to *L.* 100: But, in an obligation indiviſible, *e. g.* for the performance of a fact, if it be not ſubſcribed in terms of the ſtatute, it is void. When notaries thus atteſt a deed, the atteſtation or docquet muſt ſpecially expreſs that the granter gave them a mandate to ſign; nor is it ſufficient that this be mentioned in the body of the writing.

5. In every deed, the name of him who writes it, with his dwelling place or other mark of diſtinction, muſt be inſerted. The witneſſes muſt both ſubſcribe as witneſſes, and their names and deſignations be inſerted in the body of the deed: And all ſubſcribing witneſſes muſt know the granter, and either ſee him ſubſcribe, or hear

him acknowledge his ſubſcription; otherwiſe they are declared puniſhable as acceſſory to forgery. Deeds, decrees, and other ſecurities, conſiſting of more than one ſheet, may be written by way of book, in place of the former cuſtom of paſting together the ſeveral ſheets, and ſigning the joinings on the margin; provided each page be ſigned by the granter, and marked by its number; and the teſting clauſe expreſs the number of pages.

6. Inſtruments of ſeiſin are valid, if ſubſcribed by one notary, before a reaſonable number of witneſſes; which is extended by practice to inſtruments of reſignation. Two witneſſes are deemed a reaſonable number to every deed that can be executed by one notary. It is not neceſſary, that the witneſſes to a notorial inſtrument, or execution, ſee the notary or meſſenger ſign; for they are called as witneſſes to the tranſaction which is atteſted, and not to the ſubſcription of the perſon atteſting.

7. A new requiſite has been added to certain deeds ſince the union, for the benefit of the revenue: They muſt be executed on ſtamped paper, or parchment, paying a certain duty to the crown. Charters, inſtruments of reſignation, ſeiſins, and retours of lands holden of a ſubject, are charged with 2 *s.* 3 *d.* of duty: Bonds, tacks, contracts, and other perſonal obligations, paid at firſt 6 *d.* to which a farther duty of 1 *s.* has been ſince added. Bail-bonds, bills, teſtaments, diſcharges, or acquittances of rent or of intereſt and judicial deeds, as notorial inſtruments, bonds of cautionry in ſuſpenſions, *&c.* are excepted.

8. The granter's name and deſignation are eſſential, not properly as ſolemnities, but becauſe no writing can have effect without them. Bonds were, by our ancient practice, frequently executed without filling up the creditor's name; and they paſſed from hand to hand, like notes payable to the bearer: But as there was no method for the creditor of a perſon poſſeſſed of theſe to ſecure them for his payment, all writings taken blank in the creditor's name are declared null, as covers to fraud; with the exception of indorſations of bills of exchange.

9. Certain privileged writings do not require the ordinary ſolemnities. 1. Holograph deeds (written by the granter himſelf) are effectual without witneſſes. The date of no holograph writing, except a bill of exchange, (ſee next paragr.) can be proved by the granter's own aſſertion, in prejudice either of his heir or his creditors, but muſt be ſupported by other adminicles. 2. Teſtaments, if executed where men of ſkill in buſineſs cannot be had, are valid though they ſhould not be quite formal: and let the ſubject of a teſtament be ever ſo valuable, one notary ſigning for the teſtator, before two witneſſes, is in practice ſufficient. Clergymen were frequently notaries before the reformation; and, though they were afterwards prohibited to act as notaries, the caſe of teſtaments is excepted; ſo that theſe are ſupported by the atteſtation of one miniſter, with two witneſſes. 3. Diſcharges to tenants are ſuſtained without witneſſes, from their preſumed ruſticity, or ignorance in buſineſs. 4. Miſſive letters *in re mercatoria*, commiſſions, and fitted accounts in the courſe of trade, and bills of exchange, though they are not holograph, are, from the favour of commerce, ſuſtained without the ordinary ſolemnities.

10. A bill of exchange is an obligation in the form of a mandate, whereby the drawer or mandant deſires him to whom it is directed, to pay a certain ſum, at the day and place therein mentioned, to a third party. Bills of exchange are drawn by a perſon in one country to his correſpondent in another; and they have that name, becauſe it is the exchange, or the value of money in one place compared with its value in another, that generally determines the preciſe extent of the ſum contained in the draught. The creditor in the bill is ſometimes called the the poſſeſſor, or *porteur*. As parties to bills are of different countries, queſtions concerning them ought to be determined by the received cuſtom of trading nations, unleſs where ſpecial ſtatute interpoſes. For this reaſon, bills of exchange, though their form admits not of witneſſes, yet prove their own dates, in queſtions either with the heir, or creditors of the debtor; but this doctrine is not extended to inland bills payable to the drawer himſelf.

11. A bill is valid, without the deſignation, either of the drawer, or of the perſon to whom it is made payable: It is enough, that the drawer's ſubſcription appears to be truly his; and one's being poſſeſſor of a bill marks him out to be the creditor, if he bears the name given in the bill to the creditor: Nay, though the perſon drawn on ſhould not be deſigned, his acceptance preſumes that it was he whom the drawer had in his eye. Bills drawn blank, in the creditor's name, fall under the ſtatutory nullity; for though indorſations of bills are excepted from it, bills themſelves are not. Not only the perſon drawn upon muſt ſign his acceptance, but the drawer muſt ſign his draught, before any obligation can be formed againſt the accepter: Yet it is ſufficient in practice, that the drawer ſigns, before the bill be produced in judgment; though it ſhould be after the death both of the creditor and accepter. A creditor in a bill may tranſmit it to another by indorſation, though the bill ſhould not bear *to his order*; by the ſame rule that other rights are tranſmiſſible by aſſignation, though they do not bear *to aſſigneys*.

12. The drawer, by ſigning his draught, becomes liable for the value to the creditor in the bill, in caſe the perſon drawn upon either does not accept, or after acceptance does not pay; for he is preſumed to have received value from the creditor at giving him the draught, though it ſhould not bear *for value received*: But, if the drawer was debtor to the creditor in the bill before the draught, the bill is preſumed to be given towards payment of the debt, unleſs it expreſsly bears *for value*. The perſon drawn upon, if he refuſe to accept, while he has the drawer's money in his hands, is liable to him in damages. As a bill preſumes value from the creditor, indorſation preſumes value from the indorſee; who therefore, if he cannot obtain payment from the accepter, has recourſe againſt the indorſer, unleſs the bill be indorſed in theſe words, *without recourſe*.

13. Payment of a bill, by the accepter, acquits both the drawer and him at the hands of the creditor; but it intitles the accepter, if he was not the drawer's debtor, to an action of recourſe againſt him; and, if he was, to

a ground of compenſation. Where the bill does not bear value in the hands of the perſon drawn upon, it is preſumed that he is not the drawer's debtor, and conſequently he has recourſe againſt the drawer, *ex mandato*.

14. Bills, when indorſed, are conſidered as ſo many bags of money delivered to the onerous indorſee; which therefore carry right to the contents, free of all burdens that do not appear on the bills themſelves. Hence, a receipt or diſcharge, by the original creditor, if granted on a ſeparate paper, does not exempt the accepter from ſecond payment to the indorſee; hence alſo, no ground of compenſation competent to the accepter againſt the original creditor can be pleaded againſt the indorſee: But, if the debtor ſhall prove, by the oath of the indorſee, that he paid not the full value for the indorſation, the indorſee is juſtly conſidered as but a name; and therefore all exceptions, receivable againſt the original creditor, will be ſuſtained againſt him.

15. Bills muſt be negotiated by the poſſeſſor, againſt the perſon drawn upon, within a preciſe time, in order to preſerve recourſe againſt the drawer. In bills payable ſo many days after ſight, the creditor has a diſcretionary power of fixing the payment ſomewhat ſooner or later, as his occaſions ſhall require. Bills payable on a day certain, need not be preſented for acceptance till the day of payment, becauſe that day can neither be prolonged nor ſhortened by the time of acceptance. For the ſame reaſon, the acceptance of bills, payable on a preciſe day, need not be dated: But, where a bill is drawn payable ſo many days after ſight, it muſt; becauſe there the term of payment depends on the date of the acceptance.

16 Though bills are, in ſtrict law, due the very day on which they are made payable, and may therefore be proteſted on the day thereafter; yet there are three days immediately following the day of payment, called days of grace, within any of which the creditor may proteſt the bill: But if he delay proteſting till the day after the laſt day of grace, he loſes his recourſe. Where a bill is proteſted, either for not acceptance, or not payment, the diſhonour muſt be notified to the drawer or indorſer, within three poſts at fartheſt. This ſtrictneſs of negotiation is confined to ſuch bills as may be proteſted by the poſſeſſor upon the third day of grace: Where therefore bills are indorſed after the days of grace are expired, the indorſeee is left more at liberty, and does not loſe his recourſe, though he ſhould not take a formal proteſt for not payment, if, within a reaſonable time, he ſhall give the indorſer notice of the accepter's refuſing to pay. Not only does the poſſeſſor, who neglects ſtrict negotiation, loſe his recourſe againſt the drawer, where the perſon drawn upon becomes afterwards bankrupt, but though he ſhould continue ſolvent; for he may, in that caſe, recover payment from the debtor, and ſo is not to be indulged in an unneceſſary proceſs againſt the drawer, which he has tacitly renounced by his negligence. Recourſe is preſerved againſt the drawer, though the bill ſhould not be duly negotiated, if the perſon drawn upon was not his debtor; for there the drawer can qualify no prejudice by the neglect of diligence, and he ought not to have drawn on one who owed him nothing.

17. The privileges ſuperadded to bills by ſtatute are, that tho', by their form, they can have no clauſe of regiſtration, yet, if duly proteſted, they are regiſtrable within ſix months after their date in caſe of not acceptance, or in ſix months after the term of payment in the caſe of not payment; which regiſtration is made the foundation of ſummary diligence, either againſt the drawer or indorſer in the caſe of not acceptance, or againſt the accepter in caſe of not payment. This is extended to inland bills, *i. e.* bills both drawn and made payable in Scotland. After acceptance, ſummary diligence lies againſt no other than the accepter; the drawer and indorſer muſt be purſued by an ordinary action. It is only the principal ſum in the bill, and intereſt, that can be charged for ſummarily. The exchange, when it is not included in the draught, the re exchange incurred by ſuffering the bill to be proteſted and returned, and the expence of diligence, muſt all be recovered by an ordinary action; becauſe theſe are not liquid debts, and ſo muſt be previouſly conſtituted.

18. Bills, when drawn payable at any conſiderable diſtance of time after date, are denied the privileges of bills; for bills are intended for currency, and not to lie as a ſecurity in the creditor's hands. Bills are not valid which appear *ex facie* to be donations No extrinſic ſtipulation ought to be contained in a bill which deviates from the proper nature of bills; hence, a bill to which a penalty is adjected, or with a clauſe of intereſt from the date, is null. Inland precepts drawn, not for money the medium of trade, but for fungibles, are null, as wanting writer's name and witneſſes. It is not an agreed point whether promiſſory notes, without writer and witneſſes, unleſs holograph, are probative. This however is certain, that they at no rate intitle to the privileges of bills.

19. As for the ſolemnities eſſential to deeds ſigned in a foreign country, when they come to receive execution in Scotland, it is a general rule, that no laws can be of authority beyond the dominions of the lawgiver. Hence, in ſtrictneſs, no deed, though perfected according to the law of the place where it is ſigned, can have effect in another country where different ſolemnities are required to a deed of that ſort. But this rigour is ſo ſoftened *ex comitate*, by the common conſent of nations, that all perſonal obligations granted according to the law of that country where they are ſigned, are effectual every where, which obtains even in obligations to convey heritage. Conveyances themſelves, of heritable ſubjects, muſt be perfected according to the law of the country where the heritage lies, and from which it cannot be removed.

20. A writing, while the granter keeps it under his own power or his doer's, has no force; it becomes obligatory, only after it is delivered to the grantee himſelf, or found in the hands of a third perſon. As to which laſt, the following rules are obſerved. A deed found in the hands of one, who is doer both for the granter and grantee, is preſumed to have been put in his hands as doer for the grantee. The preſumption is alſo for delivery, if the deed appears in the hands of one who is a ſtranger to both. Where a deed is depoſited in the hands of a third perſon, the terms of depoſitation may be proved by the oath of the depoſitary, unleſs where they are

reduced into writing. A deed appearing in the cuſtody of the grantee himſelf, is conſidered as his abſolute right; in ſo much that the granter is not allowed to prove that it was granted in truſt, otherwiſe than by a written declaration ſigned by the truſtee, or by his oath.

21. The following deeds are effectual without delivery, 1. Writings containing a clauſe diſpenſing with the delivery: Theſe are of the nature of revokable deeds, where the death of the granter is equivalent to delivery, becauſe after death there can be no revocation. 2. Deeds in favour of children, even natural ones; for parents are the proper cuſtodiars or keepers of their childrens writings. From a ſimilar reaſon, poſtnuptial ſettlements by the huſband to the wife need no delivery. 3. Rights which are not to take effect till the granter's death, or even where he reſerves an intereſt to himſelf during his life; for it is preſumed he holds the cuſtody of theſe, merely to ſecure to himſelf ſuch reſerved intereſt. 4. Deeds that the granter lay under an antecedent natural obligation to execute, *e.g.* rights granted to a cautioner for his relief. 5. Mutual obligations, *e.g.* contracts; for every ſuch deed, the moment it is executed, is a common evident to all the parties contracters. Laſtly, the publication of a writing by regiſtration, is equivalent to delivery.

Tit. 22. *Of Obligations and Contracts ariſing from Conſent, and of acceſſory Obligations.*

CONTRACTS conſenſual, *i. e.* which might, by the Roman law, be perfected by ſole conſent, without the intervention either of things or of writing, are ſale, permutation, location, ſociety, and mandate. Where the ſubject of any of theſe contracts is heritable, writing is neceſſary.

2. Sale is a contract, by which one becomes obliged to give ſomething to another, in conſideration of a certain price in current money to be paid for it. Things conſiſting merely in hope, may be the ſubject of this contract, as the draught of a net. Commodities, where their importation or uſe is abſolutely prohibited, cannot be the ſubject of ſale; and even in run goods, no action lies againſt the vender for not delivery, if the buyer knew the goods were run.

3. Though this contract may be perfected before delivery of the ſubject, the property remains till then with the vender. See Tit. viii. 9. Yet till delivery, the hazard of its deterioration falls on the purchaſer, becauſe he has all the profits ariſing from it after the ſale. On the other hand, the ſubject itſelf periſhes to the vender; 1. If it ſhould periſh through his fault, or after his undue delay to deliver it. 2 If a ſubject is ſold as a fungible, and not as an individual, or *corpus*, *e.g.* a quantity of farm-wheat, ſold without diſtinguiſhing the parcel to be delivered from the reſt of the farm. 3. The *periculum* lies on the vender till delivery, if he be obliged by a ſpecial article in the contract to deliver the ſubject at a certain place.

4. Location is that contract, where an hire is ſtipulated for the uſe of things, or for the ſervice of perſons. He who lets his work or the uſe of his property to hire, is the locator or leſſor; and the other, the conductor or leſſee. In the location of things, the leſſor is obliged to deliver the ſubject, fitted to the uſe it was let for; and the leſſee muſt preſerve it carefully, put it to no other uſe, and, after that is over, reſtore it. Where a workman or artificer lets his labour, and if the work is either not performed according to contract, or if it be inſufficient, even from mere unſkilfulneſs, he is liable to his employer in damages, for he ought not, as an artificer, to have undertaken a work to which he was not equal. A ſervant hired for a certain term, is intitled to his full wages, though from ſickneſs or other accident he ſhould be diſabled for a part of his time; but, if he die before the term, his wages are only due for the time he actually ſerved. If a maſter dies, or without good reaſon turns off, before the term, a ſervant who eats in his houſe, the ſervant is intitled to his full wages, and to his maintenance till that term: And, on the other part, a ſervant who without ground deſerts his ſervice, forfeits his wages and maintenance, and is liable to his maſter in damages.

5. Society or copartnerſhip is a contract, whereby the ſeveral partners agree, concerning the communication of loſs and gain ariſing from the ſubject of the contract. It is formed by the reciprocal choice that the partners make of one another; and ſo is not conſtituted in the caſe of co-heirs, or of ſeveral legatees in the ſame ſubject. A copartnerſhip may be ſo conſtituted, that one of the partners ſhall, either from his ſole right of property in the ſubject, or from his ſuperior ſkill, be intitled to a certain ſhare of the profits, without being ſubjected to any part of the loſs; but a ſociety, where one partner is to bear a certain proportion of loſs, without being intitled to any ſhare of the profits, is juſtly reprobated. All the partners are intitled to ſhares of profit and loſs proportioned to their ſeveral ſtocks, where it is not otherwiſe covenanted.

6. As partners are united, from a *delectus perſonæ*, in a kind of brotherhood, no partner can, without a ſpecial power contained in the contract, transfer any part of his ſhare to another. All the partners are bound *in ſolidum* by the obligation of any one of them, if he ſubſcribe by the *firm* or ſocial name of the company; unleſs it be a deed that falls not under the common courſe of adminiſtration. The company-effects are the company property of the ſociety ſubjected to its debts; ſo that no partner can claim a diviſion thereof, even after the ſociety is diſſolved, till theſe are paid: And, conſequently, no creditor of a partner can, by diligence, carry to himſelf the property of any part of the common ſtock, in prejudice of a company-creditor: but he may, by arreſtment, ſecure his debtor's ſhare in the company's hands, to be made forthcoming to him at the cloſe of the copartnerſhip, in ſo far as it is not exhauſted by the company debts.

7. Society being founded in the mutual confidence among the *ſocii*, is diſſolved, not only by the renunciation, but by the death of any one of them, if it be not otherwiſe ſpecially covenanted. A partner, who renounces upon unfair views, or at a critical time, when his withdrawing may be fatal to the ſociety, looſes his partners from all their engagements to him, while he is bound to them for all the profits he ſhall make by his withdraw-

ing, and for the loſs ariſing thereby to the company. Not only natural, but civil death, *e. g.* ariſing from a ſentence inflicting capital puniſhment, makes one incapable to perform the duties of a partner, and conſequently diſſolves the ſociety. In both caſes, of death and renunciation, the remaining partners may continue the copartnerſhip, either expreſsly, by entering into a new contract; or tacitly, by carrying on their trade as formerly, Public trading companies are now every day conſtituted, with rules very different from thoſe which either obtained in the Roman law, or at this day obtain in private ſocieties. The proprietors or partners in theſe, though they may transfer their ſhares, cannot renounce; nor does their death diſſolve the company, but the ſhare of the deceaſed deſcends to his repreſentative.

8. A joint trade is not a copartnerſhip, but a momentary contract, where two or more perſons agree to contribute a ſum, to be employed in a particular courſe of trade, the produce whereof is to be divided among the adventurers, according to their ſeveral ſhares, after the voyage is finiſhed. If, in a joint trade, that partner who is intruſted with the money for purchaſing the goods, ſhould, in place of paying them in caſh, buy them upon credit, the furniſher who followed his faith alone in the ſale, has no recourſe againſt the other adventurers; he can only recover from them what of the buyer's ſhare is yet in their hands. Where any one of the adventurers, in a joint trade, becomes bankrupt, the others are preferable to his creditors, upon the common ſtock, as long as it continues undivided, for their relief of all the engagements entered into by them on account of the adventure.

9. Mandate is a contract, by which one employs another to manage any buſineſs for him; and by the Roman law, it muſt have been gratuitous. It may be conſtituted tacitly, by one's ſuffering another to act in a certain branch of his affairs, for a tract of time together, without challenge. The mandatory is at liberty not to accept of the mandate; and, as his powers are ſolely founded in the mandant's commiſſion, he muſt, if he undertakes it, ſtrictly adhere to the directions given him: Nor is it a good defence, that the method he followed was more rational; for in that his employer was the proper judge. Where no ſpecial rules are preſcribed, the mandatory, if he acts prudently, is ſecure, whatever the ſucceſs may be; and he can ſue for the recovery of all the expences reaſonably diſburſed by him in the execution of his office.

10. Mandates may be general, containing a power of adminiſtring the mandant's whole affairs; but no mandate implies a power of diſpoſing gratuitouſly of the conſtituent's property; nor even of ſelling his heritage for an adequate price: But a general mandatory may ſell ſuch of the moveables as muſt otherwiſe periſh. No mandatory can, without ſpecial powers, tranſact doubtful claims belonging to his conſtituent, or refer them to arbiters.

11. Mandates expire, 1. By the revocation of the employer, though only tacit, as if he ſhould name another mandatory for the ſame buſineſs. 2. By the renunciation of the mandatory; even after he has executed part of his commiſſion, if his office be gratuitous. 3. By the death, either of the mandant or mandatory: But if matters are not entire, the mandate continues in force, notwithſtanding ſuch revocation, renunciation, or death. Procuratories of reſignation, and precepts of ſeiſin, are made out in the form of mandates; but, becauſe they are granted for the ſole benefit of the mandatory, all of them, excepting precepts of *clare conſtat*, are declared to continue after the death either of the granter or grantee. Deeds which contain a clauſe or mandate for regiſtration, are for the ſame reaſon made regiſtrable after the death of either.

12 The favour of commerce has introduced a tacit mandate, by which maſters of ſhips are empowered to contract in name of their exercitors or employers, for repairs, ſhip-proviſions, and whatever elſe may be neceſſary for the ſhip or crew; ſo as to oblige, not themſelves only, but their employers. Whoever has the actual charge of the ſhip is deemed the maſter, though he ſhould have no commiſſion from the exercitors, or ſhould be ſubſtituted by the maſter in the direction of the ſhip without their knowledge. Exercitors are liable, whether the maſter has paid his own money to a merchant for neceſſaries, or has borrowed money to purchaſe them. The furniſher or lender muſt prove that the ſhip needed repairs, proviſions, *&c.* to ſuch an extent; but he is under no neceſſity to prove the application of the money or materials to the ſhip's uſe. If there are ſeveral exercitors, they are liable *ſinguli in ſolidum*. In the ſame manner the undertaker of any branch of trade, manufacture, or other land-negotiation, is bound by the contracts of the inſtitors whom he ſets over it, in ſo far as relates to the ſubject of the *præpoſitura*.

13. Contracts and obligations, in themſelves imperfect, receive ſtrength, by the contracter or his heirs doing any act thereafter which imports an approbation of them, and conſequently ſupplies the want of an original legal conſent. This is called homologation; and it takes place even in deeds intrinſically null, whether the nullity ariſes from the want of ſtatutory ſolemnities, or from the incapacity of the granter. It cannot be inferred, 1. By the act of a perſon who was not in the knowledge of the original deed; for one cannot approve what he is ignorant of. 2. Homologation has no place where the act or deed which is pleaded as ſuch can be aſcribed to any other cauſe; for an intention to come under an obligation is not preſumed.

14. Quaſi-contracts are formed without explicit conſent, by one of the parties doing ſomething that by its nature either obliges him to the other party or the other party to him. Under this claſs may be reckoned tutory, *&c.* the entry of an heir, *negotiorum geſtio*, *indebiti ſolutio*, communion of goods between two or more common proprietors, and *mercium jactus levandæ navis cauſa*. *Negotiorum geſtio* forms thoſe obligations which ariſe from the management of a perſon's affairs in his abſence, by another, without a mandate. As ſuch manager acts without authority from the proprietor, he ought to be liable in exact diligence, unleſs he has from friendſhip interpoſed in affairs which admitted no delay; and he is accountable for his intromiſſions with intereſt. On the

other part, he is intitled to the recovery of his neceſſary diſburſements on the ſubject, and to be relieved of the obligations in which he may have bound himſelf in conſequence of the management.

15. *Indebiti ſolutio*, or the payment to one of what is not due to him, if made through any miſtake, either of fact, or even of law, founds him who made the payment in an action againſt the receiver for repayment (*condictio indebiti.*) This action does not lie, 1. If the ſum paid was due *ex æquitate*, or by a natural obligation; for the obligation to reſtore is founded ſolely in equity. 2. If he who made the payment knew that nothing was due; for *qui conſulto dat quod non debebat, præſumitur donare.*

16. Where two or more perſons become common proprietors of the ſame ſubject, either by legacy, gift or purchaſe, without the view of co-partnerſhip, an obligation is thereby created among the proprietors to communicate the profit and loſs ariſing from the ſubject, while it remains common: And the ſubject may be divided at the ſuit of any having intereſt. This diviſion, where the queſtion is among the common proprietors, is *according to the valuation of their reſpective properties:* But, where the queſtion is between the proprietors and thoſe having ſervitudes upon the property, the ſuperfice is only divided, without prejudice to the property. Commonties belonging to the King, or to royal boroughs, are not diviſible. Lands lying runrig, and belonging to different proprietors, may be divided, with the exception of borough and incorporated acres; the execution of which is committed to the judge-ordinary, or juſtices of the peace.

17. The throwing of goods overboard, for lightening a ſhip in a ſtorm, creates an obligation, whereby the owners of the ſhip and goods ſaved are obliged to contribute for the relief of thoſe whoſe goods were thrown overboard, that ſo all may bear a proportional loſs of the goods ejected for the common ſafety. In this contribution, the ſhip's proviſions ſuffer no eſtimation. A maſter who has cut his maſt, or parted with his anchor, to ſave the ſhip, is intitled to this relief; but if he has loſt them by the ſtorm, the loſs falls only on the ſhip and freight. If the ejection does not ſave the ſhip, the goods preſerved from ſhipwreck are not liable in contribution. Ejection may be lawfully made, if the maſter and a third part of the mariners judge that meaſure neceſſary, though the owner of the goods ſhould oppoſe it: And the goods ejected are to be valued at the price that the goods of the ſame ſort which are ſaved ſhall be afterwards ſold for.

18. There are certain obligations, which cannot ſubſiſt by themſelves, but are acceſſions to, or make a part of other obligations. Of this ſort are fidejuſſion, and the obligation to pay intereſt. Cautionry, or fidejuſſion, is that obligation by which one becomes engaged as ſecurity for another, that he ſhall either pay a ſum, or perform a deed.

19. A cautioner for a ſum of money may be bound, either ſimply as cautioner for the principal debtor, or conjunctly and ſeverally for and with the principal debtor. The firſt has, by our cuſtoms, the *beneficium ordinis*, or of diſcuſſion; by which the creditor is obliged to diſcuſs the proper debtor, before he can inſiſt for payment againſt the cautioner. Where one is bound as full debtor with and for the principal, or conjunctly and ſeverally with him, the two obligants are bound equally in the ſame obligation, each *in ſolidum*; and conſequently, the cautioner, though he is but an acceſſory, may be ſued for the whole, without either diſcuſſing, or even citing the principal debtor. Cautioners for performance of facts by another, or for the faithful diſcharge of an office, *e. g.* for factors, tutors, *&c.* cannot by the nature of their engagement be bound conjunctly and ſeverally with the principal obligant, becauſe the fact to which the principal is bound cannot poſſibly be performed by any other. In ſuch engagements, therefore, the failure muſt be previouſly conſtituted againſt the proper debtor, before action can be brought againſt the cautioner, for making up the loſs of the party ſuffering.

20. The cautioner, who binds himſelf at the deſire of the principal debtor, has an *actio mandati*, or of relief againſt him, for recovering the principal and intereſt paid by himſelf to the creditor, and for neceſſary damages; which action lies *de jure*, though the creditor ſhould not aſſign to him on payment. As relief againſt the debtor is implied in fidejuſſory obligations, the cautioner, where ſuch relief is cut off, is no longer bound: Hence, the defence of preſcription frees the cautioner, as well as the principal debtor.

21. But, 1. Where the cautionry is interpoſed to an obligation merely natural, the relief is reſtricted to the ſums that have really turned to the debtor's profit. 2. A cautioner who pays without citing the debtor, loſes his relief, in ſo far as the debtor had a relevant defence againſt the debt, in whole or in part. Relief is not competent to the cautioner, till he either pays the debt, or is diſtreſſed for it; except, 1. Where the debtor is expreſsly bound to deliver to the cautioner his obligation cancelled, againſt a day certain, and has failed; or, 2. Where the debtor is *vergens ad inopiam*; in which caſe the cautioner may, by proper diligence, ſecure the debtor's funds for his own relief, even before payment or diſtreſs.

22. A right of relief is competent *de jure* to the cautioner who pays againſt his co-cautioners, unleſs where the cautioner appears to have renounced it. In conſequence of this implied relief, a creditor, if he ſhall grant a diſcharge to any one of the cautioners, muſt, in demanding the debt from the others, deduct that part, as to which he has cut off their relief by that diſcharge. Where a cautioner in a bond ſigns a bond of corroboration, as a principal obligant with the proper debtor, and with them a new cautioner, the cautioner in the new bond is intitled to a total relief againſt the firſt cautioner, at whoſe deſire he is preſumed to be bound.

23. Cautionry is alſo judicial, as in a ſuſpenſion. It is ſufficient to looſe the cautioner, that when he became bound, the ſuſpender had good reaſon to ſuſpend, *e. g.* if the charger had at that period no title, or had not then performed his part, though theſe grounds of ſuſpenſion ſhould be afterwards taken off. In all maritime cauſes, where the parties are frequently foreigners, the defender muſt give caution *judicio ſiſti et judicatum ſolvi*: Such cautioner gets free by the death of the defender before

ſentence; but he continues bound, though the cauſe ſhould be carried from the admiral to the court of ſeſſion. This ſort of caution is only to be exacted in cauſes ſtrictly maritime.

24. It happens frequently, that a creditor takes two or more obligants bound to him, all as principal debtors, without fidejuſſion. Where they are ſo bound, for the performance of facts that are in themſelves indiviſible, they are liable each for the whole, or *ſinguli in ſolidum*. But, if the obligation be for a ſum of money, they are only liable *pro rata*; unleſs, 1. Where they are in expreſs words bound conjunctly and ſeverally; or, 2. In the caſe of bills or promiſſory notes One of ſeveral obligants of this ſort, who pays the whole debt, or fulfils the obligation, is intitled to a proportional relief againſt the reſt; in ſuch manner, that the loſs muſt, in every caſe, fall equally upon all the ſolvant obligants.

25. Obligations for ſums of money are frequently accompanied with an obligation for the annualrent or intereſt thereof. Intereſt (*uſuræ*) is the profit due, by the debtor of a ſum of money, to the creditor, for the uſe of it. The canon law conſidered the taking of intereſt as unlawful: The law of Moſes allowed it to be exacted from ſtrangers; and all the reformed nations of Europe have found it neceſſary, after the example of the Romans, to authoriſe it at certain rates fixed by ſtatute. Soon after the reformation, our legal intereſt was fixed at the rate of ten *per cent. per annum*; from which time, it has been gradually reduced, till at laſt, by 12. *Ann. ſtat.* 2. *c.* 16. it was brought to five *per cent.* and has continued at that rate ever ſince.

26 Intereſt is due, either by law, or by paction. It is due by law, either from the force of ſtatute, under which may be included acts of ſederunt, or from the nature of the tranſaction. Bills of exchange, and inland bills, though they ſhould not be proteſted, carry intereſt from their date in caſe of not acceptance; or from the day of their falling due, in caſe of acceptance and not payment. Where a bill is accepted, which bears no term of payment, or which is payable on demand, no intereſt is due till demand be made of the ſum, the legal voucher of which is a notorial proteſt. Intereſt is due by a debtor after denunciation, for all the ſums contained in the diligence, even for that part which is made up of intereſt. Sums paid by cautioners on diſtreſs, carry intereſt, not only as to the principal ſum in the obligation, but as to to the intereſt paid by the cautioner. Factors named by the court of Seſſion are liable for intereſt by a ſpecial act of ſederunt; ſee Tit. xix. 10.

27. It ariſes *ex lege*, or from the nature of the tranſaction, that a purchaſer in a ſale is liable in intereſt for the price of the lands bought from the term of his entry, though the price ſhould be arreſted in his hands, or tho' the ſeller ſhould not be able to deliver to him a ſufficient progreſs or title to the lands; for no purchaſer can in equity enjoy the fruits of the lands, while at the ſame time he retains the intereſt of the price: But lawful conſignation of the price made by a purchaſer, upon the refuſal of the perſons having right to receive it, ſtops the currency of intereſt. Where one intermeddles with money belonging to another which carries intereſt, he ought to reſtore it *cum omni obventione et cauſa*, and is therefore liable in the intereſt of it, as being truly an acceſſory of the ſubject itſelf. It is alſo from the nature of the tranſaction, that intereſt is in certain caſes allowed to merchants or others in name of damages.

28. Intereſt is due by expreſs paction, where there is a clauſe in a bond or obligation, by which money is made to carry intereſt. An obligation is not lawful, where it is agreed on, that the yearly intereſt of the ſum lent, if it ſhould not be paid punctually as it falls due, ſhall be accumulated into a principal ſum bearing intereſt; but an obligation may be lawfully granted, not only for the ſum truly lent, but for the intereſt to the day at which the obligation is made payable, whereby the intermediate intereſt is accumulated into a principal ſum, from the term of payment. Intereſt may be alſo due by implied paction: Thus, where intereſt upon a debt is by a letter promiſed for time paſt, ſuch promiſe implies a paction for intereſt as long as the debt remains unpaid; thus alſo, the uſe of payment of intereſt preſumes a paction, and when intereſt is expreſſed for one term, it is preſumed to be bargained for till payment.

29. The ſubject matter of all obligations conſiſts either of things, or of facts. Things exempted from commerce cannot be the ſubject of obligation. See Tit. viii. 2. et ſeq. One cannot be obliged to the performance of a fact naturally impoſſible; nor of a fact in itſelf immoral, for that is alſo in the judgment of law impoſſible. Since impoſſible obligations are null, no penalty or damage can be incurred for non-performance: but it is otherwiſe, if the fact be in itſelf poſſible, though not in the debtor's power; in which caſe the rule obtains, *locum facti impræſtabilis ſubit damnum et intereſſe*.

30. An obligation, to which a condition is adjected, either naturally or morally impoſſible, is in the general caſe null; for the parties are preſumed not to have been ſerious. But ſuch obligation is valid, and the condition thereof held *pro non ſcripta*, 1. In teſtaments; 2. In obligations, to the performance of which the granter lies under a natural tie, as in bonds of proviſion to a child. Where an obligation is granted under a condition, lawful but unfavourable, *e. g.* that the creditor ſhall not marry without the conſent of certain friends, no more weight is given to the condition than the judge thinks reaſonable, A condition, which is in ſome degree in the power of the creditor himſelf, is held as fulfilled, if he has done all he could to fulfil it. Implement or performance cannot be demanded in a mutual contract, by that party who himſelf declines, or cannot fulfil the counterpart.

31. Donation, ſo long as the ſubject is not delivered to the donee, may be juſtly ranked among obligations; and it is that obligation which ariſes from the mere good will and liberality of the granter. Donations imply no warrandice, but from the future facts of the donor. They are hardly revokable by our law for ingratitude, though it ſhould be of the groſſeſt kind: Thoſe betwixt man and wife are revokable by the donor, even after the death of the donee; but remuneratory grants, not being truly donations, cannot be ſo revoked. That ſpecial ſort of donation, which is conſtituted verbally, is called a promiſe. The Roman law intitled all donors to the *be-*

neficium competentiæ, in virtue of which they might retain ſuch part of the donation as was neceſſary for their own ſubſiſtence. Our law allows this benefit to fathers, with reſpect to the proviſions granted to their children, and to grandfathers, which is a natural conſequence of childrens obligation to aliment their indigent parents; but to no collateral relation, not even to brothers.

32. Donations, made in contemplation of death, or *mortis cauſa*, are of the nature of legacies, and like them revokable: Conſequently, not being effectual in the granter's life, they cannot compete with any of his creditors; not even with thoſe whoſe debts were contracted after the donation. They are underſtood to be given from a perſonal regard to the donee, and therefore fall by his predeceaſe. No deed, after delivery, is to be preſumed a *donatio mortis cauſa*; for revocation is excluded by delivery.

33. Deeds are not preſumed, *in dubio*, to be donations. Hence, a deed by a debtor to his creditor, if donation be not expreſſed, is preſumed to be granted in ſecurity or ſatisfaction of the debt; but bonds of proviſion to children are, from the preſumption of paternal affection, conſtrued to be intended as an additional patrimony: Yet a tocher, given to a daughter in her marriage-contract, is preſumed to be in ſatisfaction of all former bonds and debts; becauſe marriage contracts uſually contain the whole proviſions in favour of the bride. One who aliments a perſon that is come of age, without an expreſs paction for board, is preſumed to have entertained him as a friend, unleſs in the caſe of thoſe who earn their living by the entertainment or board of ſtrangers. But alimony given to minors, who cannot bargain for themſelves, is not accounted a donation; except either where it is preſumed, from the near relation of the perſon alimenting, that it was given *ex pietate*; or where the minor had a father or curators, with whom a bargain might have been made.

Tit. 23. *Of the Diſſolution or Extinction of Obligations.*

Obligations may be diſſolved by performance or implement, conſent, compenſation, novation, and confuſion. 1. By ſpecifical performance: Thus, an obligation for a ſum of money is extinguiſhed by payment. The creditor is not obliged to accept of payment by parts, unleſs where the ſum is payable by different diviſions. If a debtor in two or more ſeparate bonds to the ſame creditor, made an indefinite payment, without aſcribing it, at the time, to any one of the obligations, the payment is applied, 1. To intereſt, or to ſums not bearing intereſt. 2. To the ſums that are leaſt ſecured, if the debtor thereby incurs no rigorous penalty. But, 3. If this application be penal on the debtor, *e. g.* by ſuffering the legal of an adjudication to expire, the payment will be ſo applied to as to ſave the debtor from that forfeiture. Where one of the debts is ſecured by a cautioner, the other not, the application is to be ſo made, *cæteris paribus*, that both creditor and cautioner may have equal juſtice done to them.

2. Payment made by the debtor upon a miſtake in fact, to one whom he believed, upon probable grounds, to have the right of receiving payment, extinguiſhes the obligation. But payment made to one, to whom the law denies the power of receiving it, has not this effect; as if a debtor, ſeized by letters of caption, ſhould make payment to the meſſenger; for *ignorantia juris neminem excuſat*. In all debts, the debtor, if he be not interpelled, may ſafely pay before the term, except in tack-duties or feu-duties; the payment whereof, before the terms at which they are made payable, is conſtrued to be colluſive, in a queſtion with a creditor of the landlord or ſuperior. Payment is *in dubio* preſumed, by the voucher of the debt being in the hands of the debtor; *chirographum, apud debitorem repertum, præſumitur ſolutum.*

3. Obligations are extinguiſhable by the conſent of the creditor, who, without full implement, or even any implement, may renounce the right conſtituted in his own favour. Though a diſcharge or acquittance, granted by one whom the debtor *bona fide* took for the creditor, but who was not, extinguiſhes the obligation, if the ſatisfaction made by the debtor was real; yet where it is imaginary, the diſcharge will not ſcreen him from paying to the true creditor the debt that he had made no prior ſatisfaction for. In all debts which are conſtituted by writing, the extinction, whether it be by ſpecifical performance, or bare conſent, muſt be proved, either by the oath of the creditor, or by a diſcharge in writing; and the ſame ſolemnities which law requires in the obligation, are neceſſary in the diſcharge: But, where payment is made, not by the debtor himſelf, but by the creditor's intromiſſion with the rents of the debtor's eſtate, or by delivery to him of goods in name of the debtor, ſuch delivery or intromiſſion, being *facti*, may be proved by witneſſes, though the debt ſhould have been not only conſtituted by writing, but made real on the debtor's lands by adjudication.

4. A diſcharge, though it ſhould be general, of all that the granter can demand, extends not to debts of an uncommon kind, which are not preſumed to have been under the granter's eye. This doctrine applies alſo to general aſſignations. In annual payments, as of rents, feu-duties, intereſt, &c. three conſecutive diſcharges by the creditor, of the yearly or termly duties, preſume the payment of all preceedings. Two diſcharges by the anceſtor, and the third by the heir, do not infer this preſumption, if the heir was ignorant of the anceſtor's diſcharges. And diſcharges by an adminiſtrator, as a factor, tutor, &c. preſume only the payment of all preceeding duties incurred during his adminiſtration. This preſumption ariſes from repeating the diſcharges thrice ſucceſſively; and ſo does not hold in the caſe of two diſcharges, though they ſhould include the duties of three or more terms.

5. Where the ſame perſon is both creditor and debtor to another, the mutual obligations, if they are for equal ſums, are extinguiſhed by compenſation; if for unequal, ſtill the leſſer obligation is extinguiſhed, and the greater diminiſhed, as far as the concourſe of debt and credit goes. To found compenſation, 1. Each of the parties muſt be debtor and creditor at the ſame time. 2. Each

of them muſt be debtor and creditor in his own right. 3. The mutual debts muſt be of the ſame quality: Hence, a ſum of money cannot be compenſated with a quantity of corns; becauſe, till the prices are fixed, at which the corns are to be converted into money, the two debts are incommenſurable. Laſtly, compenſation cannot be admitted, where the mutual debts are not clearly aſcertained, either by a written obligation, the ſentence of a judge, or the oath of the party. Where this requires but a ſhort diſcuſſion, ſentence for the purſuer is delayed for ſome time, *ex æquitate*, that the defender may make good his ground of compenſation. Where a debt for fungibles is aſcertained in money, by the ſentence of a judge, the compenſation can have no effect farther back than the liquidation, becauſe, before ſentence, the debts were incommenſurable: But, where a debt for a ſum of money is, in the courſe of a ſuit, conſtituted by the oath of the debtor, the compenſation, after it is admitted by the judge, operates, *retro*, in ſo far as concerns the currency of intereſt, to the time that, by the parties acknowledgment, the debt became due; for, in this caſe, the debtor's oath is not what creates the debt, or makes it liquid; it only declares that ſuch a liquid ſum was truly due before. Compenſation cannot be offered after decree, either by way of ſuſpenſion or reduction; unleſs it has been formerly pleaded, and unjuſtly repelled. Decrees in abſence are excepted.

6. The right of retention, which bears a near reſemblance to compenſation, is chiefly competent, where the mutual debts, not being liquid, cannot be the ground of compenſation; and it is ſometimes admitted *ex æquitate*, in liquid debts, where compenſation is excluded by ſtatute: Thus, though compenſation cannot be pleaded after decree, either againſt a creditor or his aſſigney; yet, if the original creditor ſhould become bankrupt, the debtor, even after decree, may retain againſt the aſſigney, till he gives ſecurity for ſatisfying the debtor's claim againſt the cedent. This right is frequently founded in the expence diſburſed or work employed on the ſubject retained, and ſo ariſes from the mutual obligations incumbent on the parties. But retention may be ſuſtained, though the debt due to him who claims it does not ariſe from the nature of the obligation by which he is debtor: Thus, a factor on a land-eſtate may retain the ſums levied by him in conſequence of his factory, not only till he be paid of the diſburſements made on occaſion of ſuch eſtate, but alſo till he be diſcharged from the ſeparate engagements he may have entered into on his conſtituent's account.

7. Obligations are diſſolved by novation, whereby one obligation is changed into another, without changing either the debtor or creditor. The firſt obligation being thereby extinguiſhed, the cautioners in it are looſed, and all its conſequences diſcharged; ſo that the debtor remains bound only by the laſt. As a creditor to whom a right is once conſtituted, ought not to loſe it by implication, novation is not eaſily preſumed, and the new obligation is conſtrued to be merely corroborative of the old; but, where the ſecond obligation expreſsly bears to be *in ſatisfaction* of the firſt, theſe words muſt neceſſarily be explained into novation. Where the creditor accepts of a new debtor, in place of the former who is diſcharged, this method of extinction is called delegation.

8. Obligations are extinguiſhed *confuſione*, where the debt and credit meet in the ſame perſon, either by ſucceſſion or ſingular title, *e. g.* when the debtor ſucceeds to the creditor, or the creditor to the debtor, or a ſtranger to both, for one cannot be debtor to himſelf. If the ſucceſſion, from which the *confuſio* ariſes, happens afterwards to be divided, ſo as the debtor and creditor come again to be different perſons; the *confuſio* does not produce an extinction, but only a temporary ſuſpenſion of the debt.

Tit. 24. *Of Aſſignations.*

Heritable rights, when they are cloathed with infeftment, are tranſmitted by diſpoſition, which is a writing containing procuratory of reſignation and precept of ſeiſin; but thoſe which either require no ſeiſin, or on which ſeiſin has actually followed, are tranſmiſſible by ſimple aſſignation. He who grants the aſſignation, is called the cedent; and he who receives it, the aſſigney or ceſſionary: If the aſſigney conveys his right to a third perſon, it is called a tranſlation; and if he aſſigns it back to the cedent, a retroceſſion. Certain rights are, from the uſes to which they are deſtined, incapable of tranſmiſſion, as alimentary rights: Others cannot be aſſigned by the perſon inveſted in them, without ſpecial powers given to him, as tacks, reverſions: The tranſmiſſion of a third ſort, is not preſumed to be intended, without an expreſs conveyance; as of paraphernal goods, which are ſo proper to the wife, that a general aſſignation by her to her huſband, of all that did or ſhould belong to her at her deceaſe, does not comprehend them. A liferent-right is, by its nature, incapable of a proper tranſmiſſion; but its profits may be aſſigned, while it ſubſiſts.

2. Aſſignations muſt not only be delivered to the aſſigney, but intimated by him to the debtor. Intimations are conſidered as ſo neceſſary for compleating the conveyance, that in a competition between two aſſignations, the laſt, if firſt intimated, is preferred.

3. Though, regularly, intimation to the debtor is made by an inſtrument, taken in the hands of a notary, by the aſſigney or his procurator; yet the law admits equipollencies, where the notice of the aſſignment given to the debtor is equally ſtrong. Thus, a charge upon letters of horning at the aſſigney's inſtance, or a ſuit brought by him againſt the debtor, ſupplies the want of intimation; theſe being judicial acts, which expoſe the conveyance to the eyes both of the judge and of the debtor; or the debtor's promiſe of payment by writing to the aſſigney, becauſe that is in effect a corroborating of the original debt. The aſſigney's poſſeſſion of the right, by entering into payment of the rents or intereſt, is alſo equal to an intimation; for it imports, not only notice to the debtor, but his actual compliance: But the debtor's private knowledge of the aſſignment is not ſuſtained as intimation.

4. Certain conveyances need no intimation. 1. Indorſations of bills of exchange; for theſe are not to be fettered with forms, introduced by the laws of particular ſtates. 2. Bank-notes are fully conveyed by the bare

delivery of them; for as they are payable to the bearer, their property muſt paſs with their poſſeſſion. 3. Adjudication, which is a judicial conveyance, and marriage, which is a legal one, carry the full right of the ſubjects thereby conveyed, without intimation: nevertheleſs, as there is nothing in theſe conveyances which can of themſelves put the debtor *in mala fide*, he is therefore *in tuto* to pay to the wife, or to the original creditor in the debt adjudged, till the marriage or adjudication be notified to him. Aſſignments of moveable ſubjects, though they be intimated, if they are made *retenta poſſeſſione*, (the cedent retaining the poſſeſſion), cannot hurt the cedent's creditors; for ſuch rights are preſumed, in all queſtions with creditors, to be colluſive, and granted in truſt for the cedent himſelf.

5. An aſſignation carries to the aſſigney the whole right of the ſubject conveyed, as it was in the cedent; and conſequently, he may uſe diligence, either in his cedent's name while he is alive, or in his own.

6. After an aſſignation is intimated, the debtor cannot prove payment, or compenſation, by the oath of the cedent, who has no longer any intereſt in the debt; unleſs the matter has been made litigious by an action commenced prior to the intimation: But the debtor may refer to the oath of the aſſigney, who is in the right of the debt, that the aſſignment was gratuitous, or in truſt for the cedent; either of which being proved, the oath of the cedent will affect the aſſigney. If the aſſignation be in part onerous, and in part gratuitous, the cedent's oath is good againſt the aſſigney, only in ſo far as his right is gratuitous. All defences competent againſt the original creditor in a moveable debt, which can be proved otherwiſe than by his oath, continue relevant againſt even an onerous aſſigney; whoſe right can be no better than that of his author, and muſt therefore remain affected with all the burdens which attended it in the author's perſon.

Tit. 25. *Of Arreſtments and Poindings.*

THE diligences, whereby a creditor may affect his debtor's moveable ſubjects, are arreſtment and poinding. By arreſtment is ſometimes meant the ſecuring of a criminal's perſon till trial; but as it is underſtood in the rubric of this title, it is the order of a judge, by which he who is debtor in a moveable obligation to the arreſter's debtor, is prohibited to make payment or delivery till the debt due to the arreſter be paid or ſecured. The arreſter's debtor is uſually called the common debtor; becauſe, where there are two or more competing creditors, he is debtor to all of them. The perſon in whoſe hands the diligence is uſed, is ſtyled the arreſtee.

2. Arreſtment may be laid on by the authority either of the ſupreme court, or of an inferior judge. In the firſt caſe, it proceeds either upon ſpecial letters of arreſtment, or on a warrant contained in letters of horning; and it muſt be executed by a meſſenger. The warrants granted by inferior judges are called precepts of arreſtment, and they are executed by the officer proper to the court. Where the debtor to the common debtor is a pupil, arreſtment is properly uſed in the hands of the tutor, as the pupil's adminiſtrator: This doctrine may perhaps extend to other general adminiſtrators, as commiſſioner, *&c.* But arreſtment, uſed in the hands of a factor or ſteward, cannot found an action of forthcoming without calling the conſtituent. Where the debtor to the common debtor is a corporation, arreſtment muſt be uſed in the hands of the directors or treaſurer, who repreſent the whole body. Arreſtment, when it is uſed in the hands of the debtor himſelf, is inept; for that diligence is intended only as a reſtraint upon third parties.

3. All debts, in which one is perſonally bound, though they ſhould be heritably ſecured, are grounds upon which the creditor may arreſt the moveable eſtate belonging to his debtor. Arreſtment may proceed on a debt, the term of payment whereof is not yet come, in caſe the debtor be *vergens ad inopiam*. If a debt be not yet conſtituted by decree or regiſtration, the creditor may raiſe and execute a ſummons againſt his debtor for payment, on which pending action arreſtment may be uſed, in the ſame manner as inhibition, which is called arreſtment upon a dependence. If one's ground of credit be for the performance of a fact, or if his depending proceſs be merely declaratory, without a concluſion of payment or delivery, ſuch claims are not admitted to be ſufficient grounds for arreſtment.

4. Moveable debts are the proper ſubject of arreſtment; under which are comprehended conditional debts, and even depending claims. For leſſening the expence of diligence to creditors, all bonds which have not been made properly heritable by ſeiſin are declared arreſtable. But this does not extend to adjudications, wadſets, or other perſonal rights of lands, which are not properly debts. Certain moveable debts are not arreſtable. 1. Debts due by bill, which paſs from hand to hand as bags of money. 2. Future debts; for though inhibition extends to *adquirenda* as well as *adquiſita*, yet arreſtment is limited, by its warrant, to the debt due at the time of ſerving it againſt the arreſtee. Hence, an arreſtment of rents or intereſt carries only thoſe that have already either fallen due, or at leaſt become current. Claims, depending on the iſſue of a ſuit, are not conſidered as future debts; for the ſentence, when pronounced, has a retroſpect to the period at which the claim was firſt founded. The like doctrine holds in conditional debts. 3. Alimentary debts are not arreſtable; for theſe are granted on perſonal conſiderations, and ſo are not communicable to creditors; but the paſt intereſt due upon ſuch debt may be arreſted by the perſon who has furniſhed the alimony. One cannot ſecure his own effects to himſelf for his maintenance, ſo as they ſhall not be affectable by his creditors. Salaries annexed to offices granted by the king, and particularly thoſe granted to the judges of the Seſſion, and the fees of ſervants, are conſidered as alimentary funds; but the ſurplus fee, over and above what is neceſſary for the ſervant's perſonal uſes, may be arreſted.

5. If, in contempt of the arreſtment, the arreſtee ſhall make payment of the ſum, or deliver the goods arreſted, to the common debtor, he is not only liable criminally for breach of arreſtment, but he muſt pay the debt again to the arreſter. Arreſtment is not merely prohibitory, as inhibitions are; but is a ſtep of diligence which founds the uſer in a ſubſequent action, whereby the property of

the ſubject arreſted may be adjudged to him: It therefore does not, by our later practice, fall by the death of the arreſtee, but continues to ſubſiſt, as a foundation for an action of forthcoming againſt his heir, while the ſubject arreſted remains *in medio*. Far leſs is arreſtment loſt, either by the death of the arreſter, or of the common debtor.

6. Where arreſtment proceeds on a depending action, it may be looſed by the common debtor's giving ſecurity to the arreſter for his debt, in the event it ſhall be found due. Arreſtment founded on decrees, or on regiſtred obligations, which in the judgment of law are decrees, cannot be looſed, but upon payment or conſignation; except, 1. Where the term of payment of the debt is not yet come, or the condition has not yet exiſted. 2. Where the arreſtment has proceeded on a regiſtred contract, in which the debts or mutual obligations are not liquid. 3. Where the decree is ſuſpended, or turned into a libel; for, till the ſuſpenſion be diſcuſſed, or the pending action concluded, it cannot be known whether any debt be truly due. A looſing takes off the *nexus*, which had been laid on the ſubject arreſted; ſo that the arreſtee may thereafter pay ſafely to his creditor, and the cautioner is ſubſtituted in place of the arreſtment, for the arreſter's ſecurity: Yet the arreſter may, while the ſubject continues with the arreſtee, purſue him in a forthcoming, notwithſtanding the looſing.

7. Arreſtment is only an inchoated or begun diligence; to perfect it, there muſt be an action brought by the arreſter againſt the arreſtee, to make the debt or ſubject arreſted forthcoming. In this action, the common debtor muſt be called for his intereſt, that he may have an opportunity of excepting to the lawfulneſs or extent of the debt, on which the diligence proceeded. Before a forthcoming can be purſued, the debt due by the common debtor to the arreſter, muſt be liquidated; for the arreſter can be no further intitled to the ſubject arreſted than to the extent of the debt due to him by the common debtor. Where the ſubject arreſted is a ſum of money, it is, by the decree of forthcoming, directed to be paid to the purſuer towards ſatisfying his debt; where goods are arreſted, the judge ordains them to be expoſed ſale, and the price to be delivered to the purſuer. So that in either caſe, decrees of forthcoming are judicial aſſignations to the arreſter of the ſubject arreſted.

8. In all competitions, regard is had to the dates, not of the grounds of debt, but of the diligences proceeding upon them. In the competition of arreſtments, the preference is governed by their dates, according to the priority even of hours, where it appears with any certainty which is the firſt. But, as arreſtment is but a begun diligence, therefore if a prior arreſter ſhall neglect to inſiſt in an action of forthcoming for ſuch a time as may be reaſonably conſtrued into a deſertion of his begun diligence, he loſes his preference. But, as dereliction of diligence is not eaſily preſumed, the diſtance of above two years, between the firſt arreſtment and the decree of forthcoming, was found not to make ſuch a *mora* as to intitle the poſterior arreſter to a preference. This rule of preference, according to the dates of the ſeveral arreſtments, holds, by our preſent practice, whether they have proceeded on a decree, or on a dependence; on debts not yet payable, or on debts already payable; provided the pendency ſhall have been cloſed, or the debt have become payable, before the iſſue of the competition.

9. In the competition of arreſtments with aſſignations, an aſſignation by the common debtor, intimated before arreſtment, is preferable to the arreſtment. If the aſſignation is granted before arreſtment, but not intimated till after it, the arreſter is preferred.

10. Poinding is that diligence affecting moveable ſubjects, by which their property is carried directly to the creditor. No poinding can proceed, till a charge be given to the debtor to pay or perform, and the days thereof be expired, except poindings againſt vaſſals for their feu-duties, and poindings againſt tenants for rent, proceeding upon the landlord's own decree; in which the ancient cuſtom of poinding without a previous charge continues. A debtor's goods may be poinded by one creditor, though they have been arreſted before by another; for arreſtment being but an imperfect diligence, leaves the right of the ſubject ſtill in the debtor, and ſo cannot hinder any creditor from uſing a more perfect diligence, which has the effect of carrying the property directly to himſelf.

11. No cattle pertaining to the plough, nor inſtruments of tillage, can be poinded in the time of labouring or tilling the ground, unleſs where the debtor has no other goods. By labouring time is underſtood, that time, in which that tenant, whoſe goods are to be poinded, is ploughing, though he ſhould have been earlier or later than his neighbours; but ſummer-fallowing does not fall under this rule.

12. In the execution of poinding, the debtor's goods muſt be appriſed, firſt on the ground of the lands where they are laid hold on, and a ſecond time at the market-croſs of the juriſdiction, by the ſtated appriſers thereof; or, if there are none, by perſons named by the meſſenger or other officer employed in the diligence. Next, the meſſenger muſt, after public intimation by three oyeſſes, declare the value of the goods according to the ſecond appriſement, and require the debtor to make payment of the debt, including intereſt and expences. If payment ſhall be offered to the creditor, or in his abſence to his lawful attorney; or if, in caſe of refuſal by them, conſignation of the debt ſhall be made in the hands of the judge-ordinary or his clerk, the goods muſt be left with the debtor; if not, the meſſenger ought to adjudge and deliver them over, at the appriſed value, to the uſer of the diligence towards his payment: And the debtor is intitled to a copy of the warrant and executions, as a voucher that the debt is diſcharged in whole or in part by the goods poinded.

13. Miniſters may poind for their ſtipends, upon one appriſement on the ground of the lands; and landlords were always in uſe to poind ſo, for their rents. Appriſement of the goods at the market-croſs of the next royal borough, or even of the next head-borough of ſtewartry or regality, though theſe juriſdictions be aboliſhed, is declared as ſufficient as if they were carried to the head-borough of the ſhire. Poinding, whether it be conſidered as a ſentence, or as the execution of a ſentence, muſt be

proceeded in between ſun-riſing and ſun-ſetting; or at leaſt it muſt be finiſhed before the going off of daylight. The powers of the officer employed in the execution of poindings, are not clearly defined by cuſtom, in the caſe of a third party claiming the property of the goods to be poinded. This is certain, that he may take the oath of the claimant, upon the verity of his claim; and if from thence it ſhall appear that the claimant's title is colluſive, he ought to proceed in the diligence; but, if there remains the leaſt doubt, his ſafeſt courſe is to deliver the goods to the claimant, and to expreſs in his execution the reaſons why poinding did not proceed.

14. Any perſon who ſtops a poinding *via facti*, on groundleſs pretences, is liable, both criminally, in the pains of deforcement, (ſee Tit xxxiii. 15.) and civilly, in the value of the goods which might have been poinded by the creditor.

Tit. 26. *Of Preſcriptions.*

Prescription, which is a method, both of eſtabliſhing and of extinguiſhing property, is either poſitive or negative. Poſitive preſcription is generally defined, as the Roman *uſucapio*, the acquiſition of property (it ſhould rather be, when applied to our law, the ſecuring it againſt all further challenge) by the poſſeſſor's continuing his poſſeſſion for the time which law has declared ſufficient for that purpoſe: Negative, is the loſs or amiſſion of a right, by neglecting to follow it forth, or uſe it, during the whole time limited by law. The doctrine of preſcription, which is, by ſome writers, condemned as contrary to juſtice, has been introduced, that the claims of negligent creditors might not ſubſiſt for ever, that property might be at laſt fixed, and forgeries diſcouraged, which the difficulty of detecting muſt have made exceeding frequent, if no length of time had limited the legal effect of writings.

2. Poſitive preſcription was firſt introduced into our law by 1617, *c.* 12. which enacts, that whoever ſhall have poſſeſſed his lands, annualrents, or other heritages, peaceably, in virtue of infeftments, for forty years continually after their dates, ſhall not thereafter be diſquieted in his right by any perſon pretending a better title. Under *heritages* are comprehended every right that is *fundo annexum*, and capable of continual poſſeſſion. Continued poſſeſſion, if proved as far back as the memory of man, preſumes poſſeſſion upwards to the date of the infeftment. The whole courſe of poſſeſſion muſt by the act be founded on ſeiſins, and conſequently no part thereof on the bare right of apparency; but forty years poſſeſſion, without ſeiſin, is ſufficient in the preſcription of ſuch heritable rights as do not require ſeiſin. The poſſeſſion muſt alſo be without any *lawful* interruption, *i. e.* it muſt neither be interrupted *via facti*, nor *via juris*. The preſcription of ſubjects not expreſſed in the infeftment as part and pertinent of another ſubject ſpecially expreſſed, has been explained, Tit. xiii. 6.

3. The act requires, that the poſſeſſor produce, as his title of preſcription, a charter of the lands, preceeding the forty years poſſeſſion, with the ſeiſin following on it: and where there is no charter extant, ſeiſins, one or more ſtanding together for forty years, and proceeding either on retours, or precepts of *clare conſtat*. This has given riſe to a reaſonable diſtinction obſerved in practice, between the preſcription of a ſingular ſucceſſor, and of an heir. Singular ſucceſſors muſt produce for their title of preſcription, not only a ſeiſin, but its warrant, as a charter, diſpoſition, *&c.* either in their own perſon, or in that of their author: But the production by an heir of ſeiſins, one or more, ſtanding together for forty years, and proceeding on retours or precepts of *clare conſtat*, is ſufficient. The heir is not obliged to produce the retours or precepts on which his ſeiſins proceed, nor is the ſingular ſucceſſor obliged to produce the ground of his charter; ſo that if the title of preſcription produced be a fair deed, and a ſufficient title of property, the poſſeſſor is ſecure by the act, which admits no ground of challenge, but falſehood. A ſpecial ſtatute, for eſtabliſhing the poſitive preſcription in moveable rights, was not neceſſary; for, ſince a title in writing is not requiſite for the acquiring of theſe, the negative preſcription, by which all right of action for recovering their property is cut off, effectually ſecures the poſſeſſor.

4. The negative preſcription of obligations, by the lapſe of forty years, was introduced into our law long before the poſitive, by 1469, *c.* 29.—1474, *c.* 55. This preſcription is now amplified by the foreſaid act 1617, which has extended it to all actions competent upon heritable bonds, reverſions, and others whatſoever; unleſs where the reverſions are either incorporated in the body of the wadſet-right, or regiſtred in the regiſter of reverſions: And reverſions ſo incorporated, or regiſtred, are not only exempted from the negative preſcription, but they are an effectual bar againſt any perſon from pleading the poſitive.

5. A ſhorter negative preſcription is introduced by ſtatute, in certain rights and debts. Actions of ſpuilzie, ejection, *and others of that nature*, muſt be purſued within three years after the commiſſion of the fact on which the action is founded. As in ſpuilzes and ejections, the purſuer was intitled, *in odium* of violence, to a proof by his own oath *in litem*, and to the violent profits againſt the defender, the ſtatute meant only to limit theſe ſpecial privileges by a three years preſcription, without cutting off the right of action, where the claim is reſtricted to ſimple reſtitution. Under the general words, *and others of that nature*, are comprehended all actions where the purſuer is admitted to prove his libel by his own oath *in litem*.

6. Servants fees, houſe-rents, mens ordinaries, (*i. e.* mony due for board,) and merchants accounts, fall under the triennial preſcription, by 1579, *c.* 83. There is alſo a general clauſe ſubjoined to this ſtatute, of *other the like debts*, which includes alimentary debts, wages due to workmen, and accounts due to writers, agents, or procurators. Theſe debts may by this act, be proved after the three years, either by the writing or oath of the debtor; ſo that they preſcribe only as to the mean of proof by witneſſes; but after the three years, it behoves the creditor to refer to the debtor's oath, not only the conſtitution, but the ſubſiſtence of the debt. In the preſcription of houſe-rents, ſervants fees, and alimony, each

term's rent, fee, or alimony, runs a ſeparate courſe of preſcription; ſo that in an action for theſe, the claim will be reſtricted to the arrears incurred within the three years immediately before the citation: But, in accounts, preſcription does not begin till the laſt article; for a ſingle article cannot be called an account. Actions of removing muſt alſo be purſued within three years after the warning. Reductions of erroneous retours, preſcribe, if not purſued within twenty years.

7. Miniſters ſtipends and multures preſcribe in five years after they are due; and arrears of rent, five years after the tenant's removing from the lands. As the preſcription of mails and duties was introduced in favour of poor tenants, that they might not ſuffer by neglecting to preſerve their diſcharges, a proprietor of lands ſubject to a liferent, who had obtained a leaſe of all the liferented lands from the liferenter, is not intitled to plead it, nor a tackſman of one's whole eſtate, who had by the leaſe a power of removing tenants. Bargains concerning moveables, or ſums of money which are proveable by witneſſes, preſcribe in five years after the bargain. Under theſe are included ſales, locations, and all other conſenſual contracts, to the conſtitution of which writing is not neceſſary. But all the above mentioned debts, may, after the five years, be proved, either by the oath or the writing of the debtor; of which above, § 6. A quinquennial preſcription is eſtabliſhed in arreſtments, whether on decrees or depending actions: The firſt preſcribe in five years after uſing the arreſtment, and the laſt in five years after ſentence is pronounced on the depending action.

8. No perſon binding for or with another, either as cautioner or co-principal, in a bond or contract for a ſum of money, continues bound after ſeven years from the date of the bond, provided he has either a clauſe of relief in the bond, or a ſeparate bond of relief, intimated to the creditor, at his receiving the bond But all diligence uſed within the ſeven years againſt the cautioner, ſhall ſtand good. As this is a public law, intended to prevent the bad conſequences of raſh engagements, its benefit cannot, before the lapſe of the ſeven years, be renounced by the cautioner. As it is correctory, it is ſtrictly interpreted: Thus, bonds bearing a mutual clauſe of relief *pro rata*, fall not under it; nor bonds of corroboration, nor obligations, where the condition is not purified, or the term of payment not come within the ſeven years; becauſe no diligence can be uſed on theſe. The ſtatute excludes all cautionries for the faithful diſcharge of offices; theſe not being obligations in a bond or contract for ſums of money. And practice has denied the benefit of it to all judicial cautioners, as cautioners in a ſuſpenſion. Actions of count and reckoning, competent either to minors againſt their tutors or curators, or *vice verſa*, preſcribe in ten years after the majority or death of the minor.

9. Holograph bonds, miſſive letters, and books of account, not atteſted by witneſſes, preſcribe in twenty years, unleſs the creditor ſhall thereafter prove the verity of the ſubſcription by the debtor's oath. It is therefore ſufficient to ſave from the effect of this preſcription, that the conſtitution of the debt be proved by the party's oath, after the twenty years; whereas in ſtipends, merchants accounts, *&c.* not only the conſtitution, but the ſubſiſtence of the debt, muſt be proved by writing or the debtor's oath, after the term of preſcription. Some lawyers extend this preſcription of holograph writings to all obligations for ſums not exceeding L 100 *Scots*, which are not atteſted by witneſſes; becauſe though theſe are in practice ſuſtained, yet they ought not to have the ſame duration with deeds atteſted by witneſſes. Though in the ſhort preſcriptions of debts, the right of action is for ever loſt, if not exerciſed within the time limited; yet where action was brought on any of thoſe debts, before the preſcription was run, it ſubſiſted, like any other right, for forty years. As this defeated the purpoſe of the acts eſtabliſhing theſe preſcriptions, all proceſſes upon warnings, ſpuilzies, ejections, or arreſtments, or for payment of the debts contained in act 1669, *c.* 9. are by the ſaid act, joined with 1685, *c.* 14. declared to preſcribe in five years, if not wakened within that time; ſee Tit. 30.

10. Certain obligations are loſt by the lapſe of leſs than forty years, without the aid of ſtatute, where the nature of the obligation, and the circumſtances of parties, juſtify it: Thus, bills which are not intended for laſting ſecurities, produce no action, where the creditor has been long ſilent, unleſs the ſubſiſtence of the debt be proved by the debtor's oath; but the preciſe time is not fixed by practice. Thus alſo, a receipt for bills granted by a writer to his employer, not inſiſted upon for twenty three years, was found not productive of an action. The preſcriptions of the reſtitution of minors, of the benefit of inventory, *&c.* are explained in their proper places.

11. In the poſitive preſcription, as eſtabliſhed by the act 1617, the continued poſſeſſion for forty years, proceeding upon a title of property not chargeable with falſehood, ſecures the poſſeſſor againſt all other grounds of challenge, and ſo preſumes *bona fides*, *præſumptione juris et de jure*. In the long negative preſcription, *bona fides* in the debtor is not required: The creditor's neglecting to inſiſt for ſo long a time, is conſtrued as an abandoning of his debt, and ſo is equivalent to a diſcharge. Hence, though the ſubſiſtence of the debt ſhould be referred to the debtor's own oath, after the forty years, he is not liable.

12. Preſcription runs *de momento in momentum*: The whole time defined by law muſt be compleated, before a right can be either acquired or loſt by it; ſo that interruption, made on the laſt day of the fortieth year, breaks its courſe. The poſitive preſcription runs againſt the Sovereign himſelf, even as to his annexed property, but it is generally thought he cannot ſuffer by the negative: He is ſecured againſt the negligence of his officers, in the management of proceſſes by expreſs ſtatute, 1600, *c.* 14. The negative, as well as the poſitive preſcription, runs againſt the church, though churchmen have but a temporary intereſt in their benefices. But becauſe the rights of beneficiaries to their ſtipends are liable to accidents, through the frequent change of incumbents, thirteen years poſſeſſion does, by a rule of the Roman chancery which we have adopted, found a preſumptive title in the beneficiary: But this is not properly preſcription; for if by titles recovered, perhaps out of the incumbent's own

hands, it ſhall appear that he has poſſeſſed tithes, or other ſubjects, to a greater extent than he ought, his poſſeſſion will be reſtricted accordingly. This right muſt not be confounded with that eſtabliſhed in favour of churchmen, which is confined to church lands and rents, and conſtitutes a proper preſcription, upon a poſſeſſion of thirty years.

13. The clauſe in the act 1617, ſaving minors from preſcription, is extended to the poſitive, as well as to the negative preſcription; but the exception of minority is not admitted in the caſe of hoſpitals for children, where there is a continual ſucceſſion of minors, that being a *caſus inſolitus*. Minors are expreſsly excepted in ſeveral of the ſhort preſcriptions, as 1579, *c.* 81.——1669, *c.* 9; but where law leaves them in the common caſe, they muſt be ſubject to the common rules.

14. Preſcription does not run *contra non valentem agere*, againſt one who is barred, by ſome legal incapacity, from purſuing; for in ſuch caſe, neither negligence nor dereliction can be imputed to him. This rule is, by a favourable interpretation, extended to wives who *ex reverentia maritali* forbear to purſue actions competent to them againſt their huſbands. On the ſame ground, preſcription runs only from the time that the debt or right could be ſued upon. Thus, inhibition preſcribes only from the publiſhing of the deed granted to the inhibiter's prejudice; and in the preſcription of removings, the years are computed only from the term at which the defender is warned to remove. Neither can preſcription run againſt perſons who are already in poſſeſſion, and ſo can gain nothing by a purſuit. Thus, where a perſon, who has two adjudications affecting the ſame lands, is in poſſeſſion upon one of them, preſcription cannot run againſt the other during ſuch poſſeſſion.

15. Certain rights are incapable of preſcription: 1. Things that law has exempted from commerce. 2. *Res meræ facultatis, e. g.* a faculty to charge a ſubject with debts, to revoke, *&c.* cannot be loſt by preſcription, for faculties may, by their nature, be exerciſed at any time: Hence, a proprietor's right of uſing any act of property on his own grounds, cannot be loſt by the greateſt length of time. 3. Exceptions competent to a perſon for eliding an action, cannot preſcribe, unleſs the exception is founded on a right productive of an action, *e. g.* compenſation; ſuch right muſt be inſiſted on, within the years of preſcription. 4. Obligations of yearly penſions or payments, though no demand has been made on them for forty years, do not ſuffer a total preſcription, but ſtill ſubſiſt as to the arrears fallen due within that period; becauſe preſcription cannot run againſt an obligation, till it be payable, and each year's penſion or payment is conſidered as a ſeparate debt.

16. No right can be loſt *non utendo* by one, unleſs the effect of that preſcription be to eſtabliſh it in another. Hence the rule ariſes, *juri ſanguinis nunquam præſcribitur*. Hence alſo, a proprietor of land cannot loſe his property by the negative preſcription, unleſs he who objects it can himſelf plead the poſitive. On the ſame ground, a ſuperior's right of feu-duties cannot be loſt *non utendo*; becauſe being inherent in the ſuperiority, it is truly a right of lands that cannot ſuffer the negative preſcription, except in favour of one who can plead the poſitive; which the vaſſal cannot do, being deſtitute of a title. This rule applies alſo to parſonage tithes, which are an inherent burden upon all lands not ſpecially exempted; and from which therefore the perſon liable cannot preſcribe an immunity, by bare non-payment: But ſuch vicarage tithes as are only due where they are eſtabliſhed by uſage, may be loſt by preſcription. In all theſe caſes, though the radical right cannot ſuffer the negative preſcription, the bygone duties, not demanded within the forty years, are loſt to the proprietor, ſuperior, or titular.

17. Preſcription may be interrupted by any deed, whereby the proprietor or creditor uſes his right or ground of debt. In all interruptions, notice muſt be given to the poſſeſſor of the ſubject, or the debtor, that the proprietor or creditor intends to ſue upon his right. All writings whereby the debtor himſelf acknowledges the debt, and all proceſſes for payment brought or diligences uſed againſt him upon his obligation, by horning, inhibition, arreſtment, *&c.* muſt be effectual to interrupt preſcription.

18. Interruptions, by citation upon libelled ſummonſes, where they are not uſed by a minor, preſcribe, if not renewed every ſeven years: But where the appearance of parties, or any judicial act has followed thereupon, it is no longer a bare citation, but an action which ſubſiſts for forty years. Citations for interrupting the preſcription of real rights muſt be given by meſſengers; and the ſummonſes, on which ſuch citations proceed, muſt paſs the ſignet upon a bill, and be regiſtred within ſixty days after the execution, in a particular regiſter appointed for that purpoſe: And where interruption of real rights is made *via facti*, an inſtrument muſt be taken upon it, and recorded in the ſaid regiſter; otherwiſe it can have no effect againſt ſingular ſucceſſors.

19. Interruption has the effect to cut off the courſe of preſcription, ſo that the perſon preſcribing can avail himſelf of no part of the former time, but muſt begin a new courſe, commencing from the date of the interruption. Minority therefore is no proper interruption; for it neither breaks the courſe of preſcription, nor is it a document or evidence taken by the minor on his right: It is a perſonal privilege competent to him, by which the operation of the preſcription is indeed ſuſpended during the years of minority, which are therefore diſcounted from it; but it continues to run after majority, and the years before and after the minority may be conjoined to compleat it. The ſame doctrine applies to the privilege ariſing from one's incapacity to act.

20. Diligence uſed upon a debt, againſt any one of two or more co-obligants, preſerves the debt itſelf, and ſo interrupts preſcription againſt all of them; except in the ſpecial caſe of cautioners, who are not affected by any diligence uſed againſt the principal debtor. In the ſame manner, a right of annualrent, conſtituted upon two ſeparate tenements, is preſerved as to both from the negative preſcription, by diligence uſed againſt either of them. But whether ſuch diligence has alſo the effect to hinder the poſſeſſor of the other tenement by ſingular titles from the benefit of the poſitive preſcription, may be doubted.

Tit. 27. *Of Succeſſion in heritable Rights.*

Singular ſucceſſors are thoſe who ſucceed to a perſon yet alive, in a ſpecial ſubject by ſingular titles; but ſucceſſion, in its proper ſenſe, is a method of tranſmitting rights from the dead to the living. Heritable rights deſcend by ſucceſſion to the heir properly ſo called; moveable rights, to the executors, who are ſometimes ſaid to be heirs in moveables. Succeſſion is either by ſpecial deſtination, which deſcends to thoſe named by the proprietor himſelf; or legal, which devolves upon the perſons whom the law marks out for ſucceſſors, from a preſumption, that the proprietor would have named them, had he made a deſtination. The firſt is in all caſes preferred to the other, as preſumption muſt yield to truth.

2. In the ſucceſſion of heritage, the heirs at law are otherwiſe called heirs general, heirs whatſoever, or heirs of line; and they ſucceed by the right of blood, in the following order. Firſt, deſcendents ſons are prefered to daughters, and the eldeſt ſon to all the younger. Where there are daughters only, they ſucceed equally, and are called heirs-portioners. Failing immediate deſcendents, grand-children ſucceed; and in default of them, great-grand-children; and ſo on *in infinitum*; preferring, as in the former caſe, males to females, and the eldeſt male to the younger.

3. Next after deſcendents, collaterals ſucceed; among whom the brothers *german* of the deceaſed have the firſt place. But as, in no caſe, the legal ſucceſſion of heritage is, by the law of Scotland, divided into parts, unleſs where it deſcends to females; the immediate younger brother of the deceaſed excludes the reſt, according to the rule, *heritage deſcends*. Where the deceaſed is himſelf the youngeſt, the ſucceſſion goes to the immediate elder brother, as being the leaſt deviation from this rule. If there are are no brothers german, the ſiſters german ſucceed equally; then brothers *conſanguinean*, in the ſame order as brothers german; and failing them, ſiſters *conſanguinean* equally. Next, the father ſucceeds. After him, his brothers and ſiſters, according to the rules already explained; then the grand-father; failing him, his brothers and ſiſtters; and ſo upwards, as far back as propinquity can be proved. Though children ſucceed to their mother, a mother cannot to her child; nor is there any ſucceſſion by our law through the mother of the deceaſed; in ſo much that one brother *uterine*, *i. e.* by the mother only, cannot ſucceed to another, even in that eſtate which flowed originally from their common mother.

4. In heritage there is a right of repreſentation, by which one ſucceeds, not from any title in himſelf, but in the place of, and as repreſenting ſome of his deceaſed aſcendents. Thus, where one leaves a younger ſon, and a grandchild by his eldeſt, the grandchild, though farther removed in degree from the decaſed than his uncle, excludes him, as coming in place of his father the eldeſt ſon. Hence ariſes the diſtinction between ſucceſſion *in capita*, where the diviſion is made into as many equal parts as there are *capita* or heirs, which is the caſe of heirs portioners; and ſucceſſion *in ſtirpes*, where the remoters heirs draw no more among them than the ſhare belonging to their aſcendent or *ſtirps*, whom they repreſent; an example of which may be figured in the caſe of one who leaves behind him a daughter alive, and two grand-daughters by a daughter deceaſed. In which caſe the two grand-daughters would ſucceed equally to that half which would have belonged to their mother had ſhe been alive.

5. In the ſucceſſion of heirs-portioners, indiviſible rights, *e. g.* titles of dignity, fall to the eldeſt ſiſter. A ſingle right of ſuperiority goes alſo to the eldeſt; for it hardly admits a diviſion, and the condition of the vaſſal ought not to be made worſe by multiplying ſuperiors upon him. Where there are more ſuch rights, the eldeſt may perhaps have her election of the beſt; but the younger ſiſters are entitled to a recompence, in ſo far as the diviſions are unequal; at leaſt, where the ſuperiorities yield a conſtant yearly rent. The principal ſeat of the family falls to the eldeſt, with the garden and orchard belonging to it, without recompence to the younger ſiſters; but all other houſes are divided amongſt them, together with the lands on which they are built, as parts and pertinents of theſe lands.

6. Thoſe heritable rights, to which the deceaſed did himſelf ſucceed as heir to his father or other anceſtor, get ſometimes the name of heritage in a ſtrict ſenſe, in oppoſition to the *feuda nova*, or feus of conqueſt, which he had acquired by ſingular titles, and which deſcend, not to his heir of line, but of conqueſt. This diſtinction obtains only, where two or more brothers or uncles, or their iſſue, are next in ſucceſſion; in which caſe the immediate younger brother, as heir of line, ſucceeds to the proper heritage, becauſe that deſcends; whereas the conqueſt aſcends to the immediate elder brother. It has no place in female ſucceſſion, which the law divides equally among the heirs-portioners. Where the deceaſed was the younger brother, the immediate elder brother is heir both of line and of conqueſt. An eſtate, diſponed by a father to his eldeſt ſon, is not conqueſt in the ſon's perſon, but heritage; becauſe the ſon would have ſucceeded to it, though there had been no diſpoſition. The heir of conqueſt ſucceeds to all rights affecting land, which require ſeiſin to perfect them. But teinds go to the heir of line; becauſe they are merely a burden on the fruits, not on the land. Tacks do not fall under conqueſt, becauſe they are complete rights without ſeiſin; nor perſonal bonds taken to heirs ſecluding executors.

7. The heir of line is entitled to the ſucceſſion, not only of ſubjects properly heritable, but to that ſort of moveables called *heirſhip*, which is the beſt of certain kinds. This doctrine has been probably introduced, that the heir might not have an houſe and eſtate to ſucceed to, quite diſmantled by the executor. In that ſort which goes by pairs or dozens, the beſt pair or dozen is the heirſhip. There is no heirſhip in fungibles, or things eſtimated by quantity, as grain, hay, current money, *&c.* To intitle an heir to this privilege, the deceaſed muſt have been either, 1. A Prelate: 2. A Baron, *i. e.* one who ſtood infeſt at his death in lands, though not erected into a barony; or even in a right of annualrent: Or, 3. A burgeſs; not an honorary one, but a trading burgeſs of a royal borough, or at leaſt one intitled to enter bur-

geſs, in the right of his anceſtor. Neither the heir of conqueſt, nor of tailzie, has right to heirſhip moveables.

8. As to ſucceſſion by deſtination, no proprietor can ſettle any heritable eſtate, in the proper form of a teſtament; not even bonds ſecluding executors, though theſe are not heritable *ex ſua natura*: But, where a teſtament is in part drawn up in the ſtyle of a deed *inter vivos*, ſuch part of it may contain a ſettlement of heritage, though executors ſhould be named in the teſtamentary part. The common method of ſettling the ſucceſſion of heritage is by diſpoſition, contract of marriage, or ſimple procuratory of reſignation: And, though a diſpoſition ſettling heritage ſhould have neither precept nor procuratory, it ſounds an action againſt the heir of line to complete his titles to the eſtate; and thereafter diveſt himſelf in favour of the diſponee. The appellation of tailzie, or entail, is chiefly uſed in the caſe of a land eſtate, which is ſettled on a long ſeries of heirs, ſubſtituted one after another. The perſon firſt called in the tailzie, is the inſtitute; the reſt, the heirs of tailzie, or the ſubſtitutes.

9. Tailzies, when conſidered in relation to their ſeveral degrees of force, are either, 1. Simple deſtinations: 2. Tailzies with prohibitory clauſes. 3. Tailzies with prohibitory, reſolutive, and irritant clauſes. That is a ſimple deſtination, where the perſons called to the ſucceſſion are ſubſtituted one after another, without any reſtraint laid on the exerciſe of their property. The heirs, therefore, ſucceeding to ſuch eſtate, are abſolute fiars, and conſequently may alter the deſtination at pleaſure.

10. In tailzies with clauſes prohibitory, *e. g.* declaring that it ſhall not be lawful to the heirs to contract debts or alien the lands in prejudice of the ſucceſſion, none of the heirs can alien gratuitouſly. But the members of entail may contract debts which will be effectual to the creditors, or may diſpoſe of the eſtate for onerous cauſes. In both theſe ſorts, the maker himſelf may alter the tailzie; except, 1. Where it has been granted for an onerous cauſe, as in mutual tailzies; or, 2. Where the maker is expreſly diſabled, as well as the inſtitute or the heirs.

11. Where a tailzie is guarded with irritant and reſolutive clauſes, the eſtate entailed cannot be carried off by the debt, or deed, of any of the heirs ſucceeding thereto, in prejudice of the ſubſtitutes. It was long doubted, whether ſuch tailzies ought to be effectual, even where the ſuperior's conſent was adhibited; becauſe they ſunk the property of eſtates, and created a perpetuity of liferents. They were firſt explicitely authoriſed by 1685, *c.* 22. By this ſtatute, the entail muſt be regiſtred in a ſpecial regiſter eſtabliſhed for that purpoſe; and the irritant and reſolutive clauſes muſt be inſerted, not only in the procuratories, precepts, and ſeiſins, by which the tailzies are firſt conſtituted, but in all the after conveyances thereof; otherwiſe they can have no force againſt ſingular ſucceſſors. But a talzie, even without theſe requiſites, is effectual againſt the heir of the granter, or againſt the inſtitute who accepts of it.

12. An heir of entail has full power over the entailed eſtate, except in ſo far as he is expreſly fettered; and as entails are an unfavourable reſtraint upon property, and a frequent ſnare to trading people, they are *ſtrictiſſimi juris*; ſo that no prohibition or irritancies are to be inferred by implication.

13. An heir, who counteracts the directions of the tailzie, by aliening any part of the eſtate, charging it with debt, *&c.* is ſaid to contravene. It is not the ſimple contracting of debt that infers contravention; the lands entailed muſt be actually adjudged upon the debt contracted. An heir may, where he is not expreſly barred, ſettle rational proviſions on his wife and children, without incurring contravention.

14. When the heirs of the laſt perſon ſpecially called in a tailzie come to ſucceed, the irritancies have no longer any perſon in favour of whom they can operate; and conſequently, the fee, which was before tailzied, becomes ſimple and unlimited in the perſon of ſuch heirs. The King may purchaſe lands within Scotland, notwithſtanding the ſtricteſt entail; and where the lands are in the hands of minors or fatuous perſons, his Majeſty may purchaſe them from the curators or guardians. And heirs of entail may ſell to their vaſſals the ſuperiorities belonging to the entailed eſtate; but in all theſe caſes, the price is to be ſettled in the ſame manner that the lands or ſuperiorities ſold were ſettled before the ſale.

15. Rights, not only of land-eſtates, but of bonds, are ſometimes granted to two or more perſons in conjunct fee. Where a right is ſo granted to two ſtrangers, without any ſpecial clauſe adjected to it, each of them has an equal intereſt in the fee, and the part of the deceaſed deſcends to his own heir. If the right be taken to the two jointly, and *the longeſt liver* and their heirs, the ſeveral ſhares of the conjunct fiars are affectable by their creditors during their lives; but, on the death of any one of them, the ſurvivor has the fee of the whole, in ſo far as the ſhare of the predeceaſed remains free, after payment of his debts. Where the right is taken to the two in conjunct fee, and to the heirs of one of them, he to whoſe heirs the right is taken, is the only fiar; the right of the other reſolves into a ſimple liferent: Yet where a father takes a right to himſelf and his ſon jointly, and to the ſon's heirs, ſuch right being gratuitous is not underſtood to ſtrip the father of the fee, unleſs a contrary intention ſhall plainly appear from the tenor of the right.

16. Where a right is taken to a huſband and wife, in conjunct fee and liferent, the huſband, as the *perſona dignior*, is the only fiar: The wife's right reſolves into a liferent, unleſs it be preſumeable, from ſpecial circumſtances, that the fee was intended to be in the wife. Where a right of moveables is taken to huſband and wife, the heirs of both ſucceed equally, according to the natural meaning of the words.

17. Heirs of proviſion are thoſe who ſucceed to any ſubject, in virtue of a proviſion in the inveſtiture, or other deed of ſettlement. This appellation is given moſt commonly to heirs of a marriage. Theſe are more favourably regarded than heirs by ſimple deſtination, who have only the hope of ſucceſſion; for heirs of a marriage, becauſe their proviſions are conſtituted by an onerous contract, cannot be diſappointed of them by any gratuitous deed of the father. Nevertheleſs, as their right is only a right of ſucceſſion, which is not deſigned to reſtrain the

father from granting onerous or rational deeds, he continues to have the full power of ſelling the ſubject, or charging it with debts, unleſs a proper right of credit be given to the heir by the marriage-contract, *e. g.* if the father ſhould oblige himſelf to infeft the heir in the lands, or make payment of the ſum provided againſt a day certain, or when the child attains a certain age, *&c.* for ſuch rights, when perfected by infeftment, or ſecured by diligence, are effectual againſt all the poſterior deeds of the father, even onerous.

18. Though all proviſions to children, by a marriage-contract conceived in the ordinary form, being merely rights of ſucceſſion, are poſtponed to every onerous debt of the granter, even to thoſe contracted poſterior to the proviſions; yet where a father executes a bond of proviſion to a child actually exiſting, whether ſuch child be the heir of a marriage or not, a proper debt is thereby created, which, though it be without doubt gratuitous, is not only effectual againſt the father himſelf and his heirs, but is not reducible at the inſtance even of his prior onerous creditors, if he was ſolvent at the time of granting it. A father may, notwithſtanding a firſt marriage-contract, ſettle a jointure on a ſecond wife, or provide the children of a ſecond marriage; for ſuch ſettlements are deemed onerous; but where they are exorbitant, they will be reſtricted to what is rational: And in all ſuch ſettlements, where the proviſions of the firſt marriage-contract are incroached upon, the heirs of that marriage have recourſe againſt the father, in caſe he ſhould afterwards acquire a ſeparate eſtate, which may enable him to fulfil both obligations.

19. Where heritable rights are provided to the *heirs* of a marriage, they fall to the eldeſt ſon, for he is the heir at law in heritage. Where a ſum of money is ſo provided, the word *heir* is applied to the ſubject of the proviſion, and ſo marks out the executor, who is the heir in moveables. When an heritable right is provided to the *bairns* (or iſſue) of a marriage, it is divided equally among the children, if no diviſion be made by the father; for ſuch deſtination cuts off the excluſive right of the legal heir. No proviſion granted to bairns, gives a ſpecial right of credit to any one child, as long as the father lives: The right is granted *familiæ*; ſo that the whole muſt indeed go to one or other of them; but the father has a power inherent in him, to divide it among them, in ſuch proportions as he thinks beſt; yet ſo as none of them may be entirely excluded, except in extraordinary caſes.

20. A clauſe of return is that, by which a ſum in a bond or other right, is, in a certain event, limited to return to the granter himſelf, or his heirs. When a right is granted for onerous cauſes, the creditor may defeat the clauſe of return, even gratuitouſly. But, where the ſum in the right flows from the granter, or where there is any other reaſonable cauſe for the proviſion of return in his favour, the receiver cannot diſappoint it gratuitouſly. Yet ſince he is fiar, the ſum may be either aſſigned by him for an onerous cauſe, or affected by his creditors.

21. An heir is, in the judgment of law, *eadem perſona cum defuncto*, and ſo repreſents the deceaſed univerſally, not only in his rights, but in his debts: In the firſt view, he is ſaid to be heir *active*; in the ſecond *paſſive*. From this general rule are excepted, heirs ſubſtituted in a ſpecial bond, and even ſubſtituted in a diſpoſition *omnium bonorum*, to take effect at the granter's death; for ſuch ſubſtitutes are conſidered as ſingular ſucceſſors, and their right as an univerſal legacy, which does not ſubject the legatee *ultra valorem*.

22. Before an heir can have an active title to his anceſtor's rights, he muſt be entered by ſervice and retour. He who is intitled to enter heir, is, before his actual entry, called apparent heir. The bare right of apparency carries certain privileges with it. An apparent heir may defend his anceſtor's titles againſt any third party who brings them under challenge. Tenants may ſafely pay him their rents; and after they have once acknowledged him by payment, he may compel them to continue it; and the rents not uplifted by the apparent heir belong to his executors, upon his death.

23. As an heir is, by his entry, ſubjected univerſally to his anceſtor's debts, apparent heirs have therefore a year (*annus deliberandi*) allowed to them from the anceſtor's deceaſe, to deliberate whether they will enter or not; till the expiring of which, though they may be charged by creditors to enter, they cannot be ſued in any proceſs founded upon ſuch charge. Though declaratory actions, and others which contain no perſonal concluſion, may be purſued againſt the apparent heir, without a previous charge; action does not lie even upon theſe, within the year, if the heir cannot make the proper defences without incurring a paſſive title. But judicial ſales, commenced againſt an anceſtor, may be continued upon a citation of the heir, without waiting the year of deliberating. This *annus deliberandi* is computed, in the caſe of a poſthumous heir, from the birth of ſuch heir. An apparent heir, who by immixing with the eſtate of his anceſtor, is as much ſubjected to his debts as if he had entered, can have no longer a right to deliberate whether he will enter or not.

24. All ſervices proceed on brieves from the chancery, which are called brieves of inqueſt, and have been long known in Scotland. The judge, to whom the brief is directed, is required to try the matter by an inqueſt of fifteen ſworn men. The inqueſt, if they find the claim verified, muſt declare the claimant heir to the deceaſed, by a verdict or ſervice, which the judge muſt atteſt, and return the brief, with the ſervice proceeding on it, to the chancery.

25. The ſervice of heirs is either general or ſpecial. A general ſervice veſts the heir in the right of all heritable ſubjects, which either do not require ſeiſin, or which have not been perfected by ſeiſin in the perſon of the anceſtor. A ſpecial ſervice, followed by ſeiſin, veſts the heir in the right of the ſpecial ſubjects in which the anceſtor died infeft.

26. If an heir, doubtful whether the eſtate of his anceſtor be ſufficient for clearing his debts, ſhall at any time within the *annus deliberandi*, exhibit upon oath a full inventory of all his anceſtor's heritable ſubjects, to the clerk of the ſhire where the lands lie; or, if there is no heritage requiring ſeiſin, to the clerk of the ſhire where he died; and if, after the ſame is ſubſcribed by the ſhe-

riff or ſheriff depute, the clerk, and himſelf, and regiſtered in the ſheriff's books, the extract thereof ſhall be regiſtered within forty days after expiry of the *annus deliberandi* in the general regiſter appointed for that purpoſe, his ſubſequent entry will ſubject him no farther than to the value of ſuch inventory. If the inventory be given up and regiſtred within the time preſcribed, the heir may ſerve on it, even after the year.

27. Creditors are not obliged to acquieſce in the value of the eſtate given up by the heir; but, if they be real creditors, may bring the eſtate to a public ſale, in order to diſcover its true value; ſince an eſtate is always worth what can be got for it. An heir by inventory, as he is, in effect, a truſtee for the creditors, muſt account for that value to which the eſtate may have been improved ſince the death of the anceſtor, and he muſt communicate to all the creditors the eaſes he has got in tranſacting with any one of them.

28. Practice has introduced an anomalous ſort of entry, without the interpoſition of an inqueſt, by the ſole conſent of the ſuperior, who, if he be ſatisfied that the perſon applying to him is the next heir, grants him a precept (called of *clare conſtat*, from the firſt words of its recital), commanding his bailie to infeft him in the ſubjects that belonged to his anceſtor. Theſe precepts are, no doubt, effectual againſt the ſuperior who grants them, and his heirs; and they may, when followed by ſeiſin, afford a title of preſcription: But as no perſon can be declared an heir by private authority, they cannot bar the true heir from entering after twenty years, as a legal entry would have done. Of the ſame nature is the entry by haſp and ſtaple, commonly uſed in burgage tenements of houſes; by which the bailie, without calling an inqueſt, cognoſces or declares a perſon heir, upon evidence brought before himſelf; and, at the ſame time, infefts him in the ſubject, by the ſymbol of the haſp and ſtaple of the door. Charges given by creditors to apparent heirs to enter, ſtand in the place of an actual entry, ſo as to ſupport the creditor's diligence.

29. A general ſervice cannot include a ſpecial one; ſince it has no relation to any ſpecial ſubject, and carries only that claſs of rights on which ſeiſin has not proceeded; but a ſpecial ſervice implies a general one of the ſame kind or character, and conſequently carries even ſuch rights as have not been perfected by ſeiſin. Service is not required to eſtabliſh the heir's right in titles of honour, or offices of the higheſt dignity; for theſe deſcend *jure ſanguinis*.

30. An heir, by immixing with his anceſtor's eſtate without entry, ſubjects himſelf to his debts, as if he had entered; or, in our law-phraſe, incurs a paſſive title. The only paſſive title by which an apparent heir becomes liable univerſally for all his anceſtor's debts, is *geſtio pro herede*, or his behaving as none but an heir has right to do. Behaviour as heir is inferred, from the apparent heir's intromiſſion, after the death of the anceſtor, with any part of the lands or other heritable ſubjects belonging to the deceaſed, to which he himſelf might have compleated an active title by entry.

31. This paſſive title is excluded, if the heir's intromiſſion be by order of law; or if it be founded on ſingular titles, and not as heir to the deceaſed. But an apparent heir's purchaſing any right to his anceſtor's eſtate, otherwiſe than at public roup (auction), or his poſſeſſing it in virtue of rights ſettled in the perſon of any near relation of the anceſtor, to whom he himſelf may ſucceed as heir, otherwiſe than upon purchaſe by public ſale, is deemed behaviour as heir.

32. Behaviour as heir is alſo excluded, where the intromiſſion is ſmall, unleſs an intention to defraud the anceſtor's creditors be preſumable from the circumſtances attending it. Neither is behaviour inferred againſt the apparent heir, from the payment of his anceſtor's debt, which is a voluntary act, and profitable to the creditors: nor by his taking out of brieves to ſerve; for one may alter his purpoſe, while it is not compleated: nor by his aſſuming the titles of honour belonging to his anceſtor, or exerciſing an honorary office hereditary in the family; for theſe are rights annexed to the blood, which may be uſed without proper repreſentation. But the exerciſing an heritable office of profit, which may paſs by voluntary conveyance, and conſequently is adjudgeable, may reaſonably be thought to infer a paſſive title. Laſtly, as paſſive titles have been introduced, merely for the ſecurity of creditors; therefore, where queſtions concerning behaviour ariſe among the different orders of heirs, they are liable to one another no farther than *in valorem* of their ſeveral intromiſſions.

33. Another paſſive title in heritage, may be incurred by the apparent heir's accepting a gratuitous right from the anceſtor, to any part of that eſtate to which he himſelf might have ſucceeded as heir; and it is called *præceptio hereditatis*, becauſe it is a taking of the ſucceſſion by the heir before it opens to him by the death of his anceſtor. If the right be onerous, there is no paſſive title; If the conſideration paid for it does not amount to its full value, the creditors of the deceaſed may reduce it, in ſo far as it is gratuitous, but ſtill it infers no paſſive title.

34. The heir incurring this paſſive title is no farther liable, than if he had, at the time of his acceptance, entered heir to the granter, and ſo ſubjected himſelf to the debts that were then chargeable againſt him; but with the poſterior debts he has nothing to do, not even with thoſe contracted between the date of the right, and the infeftment taken upon it, and he is therefore called *ſucceſſor titulo lucrativo poſt contractum debitum*.

35. Neither of theſe paſſive titles takes place, unleſs the ſubject intermeddled with or diſponed, be ſuch as the intromitter or receiver would ſucceed to as heir. In this alſo, theſe two paſſive titles agree, that the intromiſſion in both muſt be after the death of the anceſtor; for there can be no *termini habiles* of a paſſive title, while the anceſtor is alive. But in the following reſpect they differ: *Geſtio pro herede*, being a vicious paſſive title founded upon a quaſi delict, cannot be objected againſt the delinqent's heir, if proceſs has not been litiſconteſted while the delinquent himſelf was alive; whereas the *ſucceſſor titulo lucrativo* is, by the acceptance of the diſpoſition, underſtood to have entered into a tacit contract with the granter's creditors, by which he undertakes the burden of their debts; and all actions founded on contract are tranſmiſſible againſt heirs.

36. An apparent heir, who is cited by the anceſtor's creditor in a proceſs for payment, if he offers any peremptory defence againſt the debt, incurs a paſſive title; for he can have no intereſt to object againſt it, but in the character of heir. In the ſame manner, the heir's not renouncing upon a charge to enter heir, infers it: But the effect of both theſe is limited to the ſpecial debt purſued for, or charged upon. This paſſive title, which is inferred from the heir's not renouncing, has no effect till decree paſs againſt him; and even a renunciation offered after decree, if the decree be in abſence, will intitle the heir to a ſuſpenſion of all diligence againſt his perſon and eſtate, competent upon his anceſtor's debts.

37. By the principles of the feudal law, an heir, when he is to compleat his titles by ſpecial ſervice, muſt neceſſarily paſs over his immediate anceſtor, *e. g.* his father, if he was not infeſt; and ſerve heir to that anceſtor who was laſt veſt and ſeiſed in the right, and in whoſe *hereditas jacens* the right muſt remain, till a title be connected thereto from him. As this bore hard upon creditors, who might think themſelves ſecure in contracting with a perſon whom they ſaw for ſome time in the poſſeſſion of an eſtate, and from thence conclude that it was legally veſted in him; it is therefore provided, that every perſon, paſſing over his immediate anceſtor who had been three years in poſſeſſion, and ſerving heir to one more remote, ſhall be liable for the debts and deeds of the perſon interjected, to the value of the eſtate to which he is ſerved. This being correctory of the feudal maxims, has been ſtrictly interpreted, ſo as not to extend to the gratuitous deeds of the perſon interjected, nor to the caſe where the interjected perſon was a naked fiar, and poſſeſſed only civilly through the liferenter.

38. Our law, from its jealouſy of the weakneſs of mankind while under ſickneſs, and of the importunity of friends on that occaſion, has declared that all deeds affecting heritage, if they be granted by a perſon on deathbed, (*i. e.* after contracting that ſickneſs which ends in death), to the damage of the heir, are ineffectual, except where the debts of the granter have laid him under a neceſſity to alien his lands. As this law of deathbed is founded ſolely in the privilege of the heir, deathbed-deeds, when conſented to by the heir, are not reducible. The term properly oppoſed to death-bed is *liege pouſtie*, by which is underſtood a ſtate of health; and it gets that name, becauſe perſons in health have the *legitima poteſtas*, or lawful power of diſpoſing of their property at pleaſure.

39. The two extremes being proved, of the granter's ſickneſs immediately before ſigning, and of his death following it, though at the greateſt diſtance of time, did, by our former law, found a preſumption that the deed was granted on death-bed, which could not have been elided, but by a poſitive proof of the granter's convaleſcence; but now the allegation of death-bed is alſo excluded, by his having lived ſixty days after ſigning the deed. The legal evidence of convaleſcence is the granter's having been, after the date of the deed, at kirk *OR* market unſupported; for a proof of either will ſecure the deed from challenge. The going to kirk or market muſt be performed, when people are met together in the church or churchyard for any public meeting, civil or eccleſiaſtical, or in the market place at the time of public market. No other proof of convaleſcence is receiveable, becauſe at kirk and market there are always preſent unſuſpected witneſſes, which we can hardly be ſure of in any other caſe.

40. The privilege of ſetting aſide deeds *ex capite lecti*, is competent to all heirs, not to heirs of line only, but of conqueſt, tailzie, or proviſion; not only to the immediate, but to remoter heirs, as ſoon as the ſucceſſion opens to them. But, where it is conſented to or ratified by the immediate heir, it is ſecured againſt all challenge, even from the remoter. Yet the immediate heir cannot, by any antecedent writing, renounce his right of reduction, and thereby give ſtrength to deeds that may be afterwards granted *in lecto* to his hurt; for no private renunciation can authoriſe a perſon to act contrary to a public law; and ſuch renunciation is preſumed to be extorted through the fear of exheredation. If the heir ſhould not uſe this privilege of reduction, his creditor may, by adjudication, transfer it to himſelf, or he may without adjudication, reduce the deed, libelling upon his intereſt as creditor to the heir: But the granter's creditors have no right to this privilege, in regard that the law of death-bed was introduced, not in behalf of the granter himſelf, but of his heir.

41. The law of death-bed ſtrikes againſt diſpoſitions of every ſubject to which the heir would have ſucceeded, or from which he would have had any benefit, had it not been ſo diſponed. Deathbed-deeds granted in conſequence of a full or proper obligation in *liege pouſtie*, are not ſubject to reduction; but, where the antecedent obligation is merely natural, they are reducible. By ſtronger reaſon, the deceaſed cannot, by a deed merely voluntary, alter the nature of his eſtate on death-bed to the prejudice of his heir, ſo as from heritable to make it moveable; but if he ſhould, in *liege pouſtie*, exclude his apparent heir, by an irrevocable deed containing reſerved faculties, the heir cannot be heard to quarrel the exerciſe of theſe faculties on death-bed.

42. In a competition between the creditors of the deceaſed and of the heir, our law has juſtly preferred the creditors of the deceaſed, as every man's eſtate ought to be liable, in the firſt place, for his own debt. But this preference is, by the ſtatute, limited to the caſe where the creditors of the deceaſed have uſed diligence againſt their debtor's eſtate, within three years from his death; and therefore the heir's creditors may, after that period, affect it for their own payment. All diſpoſitions by an heir, of the anceſtor's eſtate, within a year after his death, are null, in ſo far as they are hurtful to the creditors of the anceſtor. This takes place, though theſe creditors ſhould have uſed no diligence, and even where the diſpoſitions are granted after the year: It is thought they are ineffectual againſt the creditors of the deceaſed who have uſed diligence within the three years.

Tit. 28. *Of Succeſſion in Moveables.*

In the ſucceſſion of moveable rights, it is an univerſal rule, that the next in degree to the deceaſed (or next of kin) ſucceeds to the whole; and if there are two or more equally near, all of them ſucceed by equal parts, without that prerogative, which takes place in heritage, of the eldeſt ſon over the younger, or of males over females. Neither does the right of repreſentation, explained Tit. xxvii. 4. obtain in the ſucceſſion of moveables, except in the ſingle caſe of a competition between the full blood and the half blood; for a niece by the full blood will be preferred before a brother by the half blood, though ſhe is by one degree more remote from the deceaſed than her uncle. Where the eſtate of a perſon deceaſed conſiſts partly of heritage, and partly of moveables, the heir in the heritage has no ſhare of the moveables, if there are others as near in degree to the deceaſed as himſelf: But where the heir, in ſuch caſe, finds it his intereſt to renounce his excluſive claim to the heritage, and betake himſelf to his right as one of the next of kin, he may collate or communicate the heritage with the others, who in their turn muſt collate the moveables with him; ſo that the whole is thrown into one maſs, and divided equally among all of them. This doctrine holds, not only in the line of deſcendents, but of collaterals; for it was introduced, that the heir might in no caſe be worſe than the other next of kin.

2. One may ſettle his moveable eſtate upon whom he pleaſes, excluding the legal ſucceſſor, by a teſtament; which is a written declaration of what a perſon wills to be done with his moveable eſtate after his death. No teſtamentary deed is effectual, till the death of the teſtator; who may therefore revoke it at pleaſure, or make a new one, by which the firſt loſes its force; and hence teſtaments are called, laſt or latter wills. Teſtaments, in their ſtrict acceptation, muſt contain a nomination of executors, *i. e.* of perſons appointed to adminiſter the ſucceſſion according to the will of the deceaſed: Yet nothing hinders one from making a ſettlement of moveables, in favour of an univerſal legatee, though he ſhould not have appointed executors; and on the other part, a teſtament where executors are appointed, is valid, though the perſon who is to have the right of ſucceſſion ſhould not be named. In this laſt caſe, if the executor nominated be a ſtranger, *i. e.* one who has no legal intereſt in the moveable eſtate, he is merely a truſtee, accountable to the next of kin; but he may retain a third of the dead's part (explained § 6.) for his trouble in executing the teſtament; in payment of which, legacies, if any be left to him, muſt be imputed. The heir, if he be named executor, has right to the third as a ſtranger; but if one be named, who has an intereſt in the legal ſucceſſion, he has no allowance, unleſs ſuch intereſt be leſs than a third. Nuncupative or verbal teſtaments are not, by the law of Scotland, effectual for ſupporting the nomination of an executor, let the ſubject of the ſucceſſion be ever ſo ſmall: But verbal legacies, not exceeding *L.* 100 *Scots*, are ſuſtained; and even where they are granted for more, they are ineffectual only as to the exceſs.

3. A legacy is a donation by the deceaſed, to be paid by the executor to the legatee. It may be granted, either in the teſtament, or in a ſeparate writing. Legacies are not due till the granter's death; and conſequently they can tranſmit no right to the executors of the legatee, in the event that the granter ſurvives him.

4. Legacies, where they are general, *i. e.* of a certain ſum of money indefinitely, give the legatee no right in any one debt or ſubject; he can only inſiſt in a perſonal action againſt the executor, for payment out of the teſtator's effects. A ſpecial legacy, *i. e.* of a particular debt due to the deceaſed, or of a particular ſubject belonging to him, is of the nature of an aſſignation, by which the property of the ſpecial debt or ſubject veſts, upon the teſtator's death, in the legatee, who can therefore directly ſue the debtor or poſſeſſor: Yet as no legacy can be claimed till the debts are paid, the executor muſt be cited in ſuch proceſs, that it may be known, whether there are free effects ſufficient for anſwering the legacy. Where there is not enough for payment of all the legacies, each of the general legatees muſt ſuffer a proportional abatement: But a ſpecial legatee gets his legacy entire, though there ſhould be nothing over for payment of the reſt; and on the contrary, he has no claim, if the debt or ſubject bequeathed ſhould periſh, whatever the extent of the free executry may be.

5. Minors, after puberty, can teſt without their curators, wives without their huſbands, and perſons interdicted without their interdictors; but baſtards cannot teſt, except in the caſes afterwards ſet forth, Tit. xxix. 3. As a certain ſhare of the goods, falling under the communion that is conſequent on marriage, belongs, upon the huſband's deceaſe, to his widow, *jure relictæ*, and a certain ſhare to the children, called the legitime, portion-natural, or bairns part of gear; one who has a wife or children, though he be the abſolute adminiſtrator of all theſe goods during his life, and conſequently may alien them by a deed *inter vivos* in *liege pouſtie*, even gratuitouſly, if no fraudulent intention to diſappoint the wife or children ſhall appear, yet cannot impair their ſhares gratuitouſly on deathbed; nor can he diſpoſe of his moveables to their prejudice by teſtament, though it ſhould be made in *liege pouſtie*; ſince teſtaments do not operate till the death of the teſtator, at which period the diviſion of the goods in communion have their full effect in favour of the widow and children.

6. If a perſon deceaſed leaves a widow, but no child, his teſtament, or, in other words, the goods in communion, divide in two; one half goes to the widow, the other is the dead's part, *i. e.* the abſolute property of the deceaſed, on which he can teſt, and which falls to his next of kin, if he dies inteſtate. Where he leaves children, one or more, but no widow, the children get one half as their legitime; the other half is the dead's part, which falls alſo to the children, if the father has not teſted upon it. If he leaves both widow and children, the diviſion is tripartite; the wife takes one third by herſelf; another falls, as legitime, to the children equally among them, or even to an only child, though he ſhould ſucceed to the heritage; the remaining third is the dead's part. Where the wife predeceaſes without children, one half is retained by the huſband, the other falls to her next of kin: Where ſhe leaves children, the diviſion ought alſo to be bipartite, by the common rules of ſociety, ſince no legitime is truly due on a mother's death;

yet it is in practice tripartite ; two thirds remain with the ſurviving father, as if one third were due to him *proprio nomine*, and another as adminiſtrator of the legitime for his children ; the remaining third, being the wife's ſhare, goes to her children, whether of that or any former marriage, for they are all equally her next of kin.

7. Before a teſtament can be divided, the debts owing by the deceaſed are to be deducted ; for all executry muſt be free. As the huſband has the full power of burdening the goods in communion, his debts affect the whole, and ſo leſſen the legitime and the ſhare of the relict, as well as the dead's part. His funeral charges, and the mournings and alimony due to the widow, are conſidered as his proper debts ; but the legacies, or other gratuitous rights, granted by him on deathbed, affect only the dead's part. Bonds bearing intereſt, due by the deceaſed, cannot diminiſh the relict's ſhare, becauſe ſuch bonds, when due to the deceaſed, do not increaſe it The funeral charges of the wife predeceaſing, fall wholly on her executors who have right to her ſhare. Where the deceaſed leaves no family, neither huſband, wife, nor child, the teſtament ſuffers no diviſion, but all is the dead's part.

8. The whole iſſue of the huſband, not only by that marriage which was diſſolved by his death, but by any former marriage, has an equal intereſt in the legitime ; otherwiſe the children of the firſt marriage would be cut out, as they could not claim the legitime during their father's life. But no legitime is due, 1. Upon the death of a mother. 2. Neither is it due to grandchildren, upon the death of a grandfather. Nor, 3. To children foriſfamiliated, *i. e.* to ſuch as, by having renounced the legitime, are no longer conſidered as *in familia*, and ſo are excluded from any farther ſhare of the moveable eſtate than they have already received.

9 As the right of legitime is ſtrongly founded in nature, the renunciation of it is not to be inferred by implication. Renunciation by a child of his claim of legitime has the ſame effect as his death, in favour of the other children intitled thereto ; and conſequently the ſhare of the renouncer divides among the reſt ; but he does not thereby loſe his right to the dead's part, if he does not alſo renounce his ſhare in the father's executry. Nay, his renunciation of the legitime, where he is the only younger child, has the effect to convert the whole ſubject thereof into dead's part, which will therefore fall to the renouncer himſelf as next of kin, if the heir be not willing to collate the heritage with him.

10 For preſerving an equality among all the children, who continue intitled to the legitime, we have adopted the Roman doctrine of *collatio bonorum ;* whereby the child, who has got a proviſion from his father, is obliged to collate it with the others, and impute it towards his own ſhare of the legitime ; but if, from the deed of proviſion, the father ſhall appear to have intended it as a *præcipuum* to the child, collation is excluded. A child is not bound to collate an heritable ſubject provided to him, becauſe the legitime is not impaired by ſuch proviſion. As this collation takes place only in queſtions among children who are intitled to the legitime, the relict is not bound to collate donations given her by her huſband, in order to increaſe the legitime ; and on the other part, the children are not obliged to collate their proviſions, in order to increaſe her ſhare.

11. As an heir in heritage muſt compleat his titles by entry, ſo an executor is not veſted in the right of the moveable eſtate of the deceaſed without confirmation. Confirmation is a ſentence of the Commiſſary or Biſhop's court, impowering an executor, one or more, upon making inventory of the moveables pertaining to the deceaſed, to recover, poſſeſs, and adminiſter them, either in behalf of themſelves, or of others intereſted therein. Teſtaments muſt be confirmed in the commiſſariot where the deceaſed had his principal dwelling houſe at his death. If he had no fixed reſidence, or died in a foreign country, the confirmation muſt be at *Edinburgh*, as the *commune forum ;* but if he went abroad with an intention to return, the commiſſariot within which he reſided, before he left Scotland, is the only proper court.

12. Confirmation proceeds upon an edict, which is affixed on the door of the pariſh-church where the deceaſed dwelt, and ſerves to intimate to all concerned the day of confirmation, which muſt be nine days at leaſt after publiſhing the edict. In a competition for the office of executor, the Commiſſary prefers, *primo loco*, the perſon named to it by the deceaſed himſelf, whoſe nomination he ratifies or confirms, without any previous decerniture ; this is called the confirmation of a teſtament-teſtamentary In default of an executor named by the deceaſed, univerſal diſponees are by the preſent practice preferred ; after them, the next of kin ; then the relict ; then creditors ; and laſtly, ſpecial legatees All theſe muſt be decerned executors, by a ſentence called a decree-dative ; and if afterwards they incline to confirm, the Commiſſary authoriſes them to adminiſter, upon their making inventory, and giving ſecurity to make the ſubject thereof forthcoming to all having intereſt ; which is called the confirmation of a teſtament dative.

13 A creditor, whoſe debtor's teſtament is already confirmed, may ſue the executor, who holds the office for all concerned, to make payment of his debt. Where there is no confirmation, he himſelf may apply for the office, and confirm as executor creditor ; which intitles him to ſue for, and receive the ſubject confirmed, for his own payment : And where one applies for a confirmation, as executor-creditor, every co-creditor may apply to be conjoined with him in the office. As this kind of confirmation is ſimply a form of diligence, creditors are exempted from the neceſſity of confirming more than the amount of their debts.

14 A creditor, whoſe debt has not been conſtituted, or his claim not cloſed by decree, during the life of his debtor, has no title to demand directly the office of executor *qua* creditor ; but he may charge the next of kin who ſtands off, to confirm, who muſt either renounce within twenty days after the charge, or be liable for the debt ; and if the next of kin renounces, the purſuer may conſtitute his debt, and obtain a decree *cognitionis cauſa*, againſt the *hereditas jacens* of the moveables, upon which he may confirm as executor creditor to the deceaſed. Where one is creditor, not to the deceaſed, but to his next of kin who ſtands off from confirming, he may affect the moveables of the deceaſed, by obtaining himſelf

decerned executor-dative to the deceaſed, as if he were creditor to him, and not to his next of kin.

15. Where an executor has either omitted to give up any of the effects belonging to the deceaſed in inventory, or has eſtimated them below their juſt value, there is place for a new confirmation, *ad omiſſa, vel male appretiata*, at the ſuit of any having intereſt; and if it appears that he has not omitted or undervalued any ſubject *doloſé*, the Commiſſary will ordain the ſubjects omitted, or the difference between the eſtimations in the principal teſtament and the true values, to be added thereto; but if dole ſhall be preſumed, the whole ſubject of the teſtament *ad omiſſa vel male appretiata*, will be carried to him who confirms it, to the excluſion of the executor in the principal teſtament.

16. The legitime and relict's ſhare, becauſe they are rights ariſing *ex lege*, operate *ipſo jure*, upon the father's death, in favour of the relict and children; and conſequently paſs from them, though they ſhould die before confirmation, to their next of kin: Whereas the dead's part, which falls to the children or other next of kin in the way of ſucceſſion, remains, if they ſhould die before confirming, *in bonis* of the firſt deceaſed; and ſo does not deſcend to their next of kin, but may be confirmed by the perſon who, at the time of confirmation, is the next of kin to the firſt deceaſed. Special aſſignations, though neither intimated, nor made public, during the life of the granter, carry to the aſſigney the full right of the ſubjects aſſigned, without confirmation. Special legacies are really aſſignations, and ſo fall under this rule. The next of kin, by the bare poſſeſſion of the *ipſa corpora* of moveables, acquires the property thereof without confirmation, and tranſmits it to his executors.

17. The confirmation of any one ſubject by the next of kin, as it proves his right of blood, has been adjudged to carry the whole executry out of the teſtament of the deceaſed, even what was omitted, and to tranſmit all to his own executors. The confirmation of a ſtranger, who is executor nominated, as it is merely a truſt for the next of kin, has the effect to eſtabliſh the right of the next of kin to the ſubjects confirmed, in the ſame manner as if himſelf had confirmed them.

18. Executry, though it carries a certain degree of repreſentation of the deceaſed, is properly an office: Executors therefore are not ſubjected to the debts due by the deceaſed, beyond the value of the inventory; but, at the ſame time, they are liable in diligence for making the inventory effectual to all having intereſt. An executor-creditor who confirms more than his debt amounts to, is liable in diligence for what he confirms. Executors are not liable in intereſt, even upon ſuch bonds recovered by them as carried intereſt to the deceaſed, becauſe their office obliges them to retain the ſums they have made effectual, in order to a diſtribution thereof among all having intereſt. This holds though they ſhould again lend out the money upon intereſt, as they do it at their own riſk.

19. There are certain debts of the deceaſed called privileged debts, which were always preferable to every other. Under that name are comprehended, medicines furniſhed to the deceaſed on death-bed, phyſicians fees during that period, funeral charges, and the rent of his houſe, and his ſervant's wages for the year or term current at his death. Theſe the executors are in ſafety to pay on demand. All the other creditors, who either obtain themſelves confirmed, or who cite the executor already confirmed, within ſix months after their debtor's death, are preferred, *pari paſſu*, with thoſe who have done more timely diligence; and therefore no executor can either retain for his own debt, or pay a teſtamentary debt, ſo as to exclude any creditor, who ſhall uſe diligence within the ſix months, from the benefit of the *pari paſſu* preference; neither can a decree for payment of debt be obtained, in that period, againſt an executor, becauſe, till that term be elapſed, it cannot be known how many creditors may be intitled to the fund in his hands. If no diligence be uſed within the ſix months, the executor may retain for his own debt, and pay the reſidue *primo venienti*. Such creditors of the deceaſed as have uſed diligence within a year after their debtor's death, are preferable on the ſubject of his teſtament to the creditors of his next of kin.

20. The only paſſive title in moveables is vitious intromiſſion, which may be defined, an unwarrantable intermeddling with the moveable eſtate of a perſon deceaſed, without the order of law. This is not confined, as the paſſive titles in heritage are, to the perſons intereſted in the ſucceſſion, but ſtrikes againſt all intromitters whatever. Where an executor confirmed, intromits with more than he has confirmed, he incurs a paſſive title, fraud being in the common caſe preſumed from his not giving up in inventory the full ſubject intermeddled with. Vitious intromiſſion is alſo preſumed, where the repoſitories of a dying perſon are not ſealed up, as ſoon as he becomes incapable of ſenſe, by his neareſt relations; or, if he dies in a houſe not his own, they muſt be ſealed by the maſter of ſuch houſe, and the keys delivered to the Judge-ordinary, to be kept by him, for the benefit of all having intereſt.

21. The paſſive title of vitious intromiſſion does not take place where there is any probable title or circumſtance that takes off the preſumption of fraud. In conſequence of this rule, neceſſary intromiſſion, or *cuſtodiæ cauſa*, by the wife or children, who only continue the poſſeſſion of the deceaſed, in order to preſerve his goods for the benefit of all concerned, infers no paſſive title. And upon the ſame principle, an intromitter, by confirming himſelf executor, and thereby ſubjecting himſelf to account, before action be brought againſt him on the paſſive titles, purges the vitioſity of his prior intromiſſion: And where the intromitter is one who is intereſted in the ſucceſſion, *e. g.* next of kin, his confirmation, at any time within a year from the death of the deceaſed, will exclude the paſſive title, notwithſtanding a prior citation. As this paſſive title was intended only for the ſecurity of creditors, it cannot be ſued upon by legatees; and ſince it ariſes *ex delicto*, it cannot be pleaded againſt the heir of the intromitter. As in delicts, any one of many delinquents may be ſubjected to the whole puniſhment, ſo any one of many intromitters may be ſued *in ſolidum* for the purſuer's debt, without calling the reſt; but the intromitter who pays, has an action of relief againſt the others for their ſhare of it. If the intromitters are ſued

jointly, they are liable, not *pro rata* of their ſeveral intromiſſions, but *pro virili*.

28. The whole of a debtor's eſtate is ſubjected to the payment of his debts; and therefore, both his heirs and executors are liable for them, in a queſtion with creditors; but as ſucceſſion is by law divided into the heritable and the moveable eſtate, each of theſe ought, in a queſtion between the ſeveral ſucceſſors, to bear the burdens which naturally affect it. Action of relief is accordingly competent to the heir who has paid a moveable debt, againſt the executor; and *vice verſa*. This relief is not cut off by the deceaſed's having diſponed either his land-eſtate or his moveables, with the burden of his *whole* debts; for ſuch burden is not to be conſtrued as an alteration of the legal ſucceſſion, but merely as a farther ſecurity to creditors, unleſs the contrary ſhall be preſumed from the ſpecial ſtyle of the diſpoſition.

Tit. 29. *Of laſt Heirs and Baſtards.*

BY our ancient practice, feudal grants taken to the vaſſal, and to a ſpecial order of heirs, without ſettling the laſt termination upon *heirs whatſoever*, returned to the ſuperior, upon failure of the ſpecial heirs therein contained, but now that feus are become patrimonial rights, the ſuperior is, by the general opinion, held to be fully diveſted by ſuch grant, and the right deſcends to the vaſſal's heirs at law. And even where a vaſſal dies, without leaving any heir who can prove the remoteſt propinquity to him, it is not the ſuperior, as the old law ſtood, but the King, who ſucceeds as laſt heir, both in the heritable and moveable eſtate of the deceaſed, in conſequence of the rule, *Quod nullius eſt, cedit domino Regi*.

2. If the lands, to which the King ſucceeds, be holden immediately of himſelf, the property is conſolidated with the ſuperiority, as if reſignation had been made in the Sovereign's hands. If they are holden of a ſubject, the King, who cannot be vaſſal to his own ſubject, names a donatory; who, to complete his title, muſt obtain decree of declarator; and thereafter he is preſented to the ſuperior, by letters of preſentation from the King under the quarter-ſeal, in which the ſuperior is charged to enter the donatory. The whole eſtate of the deceaſed is, in this caſe, ſubjected to his debts, and to the widow's legal proviſions. Neither the King nor his donatory is liable beyond the value of the ſucceſſion. A perſon who has no heir to ſucceed to him, cannot alien his heritage *in lecto*, to the prejudice of the King, who is intitled to ſet aſide ſuch deed, in the character of *ultimus heres*.

3. A baſtard can have no legal heirs, except thoſe of his own body; ſince there is no ſucceſſion but by the father, and a baſtard has no certain father. The King therefore ſucceeds to him, failing his lawful iſſue, as laſt heir. Though the baſtard, as abſolute proprietor of his own eſtate, can diſpoſe of his heritage in *liege pouſtie*, and of his moveables by any deed *inter vivos*; yet he is diſabled, *ex defectu natalium*, from bequeathing by teſtament, without letters of legitimation from the Sovereign. If the baſtard has lawful children, he may teſt, without ſuch letters, and name tutors and curators to his iſſue. Letters of legitimation, let their clauſes be ever ſo ſtrong, cannot enable the baſtard to ſucceed to his natural father, to the excluſion of lawful heirs.

4. The legal rights of ſucceſſion, being founded in marriage, can be claimed only by thoſe who are born in lawful marriage; the iſſue therefore of an unlawful marriage are incapable of ſucceſſion. A baſtard is excluded, 1. From his father's ſucceſſion; becauſe law knows no father, who is not marked out by marriage. 2. From all heritable ſucceſſion, whether by the father or mother; becauſe he cannot be pronounced lawful heir by the inqueſt, in terms of the brief; and, 3. From the moveable ſucceſſion of his mother; for, though the mother be known, the baſtard is not her lawful child, and legitimacy is implied in all ſucceſſion conferred by law. A baſtard, though he cannot ſucceed *jure ſanguinis*, may ſucceed by deſtination, where he is ſpecially called to the ſucceſſion by an entail or teſtament.

5. Certain perſons, though born in lawful marriage, are incapable of ſucceſſion. Aliens are, from their allegiance to a foreign prince, incapable of ſucceeding in *feudal rights*, without naturalization. Children born in a foreign ſtate, whoſe fathers were natural born ſubjects, and not attainted, are held to be natural-born ſubjects. Perſons educated in, or profeſſing the Popiſh religon, if they ſhall neglect, upon their attaining the age of fifteen, to renounce its doctrines by a ſigned declaration, cannot ſucceed in *heritage*; but muſt give place to the next Proteſtant heir, who will hold the eſtate irredeemably, if the Popiſh heir does not, within ten years after incurring the irritancy, ſign the *formula* preſcribed by the ſtatute 1700, *c*. 3.

Tit. 30. *Of Actions.*

HITHERTO of *perſons* and *rights*, the two firſt objects of law; *actions* are its third object, whereby perſons make their rights effectual. An action may be defined, a demand regularly made and inſiſted in, before the judge competent, for the attaining or recovering of a right; and it ſuffers ſeveral diviſions, according to the different natures of the rights purſued upon.

2. Actions are either real or perſonal. A real action, is that which ariſes from a right in the thing itſelf, and which therefore may be directed againſt all poſſeſſors of that thing: Thus, an action for the recovery, even of a moveable ſubject, when founded on a *jus in re*, is in the proper acceptation real; but real actions are, in vulgar ſpeech, confined to ſuch as are directed againſt heritable ſubjects. A perſonal action is founded only on an obligation undertaken for the performance of ſome fact, or the delivery of ſome ſubject; and therefore can be carried on againſt no other than the perſon obliged, or his heirs.

3. Actions are either ordinary or reſciſſory. All actions are, in the ſenſe of this diviſion, ordinary, which are not reſciſſory. Reſciſſory actions are divided, 1. Into actions of proper improbation. 2. Actions of reduction-improbation. 3. Actions of ſimple reduction. Proper improbations, which are brought for declaring writings falſe or forged, are treated of below, Tit. 33.

Reduction-improbation is an action, whereby a perſon who may be hurt or affected by a writing, inſiſts for producing or exhibiting it in court, in order to have it ſet aſide, or its effect aſcertained, under the certification that the writing, if not produced, ſhall be declared falſe and forged. This certification is a fiction of law, introduced that the production of writings may be the more effectually forced, and therefore it operates only in favour of the purſuer. Becauſe the ſummons in this action proceeds on alledged grounds of falſehood, his Majeſty's Advocate, who is the public proſecutor of crimes, muſt concur in it.

4. As the certification in this proceſs draws after it ſo heavy conſequences, two terms are aſſigned to the defenders for production. After the ſecond term is elapſed, intimation muſt be made judicially to the defender, to ſatisfy the production within ten days; and till theſe are expired, no certification can be pronounced. Certification cannot paſs againſt deeds recorded in the books of Seſſion, if the defender ſhall, before the ſecond term, offer a condeſcendence of the dates of their regiſtration, unleſs falſehood be objected; in which caſe, the original muſt be brought from the record to the court. But an extract from the inferior court is no bar to certification; the principal writing muſt be laid before the court of Seſſion on a proper warrant.

5. In an action of ſimple reduction the certification is only temporary, declaring the writings called for, null, until they be produced; ſo that they recover their full force after production, even againſt the purſuer himſelf; for which reaſon, that proceſs is now ſeldom uſed. Becauſe its certification is not ſo ſevere as in reduction-improbation, there is but on term aſſigned to the defender for producing the deeds called for.

6. The moſt uſual grounds of reductions of writings are, the want of the requiſite ſolemnities; that the granter was minor, or interdicted, or inhibited; or that he ſigned the deed on death-bed, or was compelled or frightened into it, or was circumvented; or that he granted it in prejudice of his lawful creditors.

7. In reductions on the head of force, or fear, or fraud and circumvention, the purſuer muſt libel the particular circumſtances from which his allegation is to be proved. Reduction is not competent upon every degree of force or fear; it muſt be ſuch as would ſhake a man of conſtancy and reſolution. Neither is it competent, on that fear which ariſes from the juſt authority of huſbands or parents over their wives or children, nor upon the fear ariſing from the regular execution of lawful diligence by caption, provided the deeds granted under that fear relate to the ground of debt contained in the diligence; but if they have no relation to that debt, they are reducible *ex metu*.

8. Alienations granted by debtors after contracting of lawful debts, in favour of conjunct or confident perſons, without juſt and neceſſary cauſes, and without a juſt price really paid, are null. One is deemed a prior creditor, whoſe ground of debt exiſted before the right granted by the debtor; though the written voucher of the debt ſhould bear a date poſterior to it. Perſons are accounted conjunct, whoſe relation to the granter is ſo near, as to bar them from judging in his cauſe. Confident perſons are thoſe who appear to be in the granter's confidence, by being employed in his affairs, or about his perſon; as a doer, ſteward, or domeſtic ſervant.

9. Rights, though gratuitous, are not reducible, if the granter had, at the date thereof, a ſufficient fund for the payment of his creditors. Proviſions to children are, in the judgment of law, gratuitous; ſo that their effect, in a queſtion with creditors, depends on the ſolvency of the granter: But ſettlements to wives, either in marriage contracts, or even after marriage, are onerous, in ſo far as they are rational; and conſequently are not reducible, even though the granter was inſolvent. This rule holds alſo in rational tochers contracted to huſbands: But it muſt, in all caſes, be qualified with this limitation, *if the inſolvency of the granter was not publicly known*; for if it was, fraud is preſumed in the receiver of the right, by contracting with the bankrupt.

10. The receiver of the deed, if he be a conjunct or confident perſon, muſt aſtruct or ſupport the onerous cauſe of his right, not merely by his own oath, but by ſome circumſtances or adminicles. But where a right is granted to a ſtranger, the narrative of it expreſſing an onerous cauſe, is ſufficient *per ſe* to ſecure it againſt reduction.

11. All voluntary payments or rights made by a bankrupt to one creditor, to diſappoint the more timeous diligence of another, are reducible at the inſtance of that creditor who has uſed the prior diligence. A creditor, though his diligence be but begun by citation, may inſiſt in a reduction of all poſterior voluntary rights granted to his prejudice; but the creditor who neglects to complete his begun diligence within a reaſonable time, is not intitled to reduce any right granted by the debtor, after the time that the diligence is conſidered as abandoned.

12. A prohibited alienation, when conveyed by the receiver to another who is not privy to the fraud, ſubſiſts in the perſon of the *bona fide* purchaſer. In the caſe of moveable rights, this nullity is receivable by exception; but it muſt be declared by reduction, where the right is heritable.

13. By act 1696, *c.* 5. all alienations by a bankrupt, within ſixty days before his bankruptcy, to one creditor in preference to another, are reducible, at the inſtance even of ſuch co-creditors as had not uſed the leaſt ſtep of diligence. A bankrupt is there deſcribed by the following characters; diligence uſed againſt him by horning and caption; and inſolvency, joined either with impriſonment, retiring to the ſanctuary, abſconding, or forcibly defending himſelf from diligence. It is ſufficient that a caption is raiſed againſt the debtor, though it be not executed, provided he has retired to ſhun it. It is provided, that all heritable bonds or rights on which ſeiſin may follow, ſhall be reckoned, in a queſtion with the granter's other creditors upon this act, to be of the date of the ſeiſin following thereon. But this act was found to relate only to ſecurities for former debts, and not to *nova debita*.

14. Actions are divided into *rei perſecutoriæ*, and *pœnales*. By the firſt, the purſuer inſiſts barely to recover the ſubject that is his, or the debt due to him; and this

includes the damage ſuſtained; for one is as truly a ſufferer in his patrimonial intereſt by that damage, as by the loſs of the ſubject itſelf. In penal actions, which always ariſe *ex delicto*, ſomething is alſo demanded by way of penalty.

15. Actions of ſpuilzie, ejection, and intruſion, are penal. An action of ſpuilzie is competent to one diſpoſſeſſed of a moveable ſubject violently, or without order of law, againſt the perſon diſpoſſeſſing; not only for being reſtored to the poſſeſſion of the ſubject, if extant, or for the value, if it be deſtroyed, but alſo for the violent profits, in caſe the action be brought within three years from the ſpoliation. Ejection and intruſion are, in heritable ſubjects, what ſpuilzie is in moveables The difference between the two firſt is, that in ejection, violence is uſed; whereas the intruder enters into the void poſſeſſion, without either a title from the proprietor, or the warrant of a judge The actions ariſing from all the three are of the ſame general nature.

16. The action of contravention of law-borrows is alſo penal. It proceeds on letters of law-borrows, (from *borgh* a cautioner), which contain a warrant to charge the party complained upon, that he may give ſecurity, not to hurt the complainer in his perſon, family, or eſtate. Theſe letters do not require the previous citation of the party complained upon, becauſe the caution which the law requires is only for doing what is every man's duty; but, before the letters are executed againſt him, the complainer muſt make oath that he dreads bodily harm from him. The penalty of contravention is aſcertained to a ſpecial ſum, according to the offender's quality; the half to be applied to the fiſk, and the half to the complainer. Contravention is not incurred by the uttering of reproachful words, where they are not accompanied, either with acts of violence, or at leaſt a real injury; and as the action is penal, it is elided by any probable ground of excuſe.

17 Penalties are the conſequences of delict, or tranſgreſſion; and as no heir ought to be accountable for the delict of his anceſtor, farther than the injured perſon has really ſuffered by it, penal actions die with the delinquent, and are not tranſmiſſible againſt heirs. Yet the action, if it has been commenced, and litiſconteſted in the delinquent's lifetime, may be continued againſt the heir, though the delinquent ſhould die during the dependence. Some actions are *rei perſecutoriæ* on the part of the purſuer, when he inſiſts for ſimple reſtitution; which yet may be penal in reſpect of the defender; *e. g* the action on the paſſive title of vitious intromiſſion, by which the purſuer frequently recovers the debt due to him by the deceaſed, though it ſhould exceed the value of the goods intermeddled with by the defenders.

18. The moſt celebrated diviſion of actions in our law, is into *petitory*, *poſſeſſory*, and *declaratory*. *Petitory* actions are thoſe, where ſomething is demanded from the defender, in conſequence of a right of property, or of credit in the purſuer: Thus, actions for reſtitution of moveables, actions of poinding, of forthcoming, and indeed all perſonal actions upon contracts or quaſi contracts, are petitory. *Poſſeſſory* actions are thoſe which are founded, either upon poſſeſſion alone, as ſpuilzies; or upon poſſeſſion joined with another title, as removings; and they are competent either for getting into poſſeſſion, for holding it, or for recovering it; analogous to the interdicts of the Roman law, *quorum bonorum*, *uti poſſidetis*, and *unde vi*.

16. An action of moleſtation is a poſſeſſory action, competent to the proprietor of a land-eſtate, againſt thoſe who diſturb his poſſeſſion. It is chiefly uſed in queſtions of commonty, or of controverted marches. Where a declarator of property is conjoined with a proceſs of moleſtation, the ſeſſion alone is competent to the action. Actions on brieves of perambulation, have the ſame tendency with moleſtations, *viz.* the ſettling of marches between conterminous lands.

20. The action of mails and duties is ſometimes petitory, and ſometimes poſſeſſory. In either caſe, it is directed againſt the tenants and natural poſſeſſors of land-eſtates, for payment to the purſuer of the rents remaining due by them for paſt crops, and of the full rent for the future. It is competent, not only to a proprietor whoſe right is perfected by ſeiſin, but to a ſimple diſponee, for a diſpoſition of lands includes a right to the mails and duties; and conſequently to an adjudger, for an adjudication is a judicial diſpoſition. In the petitory action, the purſuer, ſince he founds upon right, not poſſeſſion, muſt make the proprietor, from whom the tenants derive their right, party to the ſuit; and he muſt ſupport his claim by titles of property or diligences, preferable to thoſe in the perſon of his competitor. In the poſſeſſory, the purſuer, who libels that he, his anceſtors or authors, have been ſeven years in poſſeſſion, and that therefore he has the benefit of a poſſeſſory judgment, need produce no other title than a ſeiſin, which is a title ſufficient to make the poſſeſſion of heritage lawful; and it is enough, if he calls the natural poſſeſſors, though he ſhould neglect the proprietor. A poſſeſſory judgment founded on ſeven years poſſeſſion, in conſequence either of a ſeiſin or a tack, has this effect, that though one ſhould claim under a title preferable to that of the poſſeſſor, he cannot compete with him in the poſſeſſion, till in a formal proceſs of reduction he ſhall obtain the poſſeſſor's title declared void.

21. A *declaratory* action is that, in which ſome right is craved to be declared in favour of the purſuer, but nothing ſought to be paid or performed by the defender, ſuch as declarators of marriage, of irritancy, of expiry of the legal reverſion, *&c.* Under this claſs may be alſo comprehended reſciſſory actions, which, without any perſonal concluſion againſt the defender, tend ſimply to ſet aſide the rights or writings libelled, in conſequence of which a contrary right or immunity ariſes to the purſuer. Decrees upon action that are properly declaratory confer no new right; they only declare what was the purſuer's right before, and ſo have a retroſpect to the period at which that right firſt commenced. Declarators, becauſe they have no perſonal concluſion againſt the defender, may be purſued againſt an apparent heir without a previous charge given him to enter to his anceſtor; unleſs where ſpecial circumſtances require a charge.

22. An action for proving the tenor, whereby a writing, which is deſtroyed or amiſſing, is endeaved to be revived, is in effect declaratory. In obligations that are

extinguiſhable barely by the debtor's retiring or cancelling them, the purſuer, before a proof of the tenor is admitted, muſt condeſcend on ſuch a *caſus amiſſionis*, or accident by which the writing was deſtroyed, as ſhews it was loſt when in the creditor's poſſeſſion; otherwiſe bonds that have been cancelled by the debtor on payment, might be reared up as ſtill ſubſiſting againſt him: But in writings which require contrary deeds to extinguiſh their effect, as aſſignations, diſpoſitions, charters, *&c* it is ſufficient to libel that they were loſt, even *caſu fortuito*.

23. Regularly, no deed can be revived by this action, without ſome adminicle in writing, referring to that which is libelled; for no written obligation ought to be raiſed up barely on the teſtimony of witneſſes. If theſe adminicles afford ſufficient conviction, that the deed libelled did once exiſt, the tenor is admitted to be proved by witneſſes, who muſt depoſe, either that they were preſent at ſigning the deed, or that they afterwards ſaw it duly ſubſcribed. Where the relative writings contain all the ſubſtantial clauſes of that which is loſt, the tenor is ſometimes ſuſtained without witneſſes. In a writing which is libelled to have contained uncommon clauſes, all theſe muſt appear by the adminicles. Actions of proving the tenor are, on account of their importance, appropriated to the court of Seſſion; and, by the old form, the teſtimony of the witneſſes could not be received, but in preſence of all the judges.

24. The action of double or multiple poinding may be alſo reckoned declaratory. It is competent to a debtor, who is diſtreſſed, or threatened with diſtreſs, by two or more perſons claiming right to the debt, and who therefore brings the ſeveral claimants into the field, in order to debate and ſettle their ſeveral preferences, that ſo he may pay ſecurely to him whoſe right ſhall be found preferable. This action is daily purſued by an arreſtee, in the caſe of ſeveral arreſtments uſed in his hands for the ſame debt; or by tenants in the caſe of ſeveral adjudgers, all of whom claim right to the ſame rents. In theſe competitions, any of the competitors may bring an action of multiple poinding in name of the tenants, or other debtors, without their conſent, or even though they ſhould diſclaim the proceſs; ſince the law has introduced it as the proper remedy for getting ſuch competitions determined: And while the ſubject in controverſy continues *in medio*, any third perſon who conceives he has a right to it, may, though he ſhould not be cited as a defender, produce his titles, as if he were an original party to the ſuit, and will be admitted for his intereſt in the competition.

25. Certain actions may be called acceſſory, becauſe they are merely preparatory or ſubſervient to other actions. Thus, exhibitions *ad deliberandum*, at the inſtance of an heir againſt the creditors or cuſtodiers of his anceſtor's writings, are intended only to pave the way for future proceſſes. An action of tranſference is alſo of this ſort, whereby an action, during the pendency of which the defender happens to die, is craved to be tranſferred againſt his repreſentative, in the ſame condition in which it ſtood formerly. Upon the purſuer's death, his heir may inſiſt in the cauſe againſt the defender, upon producing, either a retour or a confirmed teſtament, according as the ſubject is heritable or moveable. Tranſferences being but incidental to other actions, can be pronounced by that inferior judge alone before whom the principal cauſe depended; but, where the repreſentatives of the deceaſed live in another territory, it is the ſupreme court which muſt tranſfer. Obligations may be now regiſtred ſummarily after the creditor's death; which before was not admitted, without a ſeparate proceſs of regiſtration, to which the granter was neceſſarily to be made a party.

26. A proceſs of wakening is likewiſe acceſſory. An action is ſaid to ſleep, when it lies over, not inſiſted in for a year, in which caſe its effect is ſuſpended; but even then it may, at any time within the years of preſcription, be revived or wakened by a ſummons, in which the purſuer recites the laſt ſtep of the proceſs, and concludes that it may be again carried on as if it had not been diſcontinued. An action that ſtands upon any of the inner-houſe rolls cannot ſleep; nor an action in which decree is pronounced, becauſe it has got its full completion: Conſequently the decree may be extracted after the year, without the neceſſity of a wakening.

27. An action of tranſumpt falls under the ſame claſs. It is competent to thoſe, who have a partial intereſt in writings that are not in their own cuſtody, againſt the poſſeſſors thereof, for exhibiting them, that they may be tranſumed for their behoof. Though the ordinary title in this proceſs be an obligation by the defender to grant tranſumpts to the purſuer, it is ſufficient if the purſuer can ſhow that he has an intereſt in the writings; but, in this caſe, he muſt tranſume them on his own charges. Actions of tranſumpt may be purſued before any judge-ordinary. After the writings to be tranſumed are exhibited, full duplicates are made out, collated, and ſigned, by one of the clerks of court, which are called tranſumpts, and are as effectual as an extract from the regiſter.

28. Actions proceeded anciently upon brieves iſſuing from the chancery, directed to the juſticiary or judge-ordinary, who tried the matter by a jury, upon whoſe verdict judgment was pronounced: And to this day, we retain certain brieves, as of *inqueſt*, *terce*, *ideotry*, *tutory*, *perambulation*, and perhaps two or three others: But ſummonſes were, immediately upon the inſtitution of the College of Juſtice, introduced in the place of brieves A ſummons, when applied to actions purſued before the ſeſſion, is a writ in the King's name, iſſuing from his ſignet upon the purſuer's complaint, authoriſing meſſengers to cite the defender to appear before the court, and make his defences; with certification if he fail to appear, that decree will be pronounced againſt him in terms of the certification of the ſummons.

29. The days indulged by law to a defender, between his citation and appearance, to prepare for his defence, are called *induciæ legales*. If he is within the kingdom, twenty one and ſix days, for the firſt and ſecond diets of appearance, muſt be allowed him for that purpoſe; and if out of it, ſixty and fifteen. Defenders reſiding in Orkney or Zetland muſt be cited on forty days. In certain ſummonſes which are priviledged, the *induciæ* are ſhortened: Spuilzies and ejections proceed on fifteen days;

wakenings and transferences, being but incidental, on ſix; ſee the liſt of privileged ſummonſes, in act of ſederunt June 29. 1672. A ſummons muſt be executed, *i. e.* ſerved againſt the defender, ſo as the laſt diet of appearance may be within a year after the date of the ſummons; and it muſt be called within a year after that diet, otherwiſe it falls for ever. Offence againſt the authority of the court, acts of malverſation in office by any member of the college of juſtice, and acts of violence and oppreſſion committed during the dependence of a ſuit by any of the parties, may be tried without a ſummons, by a ſummary complaint.

30. Where an action is in part penal, *e. g.* a removing, ſpuilzie, *&c.* a purſuer who reſtricts his demand to, and obtains decree merely for reſtitution, cannot thereafter bring a new proceſs for the violent profits. Yet the ſame fact may be the foundation both of a criminal and civil action, becauſe theſe two are intended for different purpoſes; the one for ſatisfying the public juſtice, the other for indemnifying the private party: And though the defender ſhould be abſolved in the criminal trial, for want of evidence, the party injured may bring an action *ad civilem effectum*, in which he is intitled to refer the libel to the defender's oath.

31. One libel or ſummons may contain different concluſions on the ſame ground of right, reſciſſory, declaratory, petitory, *&c.* if they be not repugnant to each other: Nay, though different ſums be due to one, upon diſtinct grounds of debt, or even by different debtors, the creditor may inſiſt againſt them all in the ſame ſummons.

32. Defences are pleas offered by a defender for eliding an action. They are either dilatory, which do not enter into the cauſe itſelf, and ſo can only procure an abſolviture from the *lis pendens*: Or peremptory, which entirely cut off the purſuer's right of action. The firſt, becauſe they relate to the forms of proceeding, muſt be offered *in limine judicii*, and all of them at once. But peremptory defences may be proponed at any time before ſentence.

33. A cauſe, after the parties had litigated it before the judge, was ſaid by the Romans to be litiſconteſted. By litiſconteſtation a judicial contract is underſtood to be entered into by the litigants, by which the action is perpetuated againſt heirs, even when it ariſes *ex delicto*. By our law, litiſconteſtation is not formed till an act is extracted, admitting the libel or defences to proof.

Tit. 31. *Of Probation.*

All allegations by parties to a ſuit, muſt be ſupported by proper proof. Probation is either by writing, by the party's own oath, or by witneſſes. In the caſe of allegations, which may be proved by either of the three ways, a proof is ſaid to be admitted *prout de jure*; becauſe, in ſuch caſe, all the legal methods of probation are competent to the party: If the proof he brings by writing be lame, he may have recourſe either to witneſſes or to his adverſary's oath; but, if he ſhould firſt take himſelf to the proof by oath, he cannot thereafter uſe any other probation, for the reaſon aſſigned § 3. and, on the contrary, a purſuer, who has brought a proof by witneſſes, on an extracted act, is not allowed to recur to the oath of the defender. Single combat, as a ſort of appeal to Providence, was, by our ancient law, admitted as evidence, in matters both civil and criminal. It was afterwards reſtricted to the caſe of ſuch capital crimes where no other proof could be had; ſome traces of this blind method of trial remained even in the reign of *J.* VI. who, by 1600. *c.* 12. might authoriſe duels on weighty occaſions.

2. As obligations or deeds ſigned by the party himſelf, or his anceſtors or authors, muſt be, of all evidence, the leaſt liable to exception; therefore every debt or allegation may be proved by proper evidence in writing. The ſolemnities eſſential to probative deeds have been already explained, Tit. xxi. 3. *et ſeq.* Books of account kept by merchants, tradeſmen, and other dealers in buſineſs, though not ſubſcribed, are probative againſt him who keeps them; and, in caſe of furniſhings by a ſhop-keeper, ſuch books, if they are regularly kept by him, ſupported by the teſtimony of a ſingle witneſs, afford a *ſemiplena probatio* in his favour, which becomes full evidence by his own oath in ſupplement. Notorial inſtruments and executions by meſſengers bear full evidence, that the ſolemnities therein ſet forth were uſed, not to be invalidated otherwiſe than by a proof of falſehood; but they do not prove any other extrinſic facts therein averred, againſt third parties.

3. Regularly, no perſon's right can be proved by his own oath, nor taken away by that of his adverſary; becauſe theſe are the bare averments of parties in their own favour. But, where the matter in iſſue is referred by one of the parties to the oath of the other, ſuch oath, though made in favour of the deponent himſelf, is deciſive of the point; becauſe the reference is a virtual contract between the litigants, by which they are underſtood to put the iſſue of the cauſe upon what ſhall be depoſed: And this contract is ſo ſtrictly regarded, that the the party who refers to the oath of the other cannot afterwards, in a civil action, plead upon any deed againſt the party depoſing, inconſiſtent with his oath. To obviate the ſnares that may be laid for perjury, he, to whoſe oath of verity a point is referred, may refuſe to depoſe, till his adverſary ſwear that he can bring no other evidence in proof of his allegation.

4. A defender, though he cannot be compelled to ſwear to facts in a libel properly criminal; yet may, in treſpaſſes, where the concluſion is limited to a fine, or to damages. In general, an oath of party cannot either hurt or benefit third parties; being, as to them, *res inter alios acta*.

5. An oath upon reference, is ſometimes qualified by ſpecial limitations reſtricting it. The qualities which are admitted by the judge as part of the oath, are called intrinſic; thoſe which the judge rejects or ſeparates from the oath, extrinſic. Where the quality makes a part of the allegation which is relevantly referred to oath, it is intrinſic. Thus, becauſe a merchant, ſuing for furniſhings after the three years, muſt, in order to make a relevancy, offer to prove by the defender's oath, not only the delivery of the goods, but that the price is ſtill due; there-

fore, though the defender ſhould acknowledge upon oath his having received the goods, yet, if he adds, that he paid the price, this laſt part, being a denial that the debt ſubſiſts, is intrinſic, ſince it is truly the point referred to oath. Where the quality does not import an extinction of the debt, but barely a counter-claim, or *mutua petitio*, againſt the purſuer, it is held as extrinſic, and muſt be proved *aliunde*. Neither can a defender who in his oath admits the conſtitution of a debt, get off by adjecting the quality of payment, where the payment ought by its nature to be vouched by written evidence.

6 Oaths of verity are ſometimes deferred by the judge to either party, *ex officio*; which becauſe they are not founded on any implied contract between the litigants, are not finally deciſive, but may be traverſed on proper evidence afterwards produced These oaths are commonly put by the judge for ſupplying a lame or imperfect proof, and are therefore called oaths in ſupplement. See § 2.

7. To prevent groundleſs allegations, oaths of calumny have been introduced, by which either party may demand his adverſary's oath, that he believes the fact contained in his libel or defences to be juſt and true. As this is an oath, not of verity, but only of opinion, the party who puts it to his adverſary, does not renounce other probation; and therefore no party is bound to give an oath of calumny, on recent facts of his own, for ſuch oath is really an oath of verity. Theſe oaths have not been ſo frequent ſince the act of ſederunt, Feb. 1. 1715, whereby any party, againſt whom a fact ſhall be alledged, is obliged, without making oath, to confeſs or deny it; and in caſe of calumnious denial, is ſubjected to the expence that the other party has thereby incurred.

8. In all oaths, whether of verity or calumny, the citation carries, or at leaſt implies, a certification, that if the party does not appear at the day aſſigned for depoſing, he ſhall be held *pro confeſſo*; from a preſumption of his conſciouſneſs, that the fact upon which he declines to ſwear makes againſt him; but no party can be held *pro confeſſo*, if he be in the kingdom, without a previous perſonal citation uſed againſt him. Though an oath which reſolves into a *non memini*, cannot be ſaid to prove any point; yet where one ſo depoſes upon a recent fact, to which he himſelf was privy, his oath is conſidered as a diſſembling of the truth, and he is held *pro confeſſo*, as if he had refuſed to ſwear.

9. An oath *in litem*, is that which the judge defers to a purſuer, for aſcertaining either the quantity or the value of goods which have been taken from him by the defender without order of law, or the extent of his damages. An oath *in litem*, as it is the affirmation of a party in his own behalf, is only allowed where there is proof that the other party has been engaged in ſome illegal act, or where the public policy has made it neceſſary, ſee Tit. xx. 11. This oath, as to the quantities, is not admitted, where there is a concurring teſtimony of witneſſes brought in proof of it. When it is put as to the value of goods, it is only an oath of credulity; and therefore it has always been ſubject to the modification of the court.

10. The law of Scotland rejects the teſtimony of witneſſes, 1. In payment of any ſum above *L.* 100 *Scots*, all which muſt be proved either *ſcripto vel juramento*. 2. In all gratuitous promiſes, though for the ſmalleſt trifle. 3. In all contracts, where writing is either eſſential to their conſtitution, (ſee Tit. xxi. 2.) or where it is uſually adhibited, as in the borrowing of money. And it is a general rule, ſubject to the reſtrictions mentioned in the next §, that no debt or right, once conſtituted by writing, can be taken away by witneſſes.

11. On the other part, probation by witneſſes is admitted to the extent of *L.* 100 *Scots*, in payments, nuncupative legacies, and verbal agreements which contain mutual obligations. And it is received to the higheſt extent, 1. In all bargains which have known engagements naturally ariſing from them, concerning moveable goods. 2. In facts performed in ſatisfaction, even of a written obligation, where ſuch obligation binds the party preciſely to the performance of them. 3. In facts which with difficulty admit of a proof by writing, even though the effect of ſuch proof ſhould be the extinction of a written obligation, eſpecially if the facts import fraud or violence; thus, a bond is reducible *ex dolo*, on a proof by witneſſes. Laſtly, all intromiſſion by a creditor with the rents of his debtor's eſtate payable in grain, may be proved by witneſſes; and even intromiſſion with the ſilver-rent, where the creditor has entered into the total poſſeſſion of the debtor's lands.

12. No perſon, whoſe near relation to another bars him from being a judge in his cauſe, can be admitted as a witneſs for him; but he may, againſt him, except a wife or child, who cannot be compelled to give teſtimony againſt the huſband or parent, *ob reverentiam perſonæ, et metum perjurii*. Though the witneſs, whoſe propinquity to one of the parties is objected to, be as nearly related to the other, the objection ſtands good.

13. The teſtimony of infamous perſons is rejected, *i. e.* perſons who have been guilty of crimes that law declares to infer infamy, or who have been declared infamous by the ſentence of a judge; but *infamia facti* does not diſqualify a witneſs. Pupils are inhabile witneſſes; being, in the judgment of law, incapable of the impreſſions of an oath. The teſtimony of women is ſeldom admitted, where other witneſſes can be had. And in general witneſſes otherwiſe exceptionable may, where there is a penury of witneſſes ariſing from the nature or circumſtances of the fact, be received *cum nota*; that is, their teſtimony, though not quite free from ſuſpicion, is to be conjoined with the other evidence, and to have ſuch weight given it as the judge ſhall think it deſerves.

14. All witneſſes, before they are examined in the cauſe, are purged of partial counſel; that is, they muſt declare, that they have no intereſt in the ſuit, nor have given advice how to conduct it; that they have got neither bribe nor promiſe, nor have been inſtructed how to depoſe; and that they bear no enmity to either of the parties. Theſe, becauſe they are the points put to a witneſs before his making oath, are called *initialia teſtimonii*. Where a party can bring preſent proof of a witneſs's partial counſel, in any of the above particulars, he ought to offer it before the witneſs be ſworn; but, becauſe ſuch objection, if it cannot be inſtantly verified, will be no bar to the examination, law allows the party in that caſe to

proteſt for *reprobator*, before the witneſs is examined; *i. e.* that he may be afterwards allowed to bring evidence of his enmity, or other inhability. Reprobator is competent even after ſentence, where proteſtation is duly entered; but in that caſe, the party inſiſting muſt conſign *L.* 100 *Scots*, which he forfeits if he ſuccumb. This action muſt have the concurrence of the King's Advocate, becauſe the concluſion of it imports perjury; and for this reaſon, the witneſs muſt be made a party to it.

15. The interlocutory ſentence or warrant, by which parties are authoriſed to bring their proof, is either by way of act, or of incident diligence. In an act, the Lord Ordinary who pronounces it, is no longer judge in the proceſs: but in an incident diligence, which is commonly granted upon ſpecial points, that do not exhauſt the cauſe, the Lord ordinary continues judge. If a witneſs does not appear at the day fixed by the warrant of citation, a ſecond warrant is granted of the nature of a caption, containing a command to meſſengers to apprehend and bring him before the court. Where the party to whom a proof is granted, brings none within the term allowed by the warrant, an interlocutor is pronounced, circumducing the term, and precluding him from bringing evidence thereafter. Where evidence is brought, if it be upon an act, the Lord Ordinary on the acts, after the term for proving is elapſed, declares the proof concluded, and thereupon a ſtate of the caſe is prepared by the Ordinary on concluded cauſes, which muſt be judged by the whole Lords; but if the proof be taken upon an incident diligence, the import of it may be determined by the Lord Ordinary in the cauſe.

16. Where facts do not admit a direct proof, preſumptions are received as evidence which, in many caſes, make as convincing a proof as the direct. Preſumptions are conſequences deduced from facts known or proved, which infer the certainty, or at leaſt a ſtrong probability, of another fact to be proved. This kind of probation is therefore called artificial, becauſe it requires a reaſoning to infer the truth of the point in queſtion, from the facts that already appear in proof. Preſumptions are either, 1. *juris et de jure*; 2. *juris*; or 3. *hominis* or *judicis*. The firſt ſort obtains, where ſtatute or cuſtom eſtabliſhes the truth of any point upon a preſumption; and it is ſo ſtrong, that it rejects all proof that may be brought to elide it in ſpecial caſes. Thus, the teſtimony of a witneſs, who forwardly offers himſelf without being cited, is, from a preſumption of his partiality, rejected, let his character be ever ſo fair; and thus alſo, a minor, becauſe he is by law preſumed incapable of conducting his own affairs, is, upon that preſumption, diſabled from acting without the conſent of his curators, though he ſhould be known to behave with the greateſt prudence. Many ſuch preſumptions are fixed by ſtatute.

17. *Præſumptiones juris* are thoſe, which our law books or deciſions have eſtabliſhed, without founding any particular conſequence upon them, or ſtatuting *ſuper præſumpto*. Moſt of this kind are not proper preſumptions inferred from poſitive facts, but are founded merely on the want of a contrary proof: thus, the legal preſumptions for freedom, for life, for innocence, *&c* are in effect ſo many negative propoſitions, that ſervitude, death, and guilt, are not to be preſumed, without evidence brought by him who makes the allegation. All of them, whether they be of this ſort, or proper preſumptions, as they are only conjectures formed from what commonly happens, may be elided, not only by direct evidence, but by other conjectures, affording a ſtronger degree of probability to the contrary. *Præſumptiones hominis* or *judicis*, are thoſe which ariſe daily from the circumſtances of particular caſes; the ſtrength of which is to be weighed by the judge.

18. A *fictio juris* differs from a preſumption. Things are preſumed, which are likely to be true; but a fiction or law aſſumes for truth what is either certainly falſe, or, at leaſt, is as probably falſe as true. Thus, an heir is feigned or conſidered in law as the ſame perſon with his anceſtor. Fictions of law muſt, in their effects, be always limited to the ſpecial purpoſes of equity, for which they were introduced; ſee an example, Tit. xxx. 3.

Tit. 32. *Of Sentences and their Execution.*

PROPERTY would be moſt uncertain, if debateable points might, after receiving a definitive judgment, be brought again in queſtion, at the pleaſure of either of the parties: Every ſtate has therefore affixed the character of final to certain ſentences or decrees, which in the Roman law are called *res judicatæ*, and which exclude all review or rehearing.

2. Decrees of the court of Seſſion, are either *in foro contradictorio*, where both parties have litigated the cauſe, or in abſence of the defender. Decrees of the Seſſion *in foro* cannot, in the general caſe, be again brought under the review of the court, either on points which the parties neglected to plead before ſentence (which we call competent and omitted), or upon points pleaded and found inſufficient (proponed and repelled.) But decrees, though *in foro*, are reverſible by the court, where either they labour under eſſential nullities; *e. g.* where they are *ultra petita*, or not conformable to their grounds and warrants, or founded on an error in calcul, *&c.*; or where the party againſt whom the decree is obtained has thereafter recovered evidence ſufficient to overturn it, of which he knew not before.

3. As parties might formerly reclaim againſt the ſentences of the ſeſſion, at any time before extracting the decree, no judgment was final till extract: but now, a ſentence of the inner-houſe, either not reclaimed againſt within ſix ſederunt-days after its date, or adhered to upon a reclaiming bill, though it cannot receive execution till extract, makes the judgment final as to the court of Seſſion. And, by an order of the houſe of Lords, March 24. 1725, no appeal is to be received by them from ſentences of the Seſſion after five years from extracting the ſentence; unleſs the perſon entitled to ſuch appeal be minor, clothed with a huſband, *non compos mentis*, impriſoned, or out of the kingdom. Sentences pronounced by the Lord Ordinary have the ſame effect, if not reclaimed againſt, as if they were pronounced in preſence; and all petitions againſt the interlocutor of an Ordinary muſt be preferred within eight ſederunt-days after ſigning ſuch interlocutor.

4. Decrees, in abſence of the defender, have not the force of *res judicatæ* as to him; for where the defender does not appear, he cannot be ſaid to have ſubjected himſelf by the judicial contract which is implied in litiſconteſtation: A party therefore may be reſtored againſt theſe, upon paying to the other his coſts in recovering them. The ſentences of inferior courts may be reviewed by the court of Seſſion, before decree, by advocation, and after decree, by ſuſpenſion or reduction; which two laſt are alſo the methods of calling in queſtion ſuch decrees of the Seſſion itſelf as can again be brought under the review of the court.

5. Reduction is the proper remedy, either where the decree has already received full execution by payment, or where it decrees nothing to be paid or performed, but ſimply declares a right in favour of the purſuer. Suſpenſion is that form of law by which the effect of a ſentence condemnatory, that has not yet received execution, is ſtayed or poſtponed, till the cauſe be again conſidered. The firſt ſtep towards ſuſpenſion is a bill preferred to the Lord Ordinary on the bills. This bill, when the deſire of it is granted, is a warrant for iſſuing letters of ſuſpenſion which paſs the ſignet; but, if the preſenter of the bill ſhall not, within fourteen days after paſſing it, expedite the letters, execution may proceed on the ſentence. Suſpenſions of decrees *in foro* cannot paſs, but by the whole Lords in time of ſeſſion, and by three in vacation time; but other decrees may be ſuſpended by any one of the judges.

6. As ſuſpenſion has the effect of ſtaying the execution of the creditor's legal diligence, it cannot, in the general caſe, paſs without caution given by the ſuſpender to pay the debt, in the event it ſhall be found due. Where the ſuſpender cannot, from his low or ſuſpected circumſtances, procure unqueſtionable ſecurity, the Lords admit juratory caution, *i. e.* ſuch as the ſuſpender ſwears is the beſt he can offer; but the reaſons of ſuſpenſion are, in that caſe, to be conſidered with particular accuracy at paſſing the bill. Decrees in favour of the clergy, of univerſities, hoſpitals, or pariſh ſchool-maſters, for their ſtipends, rents, or ſalaries, cannot be ſuſpended, but upon production of diſcharges, or on conſignation of the ſums charged for. A charger, who thinks himſelf ſecure without a cautioner, and wants diſpatch, may, where a ſuſpenſion of his diligence is ſought, apply to the court to get the reaſons of ſuſpenſion ſummarily diſcuſſed on the bill.

7. Though he, in whoſe favour the decree ſuſpended is pronounced, be always called the charger, yet a decree may be ſuſpended before a charge be given on it. Nay, ſuſpenſion is competent even where there is no decree, for putting a ſtop to any illegal act whatſoever: Thus, a building, or the exerciſe of a power which one aſſumes unwarrantably, is a proper ſubject of ſuſpenſion. Letters of ſuſpenſion are conſidered merely as a prohibitory diligence; ſo that the ſuſpender, if he would turn provoker, muſt bring an action of reduction. If upon diſcuſſing the letters of ſuſpenſion, the reaſons ſhall be ſuſtained, a decree is pronounced, ſuſpending the letters of diligence on which the charge was given *ſimpliciter*; which is called a decree of ſuſpenſion, and takes off the effect of the decree ſuſpended. If the reaſons of ſuſpenſion be repelled, the court find the letters of diligence orderly proceeded, *i. e.* regularly carried on; and they ordain them to be put to farther execution.

8. Decrees are carried into execution, by diligence, either againſt the perſon, or againſt the eſtate of the debtor. The firſt ſtep of perſonal execution is by letters of horning, which paſs, by warrant of the court of Seſſion, on the decrees of magiſtrates of boroughs, ſheriffs, admirals, and commiſſaries. If the debtor does not obey the will of the letters of horning within the days of the charge, the charger, after denouncing him rebel, and regiſtring the horning, may apply for letters of caption, which contain a command, not only to meſſengers, but to magiſtrates, to apprehend and impriſon the debtor. All meſſengers and magiſtrates, who refuſe their aſſiſtance in executing the caption, are liable *ſubſidarie* for the debt; and ſuch ſubſidiary action is ſupported by the execution of the meſſenger employed by the creditor, expreſſing that they were charged to concur, and would not. Letters of caption contain an expreſs warrant to the meſſenger, in caſe he cannot get acceſs, to break open all doors, and other lock-faſt places.

9. Law ſecures peers, married women, and pupils, againſt perſonal execution by caption upon civil debts. No caption can be executed againſt a debtor within the precincts of the King's palace of Holyroodhouſe: But this privilege of ſanctuary afforded no ſecurity to criminals, as that did which was, by the canon law, conferred on churches and religious houſes. Where the perſonal preſence of a debtor, under caption, is neceſſary in any of our ſupreme courts, the judges are empowered to grant him a protection, for ſuch time as may be ſufficient for his coming and going, not exceeding a month.

10. After a debtor is impriſoned, he ought not to be indulged the benefit of the air, not even under a guard; for creditors have an intereſt, that their debtors be kept under cloſe confinement, that, by the *ſqualor carceris*, they may be brought to pay their debt: And any magiſtrate or jailor, who ſhall ſuffer the priſoner to go abroad, without a proper atteſtation, upon oath, of the dangerous ſtate of his health, is liable *ſubſidarie* for the debt. Magiſtrates are in like manner liable, if they ſhall ſuffer a priſoner to eſcape, through the inſufficiency of their priſon: But, if he ſhall eſcape under night, by the uſe of inſtruments, or by open force, or by any other accident which cannot be imputed to the magiſtrates or jailor, they are not chargeable with the debt; provided they ſhall have, immediately after his eſcape, made all poſſible ſearch for him. Regularly, no priſoner for debt upon letters of caption, though he ſhould have made payment, could be releaſed without letters of ſuſpenſion, containing a charge to the jailor to ſet him at liberty; becauſe the creditor's diſcharge could not take off the penalty incurred by the debtor for contempt of the King's authority: But to ſave unneceſſary expence to debtors in ſmall debts, jailors are empowered to let go priſoners where the debt does not exceed 200 merks *Scots*, upon production of a diſcharge, in which the creditor conſents to his releaſe.

11. Our law, from a conſideration of compaſſion, allows inſolvent debtors to apply for a releaſe from priſon, upon a *ceſſio bonorum*, *i.e.* upon their making over to the creditors all their eſtate, real and perſonal. This muſt be inſiſted for, by way of action, to which all the creditors of the priſoner ought to be made parties. The priſoner muſt, in this action, which is cogniſable only by the court of Seſſion, exhibit a particular inventory of his eſtate, and make oath that he has no other eſtate than is therein contained, and that he has made no conveyance of any part of it, ſince his impriſonment, to the hurt of his creditors. He muſt alſo make oath, whether he has granted any diſpoſition of his effects before his impriſonment, and condeſcend on the perſons to whom, and on the cauſe of granting it; that the court may judge, whether, by any colluſive practice, he has forfeited his claim to liberty.

12. A fraudulent bankrupt is not allowed this privilege; nor a criminal who is liable in an aſſythment or indemnification to the party injured or his executors, though the crime itſelf ſhould be extinguiſhed by a pardon. A diſpoſition granted on a *ceſſio bonorum* is merely in farther ſecurity to the creditors, not in ſatisfaction or *in ſolutum* of the debts. If therefore, the debtor ſhall acquire any eſtate after his releaſe, ſuch eſtate may be attached by his creditors, as if there had been no *ceſſio*, except in ſo far as is neceſſary for his ſubſiſtence. Debtors, who are ſet free on a *ceſſio bonorum*, are obliged to wear a habit proper to dyvours or bankrupts. The Lords are prohibited to diſpenſe with this mark of ignominy, unleſs, in the ſummons and proceſs of *ceſſio*, it be libelled, ſuſtained, and proved, that the bankruptcy proceeds from misfortune. And bankrupts are condemned to ſubmit to the habit, even where no ſuſpicion of fraud lies againſt them, if they have been dealers in an illicite trade.

13. Where a priſoner for debt declares upon oath, before the magiſtrate of the juriſdiction, that he has not wherewith to maintain himſelf, the magiſtrate may ſet him at liberty, if the creditor, in conſequence of whoſe diligence he was impriſoned, does not aliment him within ten days after intimation made for that purpoſe. But the magiſtrate may, in ſuch caſe, detain him in priſon, if he chuſes to bear the burden of the aliment, rather than releaſe him. The ſtatute authoriſing this releaſe, which is uſually called the act of grace, is limited to the caſe of priſoners for civil debts.

14. Decrees are executed againſt the moveable eſtate of the debtor by arreſtment or poinding; and againſt his heritable eſtate, by inhibition, or adjudication. If one be condemned, in a removing or other proceſs, to quit the poſſeſſion of lands, and refuſes, notwithſtanding a charge, letters of ejection are granted of courſe, ordaining the ſheriff to eject him, and to enter the obtainer of the decree into poſſeſſion. Where one oppoſes by violence the execution of a decree, or of any lawful diligence, which the civil magiſtrate is not able by himſelf and his officers to make good, the execution is enforced *manu militari*.

15. A decree-arbitral, which is a ſentence proceeding on a ſubmiſſion to arbiters, has ſome affinity with a judicial ſentence, though in moſt reſpects the two differ. A ſubmiſſion is a contract entered into, by two or more parties who have diſputable rights or claims, whereby they refer their differences to the final determination of an arbiter or arbiters, and oblige themſelves to acquieſce in what ſhall be decided. Where the day within which the arbiters are to decide, is left blank in the ſubmiſſion, practice has limited the arbiters power of deciding to a year. As this has proceeded from the ordinary words of ſtyle, empowering the arbiters to determine betwixt and the day of next to come; therefore, where a ſubmiſſion is indefinite, without ſpecifying any time, like all other contracts or obligations, it ſubſiſts for forty years. Submiſſions, like mandates, expire by the death of any of the parties-ſubmitters before ſentence. As arbiters are not veſted with juriſdiction, they cannot compel witneſſes to make oath before them, or havers of writings to exhibit them; but this defect is ſupplied by the court of Seſſion, who, at the ſuit of the arbiters, or of either of the parties, will grant warrant for citing witneſſes, or for the exhibition of writings. For the ſame reaſon, the power of arbiters is barely to decide; the execution of the decree belongs to the judge. Where the ſubmitters conſent to the regiſtration of the decree-arbitral, performance may be enforced by ſummary diligence.

16. The power of arbiters is wholly derived from the conſent of parties Hence, where their powers are limited to a certain day, they cannot pronounce ſentence after that day. Nor can they ſubject parties to a penalty higher than that which they have agreed to in the ſubmiſſion. And where a ſubmiſſion is limited to ſpecial claims, ſentence pronounced on ſubjects not ſpecified in the ſubmiſſion is null, as being *ultra vires compromiſſi*.

17. But, on the other part, as ſubmiſſions are deſigned for a moſt favourable purpoſe, the amicable compoſing of differences, the powers thereby conferred on arbiters receive an ample interpretation. Decrees-arbitral are not reducible upon any ground, except corruption, bribery, or falſehood.

Tit. 26. *Of Crimes.*

The word *crime*, in its moſt general ſenſe, includes every breach, either of the law of God, or of our country; in a more reſtricted meaning, it ſignifies ſuch tranſgreſſions of law as are puniſhable by courts of juſtice. Crimes were, by the Roman law, divided into public and private. Public crimes were thoſe that were expreſsly declared ſuch by ſome law or conſtitution, and which, on account of their more atrocious nature and hurtful conſequences, might be proſecuted by any member of the community. Private crimes could be purſued only by the party injured, and were generally puniſhed by a pecuniary fine to be applied to his uſe. By the law of Scotland, no private party, except the perſon injured, or his next of hin, can accuſe criminally: but the King's Advocate, who in this queſtion repreſents the community, has a right to proſecute all crimes *in vindictam publicam*, though the party injured ſhould refuſe to concur. Smaller offences, as petty riots, injuries, &c. which do not demand the public vengeance, paſs generally by the appellation of delicts, and are puniſhed either by fine or impriſonment.

2. The eſſence of a crime is, that there be an intention in the actor to commit it; for an action in which the will of the agent has no part, is not a proper object either of rewards or puniſhments: Hence ariſes the rule, *crimen dolo contrahitur*. Simple negligence does not therefore conſtitute a proper crime. Yet where it is extremely groſs, it may be puniſhed arbitrarily. Far leſs can we reckon in the number of crimes, thoſe committed by an ideot or furious perſon: But leſſer degrees of fatuity, which only darken reaſon, will not afford a total defence, though they may ſave from the *pœna ordinaria*. Actions committed in drunkenneſs are not to be conſidered as involuntary, ſeeing the drunkenneſs itſelf, which was the firſt cauſe of the action, is both voluntary and criminal.

3. On the ſame principle, ſuch as are in a ſtate of infancy, or in the confines of it, are incapable of a criminal action, dole not being incident to that age; but the preciſe age at which a perſon becomes capable of dole, being fixed neither by nature nor by ſtatute, is by our practice to be gathered by the judge, as he beſt can, from the underſtanding and manners of the perſon accuſed. Where the guilt of a crime ariſes chiefly from ſtatute, the actor, if he is under puberty, can hardly be found guilty; but, where nature itſelf points out its deformity, he may, if he is *proximus pubertati*, be more eaſily preſumed capable of committing it: Yet, even in that caſe, he will not be puniſhed *pœna ordinaria*.

4. One may be guilty of a crime, not only by perpetrating it himſelf, but by being acceſſory to a crime committed by another; which laſt is by civilians ſtyled *ope et conſilio*, and, in our law-phraſe, art and part. A perſon may be guilty, art and part, either by giving advice or counſel to commit the crime; or, 2. By giving warrant or mandate to commit it; or, 3. By actually aſſiſting the criminal in the execution. It is generally agreed by doctors, that, in the more atrocious crimes, the adviſer is equally puniſhable with the criminal; and that, in the ſlighter, the circumſtances ariſing from the adviſer's leſſer age, the jocular or careleſs manner of giving advice, *&c.* may be received as pleas for ſoftening the puniſhment. One who gives mandate to commit a crime, as he is the firſt ſpring of action, ſeems more guilty than the perſon employed as the inſtrument in executing it; yet the actor cannot excuſe himſelf under the pretence of orders which he ought not to have obeyed.

5. Aſſiſtance may be given to the committer of a crime, not only in the actual execution, but previous to it, by furniſhing him, intentionally, with poiſon, arms, or the other means of perpetrating it. That ſort of aſſiſtance which is not given till after the criminal act, and which is commonly called abetting, though it be of itſelf criminal, does not infer art and part of the principal crime; as if one ſhould favour the eſcape of a criminal knowing him to be ſuch, or conceal him from juſtice.

6. Thoſe crimes that are, in their conſequences, moſt hurtful to ſociety, are puniſhed capitally, or by death; others eſcape with a leſſer puniſhment, ſometimes fixed by ſtatute, and ſometimes arbitrary, *i. e.* left to the diſcretion of the judge, who may exerciſe his juriſdiction, either by fine, impriſonment, or a corporal puniſhment. Where the puniſhment is left, by law, to the diſcretion of the judge, he can in no caſe extend it to death. The ſingle eſcheat of the criminal falls on conviction, in all capital trials, though the ſentence ſhould not expreſs it.

7. Certain crimes are committed more immediately againſt God himſelf; others, againſt the ſtate; and a third kind, againſt particular perſons. The chief crime in the firſt claſs, cogniſable by temporal courts, is *blaſphemy*, under which may be included atheiſm. This crime conſiſts in the denying or vilifying the Deity, by ſpeech or writing. All who curſe God or any of the perſons of the bleſſed Trinity, are to ſuffer death, even for a ſingle act; and thoſe who deny him, if they perſiſt in their denial. The denial of a providence, or of the authority of the holy Scriptures, is puniſhable capitally for the third offence.

8. No proſecution can now be carried on for witchcraft or conjuration. But all who undertake, from their ſkill in any occult ſcience, to *tell fortunes, or diſcover ſtolen goods*, are to ſuffer impriſonment for a year, ſtand in the pillory four times in that year, and find ſurety for their future good behaviour.

9. Some crimes againſt the ſtate are levelled directly againſt the ſupreme power, and ſtrike at the conſtitution itſelf; others diſcover ſuch a contempt of law, as tends to baffle authority, or ſlacken the reins of government. *Treaſon, crimen majeſtatis*, is that crime which is aimed againſt the majeſty of the ſtate; and can be committed only by thoſe who are ſubjects of that ſtate either by birth or reſidence. Soon after the union of the two kingdoms in 1707, the laws of treaſon, then in force in England, were made ours by 7. *An. c.* 21. both with regard to the facts conſtituting that crime, to the forms of trial, the corruption of blood, and all the penalties and forfeitures conſequent on it.

10. It is high treaſon, by the law of England, to imagine the death of the King, Queen-conſort, or of the heir apparent of the crown; to levy war againſt the King, or adhere to his enemies; to counterfeit the King's coin, or his great or privy ſeal; to kill the chancellor, treaſurer, or any of the twelve judges of England, while they are doing their offices; which laſt article is by the forenamed act 7. *An.* applied to Scotland, in the caſe of ſlaying any judge of the Seſſion or of Juſticiary ſitting in judgment. Thoſe who waſh, clip, or lighten the proper money of the realm, who adviſedly affirm by writing or printing, that the Pretender has any right to the crown, that the King and Parliament cannot limit the ſucceſſion to it, or who hold correſpondence with the Pretender or any perſon employed by him, are alſo guilty of treaſon.

11. The forms of proceeding in the trial of treaſon, whether againſt Peers or Commoners, are ſet forth in a ſmall treatiſe, publiſhed by order of the houſe of Lords in 1709, ſubjoined to a collection of ſtatutes concerning treaſon. By the conviction upon this trial, the whole eſtate of the traitor forfeits to the crown. His blood is alſo corrupted, ſo that, on the death of an anceſtor, he cannot inherit;

herit; and the eſtate which he cannot take, falls to the immediate ſuperior as eſcheat, *ob defectum heredis*, without diſtinguiſhing whether the lands hold of the crown, or of a ſubject. No attainder for treaſon ſhall, after the death of the Pretender and all his ſons, hurt the right of any perſon, other than that of the offender, during his natural life; The rights of creditors and other third parties in the caſe of forfeiture on treaſon, muſt be determined by the law of England.

12. *Miſpriſion of treaſon*, from *Meprendre*, is the overlooking or concealing of treaſon. It is inferred by one's bare knowledge of the crime, and not diſcovering it to a magiſtrate or other perſon intitled by his office to take examinations; though he ſhould not in the leaſt degree aſſent to it. The foreſaid act 7. *An.* makes the Engliſh law of miſpriſion ours. Its puniſhment is, by the law of England, perpetual impriſonment, together with the forfeiture of the offender's moveables, and of the profits of his heritable eſtate, during his life; that is, in the ſtyle of our law, his ſingle and liferent-eſcheat.

13. The crime of *ſedition* conſiſts in the raiſing commotions or diſturbances in the ſtate. It is either verbal or real. Verbal ſedition, or leaſing-making, is inferred from the uttering of words tending to create diſcord between the King and his people. It is puniſhed either by impriſonment, fine, or baniſhment, at the diſcretion of the judge. Real ſedition is generally committed, by convocating together any conſiderable number of people, without lawful authority, under the pretence of redreſſing ſome public grievance, to the diſturbing of the public peace. Thoſe who are convicted of this crime are puniſhed by the confiſcation of their goods; and their lives are at the King's will. If any perſons, to the number of twelve, ſhall aſſemble, and being required by a magiſtrate or conſtable to diſperſe, ſhall nevertheleſs continue together for an hour after ſuch command, the perſons diſobeying ſhall ſuffer death and the confiſcation of moveables.

14. Judges, who, wilfully or through corruption, uſe their authority as a cover to injuſtice or oppreſſion, are puniſhed with the loſs of honour, fame, and dignity. Under this head, may be claſſed *theftbote* (from *bote*, compenſation), which is the taking a conſideration in money or goods from a thief to exempt him from puniſhment, or connive at his eſcape from juſtice. A ſheriff or other judge, guilty of this crime, forfeits his life and goods. And even a private perſon, who takes theftbote, ſuffers as the principal thief. The buying of diſputed claims, concerning which there is a pending proceſs, by any judge or member either of the Seſſion, or of an inferior court, is puniſhed by the loſs of the delinquent's office, and all the privileges thereto belonging.

15. Deforcement is the oppoſition given, or reſiſtance made, to meſſengers or other officers, while they are employed in executing the law. The court of Seſſion is competent to this crime. It is puniſhable with the confiſcation of moveables, the one half to the King, and the other to the creditor at whoſe ſuit the diligence was uſed. Armed perſons, to the number of three or more, aſſiſting in the illegal running, landing, or exporting of prohibited or uncuſtomed goods, or any who ſhall reſiſt, wound, or maim any officer of the revenue in the execution of office, are puniſhable with death and the confiſcation of moveables.

16. *Breach of arreſtment*, (ſee Tit. xxv. 5.) is a crime of the ſame nature with deforcement, as it imports a contempt of the law and of our judges. It ſubjects to an arbitrary corporal puniſhment, and the eſcheat of moveables; with a preference to the creditor for his debt, and for ſuch farther ſum as ſhall be modified to him by the judge. Under this head of crimes againſt good government and police, may be reckoned the *foreſtalling of markets*; that is, the buying of goods intended for a public market, before they are carried there; which for the third criminal act, infers the eſcheat of moveables; as alſo ſlaying ſalmond in forbidden time, deſtroying plough-graith in time of tillage, ſlaying or houghing horſes or cows in time of harveſt, and deſtroying or ſpoiling growing timber; as to the puniſhment of which, ſee ſtatutes 1503, *c.* 72,—1587, *c.* 82, and 1698, *c.* 16—1. *Geo.* I. *St.* 2. *c.* 48.

17. Crimes againſt particular perſons may be directed, either againſt life, limb, liberty, chaſtity, goods, or reputation. *Murder* is the wilful taking away of a perſon's life, without a neceſſary cauſe. Our law makes no diſtinction betwext premeditated and ſudden homicide; both are puniſhed capitally. Caſual homicide, where the actor is in ſome degree blameable, and homicide in ſelf-defence, where the juſt bounds of defence have been exceeded, are puniſhed arbitrarily; but the ſlaughter of night-thieves, houſe-breakers, aſſiſtants in maſterful depredations, or rebels denounced for capital crimes, may be committed with impunity. The crime of *demembration*, or the cutting off of a member, is joined with that of murder; but in practice, its puniſhment has been reſtricted to the eſcheat of moveables, and an aſſythment or indemnification to the party. *Mutilation*, or the diſabling of a member, is puniſhed at the diſcretion of the judge.

18. *Self-murder* is as highly criminal as the killing our neighbour; and for this reaſon, our law has, contrary to the rule, *crimina morte extinguuntur*, allowed a proof of the crime, after the offender's death, that his ſingle eſcheat might fall to the King or his donatory. To this end, an action muſt be brought, not before the Juſticiary, but the Seſſion, becauſe it is only intended *ad civilem effectum*, for proving and declaring the ſelf-murder; and the next of kin to the deceaſed muſt be made a party to it.

19. The puniſhment of parricide, or of the murder of a parent, is not confined, by our law, to the criminal himſelf. All his poſterity in the right line are declared incapable of inheriting; and the ſucceſſion devolves on the next collateral heir. Even the curſing or beating of a parent infers death, if the perſon guilty be above ſixteen years; and an arbitrary puniſhment, if he be under it. A preſumptive or ſtatutory murder is conſtituted by 1690, *c.* 21. by which any woman who ſhall conceal her pregnancy, during its whole courſe, and ſhall not call for, or make uſe of help in the birth, is to be reputed the murderer, if the child be dead, or amiſſing. This act was intended to diſcourage the unnatural practice of wo-

men making away with their children begotten in fornication, to avoid church-cenſures.

20. *Duelling*, is the crime of fighting in ſingle combat, on previous challenges given and received. Fighting in a duel, without licence from the King, is puniſhable by death; and whatever perſon, principal or ſecond, ſhall give a challenge to fight a duel, or ſhall accept a challenge, or otherwiſe engage therein, is puniſhed by baniſhment and eſcheat of moveables, though no actual fighting ſhould enſue.

21. *Haimſucken*, (from *haim*, home, and *ſocken*, to ſeek or purſue,) is the aſſaulting or beating of a perſon in his own houſe. The puniſhment of this crime is no where defined, except in the books of the Majeſty, which make it the ſame as that of a rape; and it is, like rape, capital by our practice. The aſſault muſt be made in the proper houſe of the perſon aſſaulted, where he lies and riſes daily and nightly, ſo that neither a public houſe, nor even a private, where one is only tranſiently, falls within the law.

22. Any party to a law-ſuit, who ſhall ſlay, wound, or otherways invade his adverſary, at any period of time between executing the ſummons and the compleat execution of the decree, or ſhall be acceſſory to ſuch invaſion, ſhall loſe his cauſe. The ſentence pronounced on this trial, againſt him who has committed the battery, is not ſubject to reduction, either on the head of minority, or any other ground whatever: And if the perſon proſecuted for this crime ſhall be denounced for not appearing, his liferent, as well as ſingle eſcheat, falls upon the denunciation.

23. The crime of *wrongous impriſonment* is inferred, by granting warrants of commitment in order to trial, proceeding on informations not ſubſcribed, or without expreſſing the cauſe of commitment; by receiving or detaining priſoners on ſuch warrants; by refuſing to a priſoner a copy of the warrant of commitment; by detaining him in cloſe confinement, above eight days after his commitment; by not releaſing him on bail, where the crime is bailable; and by tranſporting perſons out of the kingdom, without either their own conſent, or a lawful ſentence. The perſons guilty of a wrongous impriſonment, are puniſhed by a pecuniary mulct, from L. 6000 down to L. 400 *Scots*, according to the rank of the perſon detained; and the judge or other perſon guilty, is over and above ſubjected to pay to the perſon detained a certain ſum *per diem*. proportioned to his rank, and is declared incapable of public truſt. All theſe penalties may be inſiſted for by a ſummary action before the ſeſſion, and are ſubject to no modification.

24. *Adultery*, is the crime by which the marriage-bed is polluted. This crime could, neither by the Roman nor Jewiſh law, be committed, but where the guilty woman was the wife of another: By ours, it is adultery, if either the man or woman be married. We diſtinguiſh between ſimple adultery, and that which is notorious or manifeſt. Open and manifeſt adulterers, who continue incorrigible, notwithſtanding the cenſures of the church, are puniſhed capitally. This crime is diſtinguiſhed by one or other of the following characters; where there is iſſue procreated between the adulterers; or where they keep bed and company together notoriouſly; or where they give ſcandal to the church, and are, upon their obſtinate refuſing to liſten to their admonitions, excommunicated. The puniſhment of ſimple adultery, not being defined by ſtatute, is left to the diſcretion of the judge; but cuſtom has made the falling of the ſingle eſcheat one of its penalties.

25. *Bigamy*, is a perſon's entering into the engagements of a ſecond marriage, in violation of a former marriage vow ſtill ſubſiſting. Bigamy, on the part of the man, has been tolerated in many ſtates, before the eſtabliſhment of Chriſtianity, even by the Jews themſelves; but it is prohibited by the precepts of the goſpel, and it is puniſhed by our law, whether on the part of the man, or of the woman, with the pains of perjury.

26. *Inceſt*, is committed by perſons who ſtand within the degrees of kindred forbidden in *Lev.* xviii. and is puniſhed capitally. The ſame degrees are prohibited in affinity, as in conſanguinity, *Lev.* xviii. 13. *et ſeq.* As this crime is repugnant to nature, all children, whether lawful or natural, ſtand on an equal footing: *Civilis ratio civilia jura corrumpere poteſt, non vero naturalia.* It is difficult indeed to bring a legal proof of a relation merely natural, on the ſide of the father; but the mother may be certainly known without marriage.

26. There is no explicite ſtatute making rape, or the raviſhing of women, capital; but it is plainly ſuppoſed in act 1612, *c.* 4. by which the raviſher is exempted from the pains of death, only in the caſe of the woman's ſubſequent conſent, or her declaration that ſhe went off with him of her own free-will; and even then, he is to ſuffer an arbitrary puniſhment, either by impriſonment, confiſcation of goods, or a pecuniary fine.

28. *Theſt* is defined, a fraudulent intermedling with the property of another, with a view of making gain. Our ancient law proportioned the puniſhment of the theſt to the value of the goods ſtolen; heightening it gradually, from a ſlight corporal puniſhment to a capital, if the value amounted to thirty-two pennies Scots, which in the reign of David I. was the price of two ſheep. In ſeveral later acts, it is taken for granted, that this crime is capital. But where the thing ſtolen is of ſmall value, we conſider it, not as theft, but as pickery, which is puniſhed either corporally or by baniſhment. The breaking of orchards, and the ſtealing of green wood, is puniſhed by a fine, which riſes as the crime is repeated.

29. Theft may be aggravated into a capital crime, though the value of the thing ſtolen be trifling; as theft twice repeated, or committed in the night, or by landed men; or of things ſet apart for ſacred uſes. The receivers and concealers of ſtolen goods, knowing them to be ſuch, ſuffer as thieves. Thoſe who barely harbour the perſon of the criminal within forty-eight hours either before or after committing the crime, are puniſhed as partakers of the theft. Such as ſell goods belonging to thieves or lawleſs perſons who dare not themſelves come to market, are puniſhed with baniſhment and the eſcheat of moveables.

30. Theft attended with violence, is called *robbery*; and in our old ſtatutes, *rieſ or ſtouthrieſ*, under which claſs may be included *ſorning*, or the taking of meat and drink by force, without paying for it. Stouthrief came

at laſt to be committed ſo audaciouſly, by bands of men aſſociated together, that it was thought neceſſary to veſt all our freeholders with a power of holding courts upon ſorners and rievers, and condemning them to death. Nay, all were capitally puniſhed, who, to ſecure their lands from depredation, paid to the rievers a yearly contribution, which got the name of *black-mail*. An act alſo paſſed, commanding to baniſhment a band of ſorners, who were originally from *Egypt*, called *Gypſies*, and adjudging to death all that ſhould be reputed *Egyptians*, if found thereafter within the kingdom. Robbery committed on the ſeas, is called *piracy*, and is puniſhed capitally by the high admiral. Several of the facts which conſtitute this crime are ſet forth in a Britiſh ſtatute, 8. *Geo.* I. *c.* 24.

31. *Falſehood*, in a large ſenſe, is the fraudulent imitation or ſuppreſſion of truth, to the damage of another. The lateſt ſtatute againſt this crime, puniſhes it by confiſcation of moveables. That particular ſpecies of falſehood, which conſiſts in the falſifying of writings, paſſes by the name of *forgery*. Our practice has now of a long time, agreeably to the Roman law, made this crime capital; unleſs the forgery be of executions, or other writings of ſmaller moment; in which caſe, it is puniſhed arbitrarily.

32. The writing muſt not only be fabricated, but put to uſe or founded on, in order to infer this crime. And though it be ſtrictly criminal, yet the trial of it is proper to the court of Seſſion; but where improbation is moved againſt a deed by way of exception, the inferior judge, before whom the action lies, is competent to it *ad civilem effectum*. When it is pleaded as an exception, our practice, to diſcourage affected delays, obliges the defender, who moves it, to conſign L. 40 Scots; which he forfeits, if his plea ſhall appear calumnious.

33. Where a perſon, found guilty of forgery by the court of Seſſion, is by them remitted to the Juſticiary, an indictment is there exhibited againſt him, and a jury ſworn, before whom the decree of Seſſion is produced, in place of all other evidence of the crime, in reſpect of which the jury find the pannel guilty; ſo that that decree, being pronounced by a competent court, is held as full proof, or, in the ſtyle of the bar, as *probatio probata*.

34. *Perjury*, which is the judicial affirmation of a falſehood on oath, really conſtitutes the *crimen falſi*; for he who is guilty of it does, in the moſt ſolemn manner, ſubſtitute falſehood in the place of truth. To conſtitute this crime, the violation of truth muſt be deliberately intended by the ſwearer; and therefore reaſonable allowances ought to be given to forgetfulneſs or miſapprehenſion, according to his age, health, and other circumſtances. The breach of a promiſſory oath does not infer this crime; for he who promiſes on oath, may ſincerely intend performance when he ſwears, and ſo cannot be ſaid to call on God to atteſt a falſehood. Though an oath, however falſe, if made upon reference in a civil queſtion, concludes the cauſe, the perſon perjured is liable to a criminal trial; for the effect of the reference can go no farther than the private right of the parties.

35. Notwithſtanding the miſchievous conſequences of perjury to ſociety, it is not puniſhed capitally, but by confiſcation of moveables, impriſonment for a year, and infamy. The court of Seſſion is competent to perjury *incidenter*, when in any examination upon oath, taken in a cauſe depending before them, a perſon appears to have ſworn falſely; but in the common caſe, that trial is proper to the Juſticiary. *Subornation of perjury* conſiſts in tampering with perſons who are to ſwear in judgment, by directing them how they are to depoſe; and it is puniſhed with the pains of perjury.

36. The crime of *ſtellionate*, from *ſtellio*, includes every fraud which is not diſtinguiſhed by a ſpecial name; but is chiefly applied to conveyances of the ſame numerical right, granted by the proprietor to different diſponees. The puniſhment of ſtellionate muſt neceſſarily be arbitrary, to adapt it to the various natures and different aggravations of the fraudulent acts. The perſons guilty of that kind of it, which conſiſts in granting double conveyances, are by our law declared infamous, and their lives and goods at the King's mercy. The cogniſance of *fraudulent bankruptcy* is appropriated to the court of Seſſion, who may inflict any puniſhment on the offender, that appears proportioned to his guilt, death excepted.

37. The crime of *uſury*, before the reformation, conſiſted in the taking of *any* intereſt for the uſe of money; and now in taking an higher rate of intereſt than is authoriſed by law. It is divided into *uſura manifeſta*, or direct; and *velata*, or covered. One may be guilty of the firſt kind, either where he covenants with the debtor for more than the lawful intereſt on the loan-money; or where one receives the intereſt of a ſum before it is due, ſince thereby he takes a conſideration for the uſe of money before the debtor has really got the uſe of it. Where a debt is clogged with an uncertain condition, by which the creditor runs the hazard of loſing his ſum, he may covenant for an higher intereſt than the legal, without the crime of uſury; for there, the intereſt is not given merely in conſideration of the uſe of the money, but of the danger undertaken by the creditor.

38. Covered uſury, is that which is committed under the maſk, not of a loan, but of ſome other contract; *e. g.* a ſale, or an improper wadſet. And in general, all obligations entered into with an intention of getting more than the legal intereſt for the uſe of money, however they may be diſguiſed, are uſurious. As a farther guard againſt this crime, the taking more than the legal intereſt for the forbearance of payment of money, merchandiſe, or other commodities, by way of loan, exchange, or other contrivance whatever; or the taking a bribe for the loan of money, or for delaying its payment when lent, is declared uſury. Where uſury is proved, the uſurious obligation is not only declared void, but the creditor, if he has received any unlawful profits, forfeits the treble value of the ſums or goods lent. Uſury, when it is to be purſued criminally, muſt be tried by the Juſticiary; but where the libel concludes only for voiding the debt or reſtitution, the ſeſſion is the proper court.

39. *Injury*, in its proper acceptation, is the reproaching or affronting our neighbour. Injuries are either verbal or real. A verbal injury, when directed againſt a private perſon, conſiſts in the uttering contumelious words, which tend to expoſe our neighbour's character by making him little or ridiculous. It does not ſeem that the twitting

ting one with natural defects, without any ſarcaſtical reflections, though it be inhuman, falls under this deſcription, as theſe imply no real reproach in the juſt opinion of mankind. Where the injurious expreſſions have a tendency to blacken one's moral character, or fix ſome particular guilt upon him, and are deliberately repeated in different companies, or handed about in whiſpers to confidents, it then grows up to the crime of ſlander: and where a perſon's moral character is thus attacked, the *animus injuriandi* is commonly inferred from the injurious words themſelves, unleſs ſpecial circumſtances be offered to take off the preſumption; *ex. gr.* that the words were uttered in judgment in one's own defence, or by way of information to a magiſtrate, and had ſome foundation in fact. Though the cognizance of ſlander is proper to the commiſſaries, who, as the *judices Chriſtianitatis*, are the only judges of ſcandal; yet for ſome time paſt, bare verbal injuries have been tried by other criminal judges, and even by the Seſſion. It is puniſhed either by a fine, proportioned to the condition of the perſons injuring and injured, and the circumſtances of time and place; or if the injury import ſcandal, by publicly acknowledging the offence; and frequently the two are conjoined. The calling one a bankrupt is not, in ſtrict ſpeech, a verbal injury, as it does not affect the perſon's moral character; yet as it may hurt his credit in the way of buſineſs, it founds him in an action of damages, which muſt be brought before the judge-ordinary. A real injury is inflicted by any fact by which a perſon's honour or dignity is affected; as ſtriking one with a cane, or even aiming a blow without ſtriking; ſpitting in one's face; aſſuming a coat of arms, or any other mark of diſtinction proper to another, *&c.* The compoſing and publiſhing defamatory libels may be reckoned of this kind. Real injuries are tried by the judge-ordinary, and puniſhed, either by fine or impriſonment, according to the demerit of the offenders.

40. After having ſhortly explained the ſeveral crimes puniſhable by our law, this treatiſe may be concluded, with a few obſervations on criminal juriſdiction, the forms of trial, and the methods by which crimes may be extinguiſhed. Criminal juriſdiction is founded, 1. *Ratione domicilii*, if the defender dwells within the territory of the judge. Vagabonds, who have no certain domicile, may be tried where-ever they are apprehended. 2. *Ratione delicti*, if the crime was committed within the territory. Treaſon is triable, by the Engliſh law, in any county that the King ſhould appoint; and by a temporary act now expired, treaſon committed in certain Scots counties, was made triable by the court of Juſticiary, where-ever it ſhould ſit.

41. No criminal trial can proceed, unleſs the perſon accuſed is capable of making his defence. Abſents therefore cannot be tried; nor fatuous nor furious perſons, *durante furore*, even for crimes committed, while they were in their ſenſes. For a like reaſon, minors who had no curators could not, by the Roman law, be tried criminally; but our practice conſiders every perſon who is capable of dole, to be alſo ſufficiently qualified for making his defence in a criminal trial.

42. No perſon can be impriſoned in order to ſtand trial for any crime, without a warrant in writing expreſſing the cauſe, and proceeding upon a ſubſcribed information, unleſs in the caſe of indignities done to judges, riots, and the other offences ſpecially mentioned in 1701, *c.* 6. Every priſoner committed in order to trial, if the crime of which he is accuſed be not capital, is entitled to be releaſed upon bail, the extent of which is to be modified by the judge, not exceeding 12000 merks Scots for a Nobleman, 6000 for a landed gentleman, 2000 for any other gentleman or burgeſs, and 600 for any other inferior perſon. That perſons who, either from the nature of the crime with which they are charged, or from their low circumſtances, cannot procure bail, may not lie for ever in priſon untried, it is lawful to every ſuch priſoner, to apply to the criminal judge, that his trial may be brought on. The judge muſt, within twenty-four hours after ſuch application, iſſue letters directed to meſſengers, for intimating to the proſecutor to fix a diet for the priſoner's trial, within ſixty days after the intimation, under the pain of wrongous impriſonment: And if the proſecutor does not inſiſt within that time, or if the trial is not finiſhed in forty days more, when carried on before the Juſticiary, or in thirty, when before any other judge; the priſoner is, upon a ſecond application, ſetting forth that the legal time is elapſed, entitled to his freedom, under the ſame penalty.

43. Upon one's committing any of the groſſer crimes, it is uſual for a juſtice of the peace, ſheriff, or other judge, to take a precognition of the facts, *i. e.* to examine thoſe who were preſent at the criminal act, upon the ſpecial circumſtances attending it, in order to know whether there is ground for a trial, and to ſerve as a direction to the proſecutor, how to ſet forth the facts in the libel; but the perſons examined may inſiſt to have their declarations cancelled, before they give teſtimony at the trial. Juſtices of the peace, ſheriffs, and magiſtrates of boroughs, are alſo authoriſed to receive informations, concerning crimes to be tried in the circuit-courts; which informations are to be tranſmitted to the juſtice-clerk forty days before the ſitting of the reſpective courts. To diſcourage groundleſs criminal trials, all proſecutors, where the defender was abſolved, were condemned by ſtatute, in coſts, as they ſhould be modified by the judge, and beſides were ſubjected to a ſmall fine to be divided between the fiſk and the defender: And where the King's advocate was the only purſuer, his informer was made liable. This ſufficiently warrants the preſent practice of condemning vexatious proſecutors in a pecuniary mulct, though far exceeding the ſtatutory ſum.

44. The forms of law upon criminal accuſations, differ much from thoſe obſerved in civil actions, if we except the caſe of ſuch crimes as the court of Seſſion is competent to, and of leſſer offences tried before inferior courts. The trial of crimes proceeds, either upon indictment, which is ſometimes uſed, when the perſon to be tried is in priſon; or by crinal letters iſſuing from the ſignet of the Juſticiary. In either caſe, the defender muſt be ſerved with a full copy of the indictment or letters, and with a liſt of the witneſſes to be brought againſt him, and of the perſons who are to paſs on the inqueſt, and fifteen free days muſt intervene, between his being

ſo ſerved, and the day of appearance. When the trial proceeds upon criminal letters, the private proſecutor muſt give ſecurity, at raiſing the letters, that he will report them duly executed to the Juſticiary, in terms of 1535, *c.* 35; and the defender, if he be not already in priſon, is, by the letters, required to give caution, within a certain number of days after his citation, for his appearance upon the day fixed for his trial: And if he gives none within the days of the charge he may be denounced rebel, which infers the forfeiture of his moveables.

45. That part of the indictment, or of the criminal letters, which contains the ground of the charge againſt the defender, and the nature or degree of the puniſhment he ought to ſuffer, is called the libel. All libels muſt be ſpecial, ſetting forth the particular facts inferring the guilt, and the particular place where theſe facts were done. The time of committing the crime may be libelled in more general terms, with an alternative as to the month, or day of the month: but as it is not practicable in moſt caſes, to libel upon the preciſe circumſtances of acceſſion that may appear in proof, libels againſt acceſſories are ſufficient, if they mentioned, in general, that the perſons proſecuted are guilty art and part.

46. The defender, in a criminal trial, may raiſe letters of exculpation, for citing witneſſes in proof of his defences againſt the libel, or of his objections againſt any of the jury or witneſſes; which muſt be executed, to the ſame day of appearance, with that of the indictment or criminal letters.

47. The diets of appearance, in the court of Juſticiary, are peremptory; the criminal letters muſt be called on the very day to which the defender is cited; and hence, if no accuſer appears, their effect is loſt, *inſtantia perit*, and new letters muſt be raiſed. If the libel or any of the executions, ſhall to the proſecutor appear informal, or if he be diffident of the proof, from the abſconding of a neceſſary witneſs, the court will, upon a motion made by him, deſert the diet *pro loco et tempore*; after which new letters become alſo neceſſary. A defender, who does not appear on the day to which he is cited, is declared fugitive; in conſequence of which, his ſingle eſcheat falls The defender, after his appearance in court, is called the pannel.

48 The two things to be chiefly regarded in a criminal libel, are, 1 The relevancy of the facts, *i. e.* their ſufficiency to infer the concluſion; 2. Their truth The conſideration of the firſt belongs to the judge of the court; that of the other, to the jury or aſſize. If the facts libelled be ſound irrelevant, the pannel is diſmiſſed from the bar; if relevant, the court remits the proof thereof to be determined by the jury; which muſt conſiſt of 15 men picked out by the court from a greater number not exceeding 45, who have been all ſummoned, and given in liſt to the defender at ſerving him with a copy of the libel.

49. Crimes cannot, like debts, be referred to the defender's oath; for no perſon is compellable to ſwear againſt himſelf, where his life, limb, liberty, or eſtate is concerned, nor even in crimes which infer infamy; becauſe one's good name is, in right eſtimation, as valuable as his life. There is one exception however to this rule in trying the crime of uſury, which may be proved by the uſurer's own oath, notwithſtanding the rule, *nemo tenetur jurare in ſuam turpitudinem*. Crimes therefore are in the general caſe proveable only by the defender's free confeſſion, or by writing, or by witneſſes. No extrajudicial confeſſion, unleſs it is adhered to by the pannel in judgment, can be admitted as evidence.

50 All objections relevant againſt a witneſs in civil caſes, are alſo relevant in criminal. No witneſs is admitted, who may gain or loſe by the event of the trial. *Socii criminis*, or aſſociates in the ſame crime, are not admitted againſt one another, except either in crimes againſt the ſtate, as treaſon; in occult crimes, where other witneſſes cannot be had, as forgery; or in thefts or depredations committed in the Highlands. The teſtimony of the private party injured may be received againſt the pannel, where the King's Advocate is the only proſecutor, if, from the nature of the crime, there muſt needs be a penury of witneſſes, as in rape, robbery, *&c.*

51. After all the witneſſes have been examined in court, the jury are ſhut up in a room by themſelves, where they muſt continue, excluded from all correſpondence, till their verdict or judgment be ſubſcribed by the foreman (or chancellor), and clerk; and according to this verdict, the court pronounces ſentence, either abſolving or condemning. It is neceſſary, by the law of Scotland, that a jury ſhould be unanimous in finding a perſon guilty; the narroweſt majority is as ſufficient againſt the pannel, as for him, Juries cannot be puniſhed on account of an erroneous verdict, either for or againſt the pannel.

52. Though the proper buſineſs of a jury be to inquire into the truth of the facts found relevant by the court, for which reaſon they are ſometimes called the inqueſt; yet, in many caſes, they judge alſo in matters of law or relevancy. Thus, though an objection againſt a witneſs ſhould be repelled by the court, the jury are under no neceſſity to give more credit to his teſtimony than they think juſt: And in all trials of art and part, where ſpecial facts are not libelled, the jury, if they return a general verdict, are indeed judges, not only of the truth, but of the relevancy of the facts that are ſworn to by the witneſſes A general verdict, is that which finds, in general terms, that the pannel is guilty or not guilty, or that the libel or defences are proved or not proved. In a ſpecial verdict, the jury finds certain facts proved, the import of which is to be afterwards conſidered by the court.

53. Criminal judges muſt now ſuſpend for ſome time the execution of ſuch ſentences as affect life or limb, that ſo condemned criminals, whoſe caſes deſerve favour, may have acceſs to apply to the king for mercy. No ſentence of any court of judicature, ſouth of the river Forth, importing either death or demembration, can be executed in leſs than thirty days; and, if north of it, in leſs than forty days, after the date of the ſentence. But corporal puniſhments, leſs than death or diſembering, *e g.* whipping, pillory, *&c.* may be inflicted eight days after ſentence on this ſide Forth, and twelve days after ſentence beyond it.

54 Crimes are extinguiſhed, 1 By the death of the criminal; both becauſe a dead perſon can make no defence, ſo that his trial is truly a judging upon the hearing

of one ſide; and becauſe, though his guilt ſhould be ever ſo notorious, he is after death carried beyond the reach of human penalties: Such trials therefore can have no effect, but to puniſh the innocent heir, contrary to that moſt equitable rule, *culpa tenet ſuos auctores*. 2. Crimes may be extinguiſhed by a remiſſion from the Sovereign. But a remiſſion, though it ſecures the delinquent from the public reſentment, the exerciſe of which belongs to the Crown, cannot cut off the party injured from his claim of damages, over which the Crown has no prerogative. Whoever therefore founds on a remiſſion, is liable in damages to the private proſecutor, in the ſame manner, as if he had been tried and found guilty. Even general acts of indemnity paſſed in parliament, though they ſecure againſt ſuch penalties as law inflicts upon the criminal, merely *per modum pœnæ*, yet do not againſt the payment of any pecuniary fine, which is given by ſtatute to the party injured, nor againſt the demand of any claim competent to him in name of damages.

55. Leſſer injuries, which cannot be properly ſaid to affect the public peace, may be extinguiſhed, either by the private party's expreſsly forgiving them, or by his being reconciled to the offender, after receiving the injury. Hence ariſes the rule, *diſſimulatione tollitur injuria*. But where the offence is of a higher nature, the party injured, though he may paſs from the proſecution, in ſo far as his private intereſt is concerned, cannot preclude the King's Advocate, or Procurator-fiſcal, from inſiſting *ad vindictam publicam*.

56. Crimes are alſo extinguiſhed by preſcription, which operates by the mere lapſe of time, without any act, either of the Sovereign or of the private ſufferer. Crimes preſcribe in twenty years; but in particular crimes, the preſcription is limited by ſtatute to a ſhorter time. No perſon can be proſecuted upon the act againſt wrongous impriſonment, after three years. High treaſon, committed within his Majeſty's dominions, ſuffers likewiſe a triennial preſcription, if indictment be not found againſt the traitor within that time. All actions, brought upon any penal ſtatute made or to be made, where the penalty is appropriated to the Crown, expire in two years after committing the offence; and where the penalty goes to the Crown or other perſecutor, the proſecutor muſt ſue within one year, and the Crown within two years after the year ended. Certain crimes are, without the aid of any ſtatute, extinguiſhed by a ſhorter preſcription than twenty years. By our old law, in the caſes of rape, robbery, and hame-ſucken, the party injured was not heard, after a ſilence of twenty-four hours; from a preſumption, that perſons could not be ſo groſsly injured, without immediately complaining: And it is probable, that a proſecution for theſe crimes, if delayed for any conſideraby time, would be caſt even at this day, or at leaſt the puniſhment reſtricted. Leſſer injuries ſuffer alſo a ſhort preſcription; law *preſuming* forgiveneſs, from the nature of the offence, and the ſilence of the party. The particular ſpace of time ſufficient to eſtabliſh this preſumption muſt be determined by the judge, according to circumſtances.

Lawburrows, in Scots Law. See Law, Tit xxx. 16.

LAWLESS court, a court ſaid to be held annually on King's hill, at Rochford, in Eſſex, on the Wedneſday morning after Michaelmas-day, at cock-crowing, where they whiſper, and have no candle nor any pen and ink, but only a coal. Perſons who owe ſuit, or ſervice, and do not appear, forfeit double their rent every hour they are miſſing.

This ſervile attendance, Cambden informs us, was impoſed on the tenants for conſpiring at the like unſeaſonable time to raiſe a commotion. The court belongs to the honour of Raleigh, and to the earl of Warwick; and is called lawleſs, from its being held at an unlawful hour.

LAWN, a ſpacious plain in a park, or adjoining to a noble ſeat.

LAWSONIA, in botany, a genus of the octandria monogynia claſs. The calix conſiſts of four ſegments, and the corolla of four petals; the ſtamina are diſpoſed in pairs; and there are four capſules containing a great many ſeeds. There are two ſpecies, both natives of India.

LAWYER ſignifies a counſellor, or one that is learned or ſkilled in the law.

Lay-brothers, among the Romaniſts, thoſe pious, but illiterate perſons, who devote themſelves, in ſome convent, to the ſervice of the religious. They wear a different habit from that of the religious, but never enter into the choir, nor are preſent at the chapters; nor do they make any other vow, except of conſtancy and obedience. In nunneries, there are alſo lay-ſiſters.

Lay-man, one who follows a ſecular employment, or has not entered into holy orders.

LAYERS, in gardening, are tender ſhoots, or twigs of trees, laid or buried in the ground; till having ſtruck root, they are ſeparated from the parent-tree, and become diſtinct plants.

LAZAR-HOUSE, or **Lazaretto**, a public-building, in the nature of an hoſpital, to receive the poor and thoſe afflicted with contagious diſtempers. In ſome places, lazarettos are appointed for the performance of quarrantine; in which caſe, thoſe are obliged to be confined in them who are ſuſpected to have come from places infected with the plague.

LAZARITES, or *Fathers of St* **Lazarus**, a religious congregation of regular clerks, inſtituted in France in the ſeventeenth century, by M. Vincent. They take their name from a houſe in the ſuburbs of Paris, where they have a ſeminary, called the ſeminary of good children. The vows they make are ſimple; and, upon occaſion, may be diſpenſed with.

LAZULI, *or Lapis* **Lazuli**, in natural hiſtory, one of the ores of copper, the baſis of which is a cryſtalline matter, coloured with that elegant blue which copper gives to all alkaline liquors.

The lapis lazuli is found in many parts of the world; but that of Aſia and Africa is much ſuperior both in beauty and real value to the Bohemian and German kind, which is too often ſold in its place.

Its great uſe, beſide the poliſhing as a gem, is the making the fine blue uſed in painting called ultramarine, which is obtained from it by calcination.

LEAD. See CHEMISTRY, p. 84, 186.

LEAF, *folium*, in the natural hiſtory of plants. See BOTANY, ſect. 2.

LEAF, in clocks and watches, an appellation given to the notches of their pinions. See WATCH.

LEAGUE, a meaſure of length, containing more or leſs geometrical paces, according to the different uſages and cuſtoms of countries. A league at ſea, where it is chiefly uſed by us, being a land-meaſure moſtly peculiar to the French and Germans, contains three thouſand geometrical paces, or three Engliſh miles.

LEAGUE alſo denotes an alliance or confederacy between princes and ſtates for their mutual aid, either in attacking ſome common enemy, or in defending themſelves.

LEAK, among ſeamen, is a hole in the ſhip through which the water comes in. To ſpring a leak, is ſaid of a ſhip that begins to leak. To ſtop a leak, is to fill it with a plug wrapt in oakam and well tarred, or putting in a tarpawling clout to keep the water out; or nailing a piece of ſheet-lead upon the place.

LEAKAGE, the ſtate of a veſſel that leaks, or lets water or other liquid ouze in or out.

LEAKAGE, in commerce, is an allowance of 12 *per cent.* in the cuſtoms, allowed to importers of wines for the waſte and damage it is ſuppoſed to have received in the paſſage: an allowance of two barrels in twenty-two is alſo made to the brewers of ale and beer, by the exciſe-office.

LEAOTUNG, the moſt northerly part of China, in Aſia.

LEAP, in muſic, is when the ſong does not proceed by conjoint degrees, as when between each note there is an interval of a third, fourth, fifth, *&c.*

LEAP-YEAR. See ASTRONOMY, p. 489.

LEARMOUTH, a market-town of Northumberland, ſituated forty eight miles north-weſt of Newcaſtle, and twelve ſouth-weſt of Berwick.

LEASING-MAKING, in Scots law, the uttering of words tending to excite diſcord between the King and his people; alſo called verbal ſedition.

LEATHER, the ſkin of ſeveral ſorts of beaſts dreſſed and prepared for the uſe of the various manufacturers, whoſe buſineſs it is to make them up. See TANNING.

Colouring of LEATHER.

To colour white leather. Hang the ſkins in chalk or lime-water, till they are grown ſupple, that the hair or wool may be ſtripped off; ſtretch them on tenters, or by means of lines, and ſmooth them over: then bruſh them over with alum-water very warm, and colour them with the colour you would have them, and dry them in the ſun, or in ſome warm houſe, and they will be uſeful on ſundry occaſions, without any further trouble.

To colour black leather the German way. Take of the bark of the elder two pounds, of the filings or ruſt of iron the ſame quantity; put them into two gallons of rain-water, and ſtop them up cloſe in a caſk or veſſel, and let them ſtand for the ſpace of two months: then add to that the liquid part of a pound of nut-galls, beaten to powder, and a quarter of a pound of copperas, heating them over the fire, and ſuffering them to ſtand 24 hours after; and then uſe the liquor with a bruſh till the ſkin has taken a fine black.

To colour leather a fair red. Firſt rub the leather well in alum-water, or alum it; boil ſtale urine, ſcum it till half of it is waſted: then put in an ounce of the fineſt lake, the like quantity of brazil in powder, one ounce of alum, and half an ounce of ſal armoniac; mix them well, and keep them ſtirring over a gentle fire about two hours; and ſo uſe the liquid part, to colour or tinge the ſkins.

To colour leather of a curious French yellow. Take one part of chalk, and another of wood-aſhes, and make of them a good lye; then ſtrain out the fine liquor, and ſet it in a veſſel over the fire, and put into it turmeric in powder, and a little ſaffron; and let it ſimmer, till it becomes pretty thick; then ſet it a cooling, to be uſed as occaſion requires.

To make white leather blue. Take a quart of elder-berries, ſtrain out the juice, and boil it with an ounce of powder of alum, and half an ounce of indigo, or ſmalt-blue, and bruſh over the leather with a fine bruſh dipped in it three times, ſuffering it to dry between whiles, and the buſineſs will be effected.

To colour Spaniſh leather, &c. Take that which the Dutch call pomplemelch, warm it, and rub the leather with it; then take of Venice tot appelen; and having pounded it ſmall, put a quantity of water to it, and let it ſoften over a gentle fire; then preſs out the water, and rub or waſh out the ſkin in it; repeating the ſame ſeveral times; and after that, take the fineſt ſhoemakers black, and rub the ſkin over with it, having in the melting added a little vitriol or copperas; and letting it dry, take gooſe or hog's greaſe, and with a woollen cloth rub the ſkin over for a good while, where there is a good fire to ſupple it, and afterwards rub it over with your hands, till it diſappear; or inſtead of greaſe, you may uſe linſeed or train-oil, and ſo in caſe of any other colour, according to the colours you deſign.

Dying of LEATHER.

A reddiſh colour. Firſt waſh the ſkins in water, and wring them out well, and afterwards wet them with a ſolution of tartar and bay-ſalt in fair water, and wring them out again; then to the former diſſolution add aſhes of crab ſhells, and rub the ſkins very well with this: afterwards, waſh them in common water, and wring them out; then waſh them with tincture of madder in the ſolution of tartar and alum and the crab-ſhell aſhes: and if they prove not red enough after all, waſh them with the tincture of brazil.

A pure yellow. Take of fine aloes two ounces, of linſeed-oil four pounds; diſſolve or melt them; then ſtrain the liquor, and beſmear the ſkins with it, and being dry varniſh them over.

An orange. Boil fuſtic-berries in alum-water: but for a deep orange, uſe turmeric-root.

Blue. Boil elder-berries, or dwarf elder, in water; then ſmear or waſh the ſkins with it; wring them out; then boil the berries as before in a ſolution of alum water, and wet the ſkins in the ſame water once or twice; dry them, and they will be very blue.

A pure ſky-colour. For each ſkin take indigo one ounce; put it into boiling water, let it ſtand one night; then warm it a little, and with a bruſh-pencil beſmear the ſkin twice over.

Purple. Diſſolve roch-alum in warm water, wet the ſkins with it, dry them; then boil raſped brazil well in water; let it ſtand to cool: do this three times, and afterwards rub the dye over the ſkins with your hand; and when they are dry, poliſh them.

Green. Take ſap-green and alum-water, of each a ſufficient quantity; mix and boil them a little; if you would have the colour darker, add a little indigo.

Proceſſes for dying LEATHER Red *and* Yellow, *as practiſed in* Turkey; *with directions for preparing and tanning the ſkins, as communicated by Mr* Philippo, *a native of* Armenia, *who received from the Society for the Encouragement of Arts,* &c. *one hundred pounds, and alſo the gold medal of the Society, as a reward for diſcovering this ſecret.*

1. *Firſt preparation of the Skins, both for Red and Yellow Leather, by dreſſing them in lime.* Let the ſkins, dried with the hair on, be firſt laid to ſoak in clean water for three days; let them then be broken over the fleſh ſide, put into freſh water for two days longer, and afterwards hung up to drain half an hour. Let them now be broken again on the fleſh ſide, limed in cold lime on the ſame ſide, and doubled together with the grain ſide outward. In this ſtate they muſt be hung up within doors over a frame for five or ſix days, till the hair be looſe; which muſt be then taken off, and the ſkins returned into the lime-pit, for about three weeks. Take them out, and let them be well worked fleſh and grain, every ſixth or ſeventh day during that time: after which, let them be waſhed ten times in clear water, changing the water at each waſhing. They are next to be prepared in drench, as below mentioned.

2. *Second preparation of the Skins for both the Red and Yellow Dyes by drenching.* After ſqueezing the water out of the ſkins, put them into a mixture of bran and water, warm as new milk, in the following proportions, *viz.* about three pounds of bran for five ſkins, and water ſufficient to make the mixture moderately fluid, which will be about a gallon to each pound of bran. In this drench let the ſkins lie three days; at the end of which time they muſt be well worked, and afterwards returned into the drench two days longer. They muſt then be taken out and rubbed between the hands; the water ſqueezed from them, and the bran ſcraped off clear from both ſides of the ſkins. After this they muſt be again waſhed ten times in clear water, and the water ſqueezed out of them.

Thus far the preparatory proceſs of all the ſkins, whether intended to be dyed red or yellow, is the ſame; but afterwards thoſe which are to be dyed red, muſt be treated as follows.

3. *Preparation in honey and bran of the ſkins that are to be dyed red.* Mix one pound of honey with three pints of luke-warm water, and ſtirr them together till the honey is diſſolved. Then add two double handfuls of bran; and taking four ſkins (for which the above quantity of the mixture will be ſufficient) work them well in it one after another. Afterwards fold up each ſkin ſeparately into a round form, with the fleſh ſide inwards, and lay them in an earthen pan, or other proper veſſel; if in the ſummer, by the ſide of each other; but in the winter, on the top of each other. Place the veſſel in a ſloping poſition, ſo that ſuch part of the fluid as may ſpontaneouſly drain from the ſkins, may drain from them. An acid fermentation will then riſe in the liquor, and the ſkins will ſwell conſiderably. In this ſtate they muſt continue for ſeven or eight days; but the moiſture that drains from them, muſt be poured off, once or twice a-day, as occaſion may require. After this a further preparation in ſalt is neceſſary; and which muſt be performed in the following manner.

4. *Preparation in ſalt of the ſkins to be dyed red.* After the ſkins have been fermented in the honey and bran, as abovementioned, let them be taken out of that mixture on the eighth or ninth day, and well rubbed with dry common ſea-ſalt, in the proportion of about half a pound to each ſkin; the ſalt muſt be well rubbed and worked with them. This will make them contract again, and part with a further conſiderable quantity of moiſture; which muſt be ſqueezed out by drawing each ſkin ſeparately through the hands. They muſt next be ſcraped clean on both ſides from the bran, ſuperfluous ſalt, and moiſture that may adhere to them. After which, dry ſalt muſt be ſtrewed over the grain ſide, and well rubbed in with the hand. They are then to be doubled with the fleſh ſide outwards, lengthways from neck to tail, and a little more dry ſalt muſt be thinly ſtrewed over the fleſh ſide, and rubbed in; for the two laſt operations about a pound and a half of ſalt will be ſufficient for each ſkin. They muſt then be put, thus folded on each other, between two clean boards, placed ſloping, breadthways; and a heavy weight laid on the upper board, in order gradually to preſs out what moiſture they will thus part with. In this ſtate of preſſure, they muſt be continued two days or longer, till it is convenient to dye them, for which they will then be duely prepared.

5. *Preparation of the Red Dye, in a proper proportion for four ſkins.* Put eight gallons of water into a copper, with ſeven ounces of ſhenan *, tied up in a linen bag.

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* Shenan is a drug much uſed by dyers in the Eaſt; and may eaſily be procured at any of the ports of Syria and Africa, in the Levant. It is the Eaſtern-jointed cali, called by botaniſts ſelicornia; and grows in great plenty in thoſe and other parts of the Eaſt. There is a leſſer ſpecies of the ſelicornia on our coaſt, which, from its great affinity with the ſhenan, might be preſumed to have the ſame qualities. On ſome trials, however, it has not appeared to anſwer the intention

Light a fire under a copper, and when the water has boiled about a quarter of an hour, take out the bag of ſhenan, and put into the boiling fluid or lixivium, 1ſt, two drams of alum; 2dly, two drams of pomegranate bark; 3dly, three quarters of an ounce of turmeric; 4thly, three ounces of cochineal; 5thly, two ounces of loaf-ſugar. Let the whole mixture boil about ſix minutes, then cover the fire, and take out a quart of liquor, putting it into a flat earthen pan; and when it is as cold as new milk, take one ſkin, folded lengthways, the grain ſide outwards, and dip it in the liquor, rubbing it gently with the hands. Then taking out the ſkin, hang it up to drain, and throw away the ſuperfluous dye. Proceed in the ſame manner with the remaining three ſkins; repeating the operation on each ſkin ſeparately, eight times, ſqueezing the ſkins by drawing them through the hands before each freſh dipping. Lay them now on one ſide of a large pan, ſet ſloping, to drain off as much of the moiſture as will run from them without preſſure, for about two hours, or till they are cold; then tan them as below directed.

6. *Tanning the Red Skins.* Powder four ounces of the beſt white galls in a marble mortar, ſifting it through a fine ſieve. Mix the powder with about three quarts of water, and work the ſkins well in this mixture for half an hour or more, folding up the ſkins four-fold. Let them lie in this tan twenty-four hours; when they muſt be worked again as before; then taken out, ſcraped clean on both ſides from the firſt galls, and put into a like quantity of freſh galls and water. In this freſh mixture they muſt be again well worked for three quarters of an hour; then folded up as before, and left in the freſh tan for three days. On the fourth day they muſt be taken out, waſhed clean from the galls, in ſeven or eight freſh quantities of water, and then hung up to dry.

7. *Manner of dreſſing the ſkins after they are tanned.* When the ſkins have been treated as above, and are very near dry, they ſhould be ſcraped with the proper inſtrument or ſcraper on the fleſh ſide, to reduce them to a proper degree of thickneſs. They are then to be laid on a ſmooth board, and glazed by rubbing them with a ſmooth glaſs. After which they muſt be oiled, by rubbing them with olive oil, by means of a linen rag, in the proportion of one ounce and an half of oil for four ſkins: then they are to be grained on a graining board, lengthways, breadthways, and cornerways, or from corner to corner.

8. *Preparation with Galls, for the Skins to be dyed yellow.* After the four ſkins are taken out of the drench of bran, and clean waſhed as before directed in the ſecond article, they muſt be very well worked, half an hour or more, in a mixture of a pound and a half of the beſt white galls, finely powdered, with two quarts of clean water. The ſkins are then to be ſeparately doubled lengthways; rolled up with the fleſh ſide outwards, laid in the mixture, and cloſe preſſed down on each other, in which ſtate they muſt continue two whole days. On the third day let them be again worked in the tan; and afterwards ſcraped clean from the galls, with an ivory or braſs inſtrument (for no iron muſt touch them.) They muſt then be put into a freſh tan, made of two pounds of galls finely powdered, with about three quarts of water, and well worked therein fifteen times. After this they muſt be doubled, rolled up as before, and laid in the ſecond tan for three days. On the third day a quarter of a pound of white ſea-ſalt muſt be worked into each ſkin; and the ſkins doubled up as before, and returned into the tan, till the day following, when they are to be taken out, and well waſhed ſix times in cold water; and four times in water lukewarm. The water muſt be then well ſqueezed out, by laying the ſkins under preſſure, for about half an hour, between two boards, with a weight of about two or three hundred pounds laid upon the uppermoſt board, when they will be ready for the dye.

9. *Preparation of the Yellow Dye, in the proper proportion for four ſkins.* Mix ſix ounces of caſſiari gehira*, or dgehira, or the berries of the eaſtern rhamnus, with the ſame quantity of alum, and pound them together till they be fine, in a marble or braſs mortar, with a braſs peſtle. Then dividing the materials, thus powdered, into three equal parts of four ounces each, put one of thoſe three parts into about a pint and a half of water, in a china or earthern veſſel; and ſtir the mixture together. Let the fluid ſtand to cool, till it will not ſcald the hand. Then ſpreading one of the ſkins flat on a table, in a warm room, with the grain ſide uppermoſt, pour a fourth part of the tinging liquor, prepared as above directed, over the upper or grain ſide, ſpreading it equally over the ſkin with the hand, and rubbing it well in. Afterwards do the like with the other three ſkins, for which the mixture firſt made will be ſufficient.

This operation muſt be repeated twice more on each ſkin ſeparately, with the remaining eight ounces of the powder of the berries, and alum, with the abovementioned due proportions of hot water, put to them as before directed.

The ſkins, when dyed, are to be hung up on a wooden frame, without being folded, with the grain ſide outwards, about three quarters of an hour to drain, when they muſt be carried to a river or ſtream of running water, and well waſhed therein ſix times or more. After this, they muſt be put under preſſure for about an hour, till the water be well ſqueezed out; afterwards the ſkins muſt be hung up to dry in a warm room.

This being done, the ſkins are to be dreſſed and grained as before directed for thoſe dyed red; except the oiling, which muſt be omitted.

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tention of the ſhenan; but it will be prudent to purſue the examination of this further, as ſome unknown circumſtances in the collecting or uſing the Engliſh ſelicornia might occaſion the miſcarriage. But be this as it may, the Eaſtern ſhenan may, at all events, be eaſily procured in any quantity, at a very trifling expence, by any of the captains of Turkey ſhips, at Aleppo, Smyrna, *&c.*

* The caſſiari gehira is the berries of an Eaſtern rhamnus, or buckthorn tree, and may be had at Aleppo, and other parts of the Levant, at a ſmall price. The common Avignon, or yellow berries, may be ſubſtituted, but not with ſo good an effect; the caſſiari gehira being a ſtronger and brighter yellow dye, both for this uſe, and alſo that of colouring paper hangings, *&c.*

Gilding of LEATHER. Take glair of the whites of eggs, or gum-water, and with a bruſh rub over the leather with either of them; then lay on the gold or ſilver, and letting them dry, burniſh them. See the articles GILDING and BURNISHING.

To dreſs or cover leather with ſilver or gold. Take brown red, grind or move it on a ſtone with a muller, adding water and chalk; and when the latter is diſſolved, rub, or lighty dawb the leather over with it, till it looks a little whitiſh; and then lay on the leaf, ſilver or gold, before the leather is quite dry, laying the leaves a little over each other, that there may not be the leaſt part uncovered; and when they have well cloſed with the leather, and are ſufficiently dried on, and hardened, rub them over with an ivory poliſher, or the fore-tooth of a horſe.

LEAVEN, a piece of ſour dough, uſed to ferment and render light a much larger quantity of dough or paſte.

LECHEA, in botany, a genus of the triandria trigynia claſs. The calix conſiſts of three leaves, and the corolla of three linear petals; and the capſules are three, with three valves, and one ſeed. There are two ſpecies, both natives of Canada.

LECTICA, in Roman antiquity, a vehicle in which people were carried in a reclining poſture.

LECTISTERNIUM, a religious feaſt or banquet of the ancient Romans. In times of public danger or calamity, or of thankſgiving for ſome happy event, the republic ordered ſolemn feaſts to be made for the gods; and this ſolemnity was called lectiſternium, becauſe on this occaſion they ſpread tables, and placed beds around them, on which their heavenly gueſts were to lie and eat.

LECTURERS, in England, are an order of preachers in pariſh-churches, diſtinct from the rector or vicar. They are choſen by the veſtry, or chief inhabitants of the pariſh, and are uſually the afternoon preachers.

LEDBURY, a market-town of Hereford-ſhire, thirteen miles eaſt of Hereford.

LEDGER, the principal book wherein merchants enter their accounts See BOOK-KEEPING.

LEDUM, the MARSH CISTUS, in botany, a genus of the decandria monogynia claſs. The calix conſiſts of five ſegments, and the corolla of five plain petals; and the capſule has five cells, opening at the baſe. There is but one ſpecies, a native of the northern parts of Europe.

LEE, in the ſea-language, a word of various ſignifications; though it is generally underſtood to mean the part oppoſite to the wind. Thus *lee ſhore*, is that ſhore againſt which the wind blows. *Lee-latch*, or have a care of the lee-latch. is, take care that the ſhip do not go to the leeward, or too near the ſhore. *A lee the helm*, put it to the leeward ſide of the ſhip. *To lie by the lee*, or to come up to the lee, is to bring the ſhip ſo, that all her ſails may lie flat againſt her maſts and ſhrouds, and that the wind may come right upon her broad ſide.

LEE-WAY, is the angle that the rhumbline, upon which the ſhip endeavours to ſail, makes with the rhumb upon which ſhe really ſails. See NAVIGATION.

LEECH, in zoology. See HIRUDO.

LEEDS, a large market-town, in the weſt riding of Yorkſhire, ſituated on the river Aire, twenty-miles ſouth-weſt of York; it has a very great woolen trade.

LEEK. See ALLIUM.

LEERDAM, a town in the province of Holland, ſeventeen miles north-eaſt of Dort: E. long. 5°, N. lat. 51° 50′.

LEERWICK, a town of Scotland, in Mainland, one of the iſlands of Shetland, in the county of Orkney: W. long. 30′, N. lat. 61° 20′.

LEES, are the more groſs and ponderous parts of liquors, which, being ſeparated by fermentation, fall to the bottom.

LEET, a little court held within a manor, and called the king's court, on account that its authority to puniſh offences originally belonged to the Crown, from whence it is derived to inferior perſons.

LEEWARD, at ſea, the ſide oppoſite to that on which the wind blows.

LEEWARD-ISLANDS, in America, a name given to the Caribbees.

LEG, in anatomy. See ANATOMY, Part I. and II. *&c.*

LEGACY, in Scots law, a donation by one perſon to another, to be paid by the giver's executor after his death. See LAW, Tit. xxviii. 3.

LEGATEE, in Scots law, the perſon to whom a legacy is provided.

LEGATE, a cardinal or biſhop, whom the pope ſends as his ambaſſador to ſovereign princes.

LEGATUS, in roman antiquity, a military officer who commanded as deputy of the chief general.

LEGEND, any idle or ridiculous ſtory told by the Romaniſts concerning their ſaints, and other perſons, in order to ſupport the credit of their religion.

The legend was originally a book uſed in the old Romiſh churches, containing the leſſons to be read at divine ſervice; hence the lives of the ſaints and martyrs came to be called legends, becauſe chapters were read out of them at matins, and in the refectories of religious houſes. Among theſe the golden legend, which is a collection of the lives of the ſaints, was received by the church with great applauſe, which it maintained for two hundred years; though it is ſo full of ridiculous and romantic ſtories, that the Romaniſts themſelves are now aſhamed of it.

LEGER-LINE, in muſic, one added to the ſtaff of five lines, when the aſcending or deſcending notes run very high or low: there are ſometimes many of theſe lines both above and below the ſtaff, to the number of four or five.

LEGGIARDO, or LEGGIARDAMEMTE, in muſic, ſignifies to play or ſing in a lively, briſk, and gay manner.

LEGHORN, or LIVORNO, a port town of Italy, in the duchy of Tuſcany, ſituated on the Tuſcan ſea, forty miles weſt of Florence: E. long. 11°, N. lat. 43° 30′.

LEGION, in Roman antiquity, a body of foot which conſiſted of ten cohorts.

The exact number contained in a legion, was fixed by Romulus at three thouſand; though Plutarch aſſures us, that after the reception of the Sabines into Rome, he encreaſed it to ſix thouſand. The common number afterwards, in the firſt times of the free ſtate, was four thouſand; but in the war with Hannibal, it aroſe to five thouſand; and after this it is probable that it ſunk again to four thouſand, or four thouſand two hundred, which was the number in the time of Polybius.

LEGISLATOR, a law-giver, or perſon who eſtabliſhes the polity and laws of a ſtate. Such was Moſes, among the Jews; Lycurgus, among the Lacedæmonians, *&c.*

LEGITIMATION, an act whereby illegitimate children are rendered legitimate.

LEGITIME, in Scots law, that ſhare of the moveable effects belonging to a huſband and wife, which upon the huſband's death falls to the children. See Law, Tit. xxviii. 5.

LEGUME. See Botany, p. 637.

LEGUMINOUS, an appellation given to all plants whoſe fruit is a legume.

LEICESTER, the county-town of Leiceſterſhire. It ſends two members to parliament. W. long. 1° 5′, and N. lat. 52° 40′.

LEININGEN, a town of Germany, ſeventeen miles ſouth of Worms.

LEINSTER, a province of Ireland, the capital of which is Dublin.

LEIPSIC, a rich and populous city of Germany, in the circle of Upper Saxony and province of Miſnia: E. long. 12° 40′, N. lat. 51° 20′.

LEITH, a port-town of Scotland, about two miles north of Edinburgh.

LEMBURG, Leopolis, a city of Poland, and capital of the province of Red Ruſſia: E. long. 24°, N. lat. 49°.

LEMMA, in mathematics, a propoſition which ſerves previouſly to prepare the way for the more eaſy apprehenſion of the demonſtration of ſome theorem, or conſtruction of ſome problem.

LEMNA, in botany, a genus of the monoecia diandria claſs. The calix of both male and female conſiſts of one leaf; neither of them have any corolla; the female has one ſtylus, and the capſule conſiſts of one cell. There are four ſpecies, three of which are natives of Britain, *viz.* the triſulca, or ivy-leaved duck's-meat; the minor, or leaſt duck's meat; and the polyrhiza, or greater duck's-meat.

LEMNOS, an iſland of the Archipelago, ſituated forty-miles ſouth-weſt of the entrance of the Helleſpont; E. lon. 26°, N. lat. 29°.

LEMON, in botany. See Citrus.

LEMONADE, a liquor prepared of water, ſugar, and lemon or citron juice: it is very cooling and grateful.

LEMUR, in zoology, a genus of quadrupeds belonging to the order of primates, the characters of which are theſe: There are four fore-teeth in the upper jaw, the intermediate ones being remote; and ſix long, compreſſed, parallel teeth in the under jaw; the dog-teeth are ſolitary, and the grinders are ſomewhat labated. There are five ſpecies, *viz.*

1. The tardigradus, is a ſmall animal, about eight inches long; and is found in Ceylon. The head is roundiſh, with a prominent noſe; the legs are long and thick; and the feet reſemble thoſe of a monkey; the eyes are round, and near each other; the ears are long, and ſituate very low on the head. The hair on the top of the head, the ears, the neck, the ſhoulders, the back, the ſides, and the outer parts of the thighs and legs, are of a reddiſh aſh-colour; there is a white line betwixt the ears; the under jaw, the throat, the breaſt, and the belly, are mixed with white and an aſh colour. It has no tail. This animal is of a very ſingular conſtruction. It is perhaps longer in proportion to its thickneſs than any other quadruped: But its natural hiſtory is but imperfectly known.

2. The mongoz, is of a greyiſh colour above, and white below; his body is about a foot and a half in length; and the tail is as long as the body. This animal is very troubleſome when kept in a domeſtic ſtate. He takes every opportunity of eſcaping, and flies to the woods in queſt of fruits, and it is very difficult to catch him. He bites in a cruel manner thoſe with whom he is leaſt acquainted. He has a great averſion at cold and moiſture. He lives upon bread and fruits. His motions are briſk and lively. He is a native of Madagaſcar.

3. The macaco has a long tail, with about 30 alternate rings of black and white, and a barbed collar. He is about a foot and four inches long, and the tail is longer than the body. His general figure very much reſembles that of a monkey, excepting the head, which is ſomewhat triangular. The mocaco is a beautiful and elegant animal. Although his figure reſembles the monkey, his diſpoſitions and manners are very different. He is gentle and inoffenſive in a domeſtic ſtate. In a natural ſtate, he is fond of ſociety: In the iſland of Madagaſcar, troops of 30 or 40 of them are generally found together in the woods.

4. The catta has likewiſe a long tail, with black and white rings. This is a very gentle animal; it lives upon fruits and roots; its motion is ſlow; and it makes a placid murmuring noiſe like a cat. It is likewiſe a native of Madagaſcar.

5. The volans, reſembles a bat, being furniſhed with a ſtrong membrane, like that animal, by which it is enabled to fly. It is a native of Aſia; but its hiſtory is not ſufficiently known.

LEMURIA, a feſtival of the ancient Romans, ſolemnized on the ninth of May, to pacify the manes of the dead, who were the lemures or phantoms that came in the night to torment the living.

LENA, a great river of Siberia running north from N. lat. 55° to 72°.

LENÆA, in antiquity, a feſtival of Bacchus, ſirnamed Lenæus from a vine-preſs. Beſides the uſual ceremonies at feaſts ſacred to this god, it was remarkable for poetical contentions, and tragedies acted at this time.

LENS, in dioptrics, properly ſignifies a ſmall roundiſh glaſs, of the figure of a lentil; but is extended to any optic glaſs, not very thick, which either collects the rays of light into a point, in their paſſage through it, or diſperſes them further apart, according to the laws of refraction. See OPTICS.

LENT, a ſolemn time of faſting in the Chriſtian church, obſerved as a time of humiliation before Eaſter, the great feſtival of our Saviour's reſurrection.

Thoſe of the Romiſh church, and ſome of the Proteſtant communion, maintain, that it was always a faſt of forty days, and, as ſuch, of apoſtolical inſtitution. Others think it was only of eccleſiaſtical inſtitution, and that it was variouſly obſerved in different churches, and grew by degrees from a faſt of forty hours, to a faſt of forty days. This is the ſentiment of Morton, biſhop Taylor, du Maulin, Daillee, and others.

LENTISCUS, in botany. See PISTACIA.

LEO, in zoology. See FELIS.

LEO, in aſtronomy. See ASTRONOMY, p. 467.

St **LEO**, a town and biſhop's ſee of Italy, twenty miles north-weſt of Urbino.

LEON, the capital of the province of Leon, in Spain, ſituated on the river Eſla: W. long. 6° 5′, N. lat. 43°.

LEON is alſo the capital of the province of Nicaragua, in Mexico, ſituated at the weſt end of the Lake Nicaragua: W. long, 91°, N. lat. 11° 30′.

St **LEONARD**, a town of France, in the province of Guiennes, and territory of Limoſin: E. long. 1° 45′, N. lat. 45° 50′.

St. **LEONHART**, a town of Germany, in the circle of Auſtria, and duchy of Carinthia: E. long. 15°, N. lat. 47°.

LEONTICE, in botany, a genus of the hexandria monogynia claſs. The corolla conſiſts of ſix petals, and the nectarium of ſix leaves inſerted into the ungues of the corolla, and having an open limbus; and the calix has ſix deciduous leaves. There are four ſpecies, none of them natives of Britain.

LEONTINI, a town of Sicily, twenty miles north-weſt of Syracuſe.

LEONTODON, in botany, a genus of the ſyngeneſia polygamia æqualis claſs. The receptacle is naked; the calix is caliculated; the pappus is ſimple; and the floſculi are in a ſimple ſeries. There are nine ſpecies, three of them natives of Britain, *viz.* the taraxacum, or dandelion; the hiſpidum, or rough dandelion; and the autumnale, or yellow devil's-bit. The root of the taraxacum is eſteemed a good cathartic.

LEONURUS, LION'S TAIL, in botany, a genus of the didynamia gymnoſpermia claſs. The antheræ are interſperſed with ſhining glands. There are five ſpecies, only one of them, *viz.* the cardiaca, or mother-wort, is a native of Britain.

LEOPARD. See FELIS.

LEOPARD'S BANE, in botany. See DORONICUM.

LEPANTO, a port-town of European Turky, eighty miles weſt of the iſthmus of Corinth; whence the gulph of Lepanto takes its name.

LEPASTRUM, in natural hiſtory, a genus of ſelenitæ, compoſed of plates diſpoſed in the form of a radiated ſtar.

LEPIDIUM, in botany, a genus of the tetradynamia ſiliculoſa claſs. The pod is emarginated, cordated, and contains many ſeeds. There are 17 ſpecies, three of them natives of Britain, *viz.* the latifolium, or dittander: the ruderale, narrow-leaved wild creſs, or dittander; and the petræum, or mountain dittander.

LEPIDOPTERA, in zoology, an order of inſects, with four wings, which are covered with imbricated ſquamulæ. See NATURAL HISTORY.

LEPIUM, in natural hiſtory, a genus of foſſils of the harder gypſum, compoſed of very ſmall particles, and of a leſs glittering hue.

There is only one ſpecies of this genus, being one of the leaſt valuable and moſt impure of the claſs of gypſums. It is of an extremely rude, irregular, coarſe and unequal ſtructure; a little ſoft to the touch, of a very dull appearance, and of different degrees of a greyiſh white. It is burnt in plaiſter for the coarſer works; it calcines very ſlowly and unequally, and makes but a very coarſe and ordinary plaiſter.

LEPROSY, a foul cutaneous diſeaſe, appearing in dry, white, thin, ſcurfy ſcabs, either on the whole body, or only ſome part of it, and uſually attended with a violent itching and other pains. See MEDICINE.

LEPTODECORHOMBES, in natural hiſtory, a genus of foſſils of the order of the ſelenitæ; conſiſting of ten planes, each ſo nearly equal to that oppoſite to it as very much to approach to a decahedral parallelopiped, though never truly or regularly ſo.

Of this genus there are only five known ſpecies. 1. A thin, fine, pellucid, and ſlender ſtreaked one, with tranſverſe ſtriæ, found in conſiderable quantities in the ſtrata of clay in moſt parts of England, particularly near Heddington in Oxfordſhire. 2. A thin, dull-looking opake, and ſlender ſtreaked one, more ſcarce than the former, and found principally in Leiceſterſhire and Staffordſhire. 3. A thin fine ſtreaked one, with longitudinal ſtriæ, found in the clay-pits at Richmond, and generally lying at great depths. This has often on its top and bottom a very elegant ſmaller rhomboide, deſcribed by four regular lines. 4. A rough kind, with thick tranſverſe ſtriæ, and a ſcabrous ſurface, very common in Leiceſterſhire and Yorkſhire. And, 5. a very ſhort kind, with thick plates, common in the clay-pits of Northamptonſhire and Yorkſhire.

LEPTOPOLYGINGLIMI, in Natural Hiſtory, a genus of foſſil ſhells, diſtinguiſhed by a number of minute teeth at the cardo; whereof we find great numbers at Harwick cliff, and in the marle-pits of Suſſex.

LEPTURA, in zoology, a genus of inſects belonging to the order of coleoptera, the characters of which are theſe:—The feelers are briſtly; the elytra are attenuated towards the apex; and the thorax is ſomewhat cylindrical. There are 25 ſpecies, principally diſtinguiſhed by their colour.

LEPUS, in zoology, a genus of quadrupeds belonging to the order of glires. The characters are theſe; they have two fore-teeth in each jaw; thoſe in the upper jaw are double, the interior ones being ſmalleſt. There are four ſpecies, *viz.*

1. The timidus, or hare, has a ſhort tail; the points of the ears are black; the upper-lip is divided up to

the noſtrils; the length of the body is generally about a foot and a half; and the colour of the hair is reddiſh, interſperſed with white. The hare is naturally a timid animal. He ſleeps in his form, or ſeat, during the day, and feeds, copulates, *&c.* in the night. In a moon-light evening, a number of them are ſometimes ſeen ſporting together, leaping and purſuing each other: But the leaſt motion, the falling of a leaf, alarms them; and then they all run off ſeparately, each taking a different route. They are extremely ſwift in their motion, which is a kind of gallop, or a ſucceſſion of quick leaps. When purſued, they always take to the higher grounds: as their fore feet are much ſhorter than the hind ones, they run with more eaſe up-hill than down hill. The hare is endowed with all thoſe inſtincts which are neceſſary for his own preſervation. In winter he chuſes a form expoſed to the ſouth, and in ſummer to the north. He conceals himſelf among vegetables of the ſame colour with himſelf. Mr Fouilloux ſays, that he obſerved a hare, as ſoon as he heard the ſound of the horn, or the noiſe of the dogs, although at a mile's diſtance, riſe from her ſeat, ſwim acroſs a rivulet, then lie down among the ruſhes, and by this means evade the ſcent of the dogs. After being chaſed for a couple of hours, a hare will ſometimes puſh another from his form, and lie down in it himſelf. When hard preſſed, the hare will mingle with a flock of ſheep, run up an old wall and conceal himſelf among the graſs on the top of it, or croſs a river ſeveral times at ſmall diſtances. He never runs againſt the wind, or ſtraight forward; but conſtantly doubles about, in order to make the dogs loſe their ſcent.

It is remarkable, that the hare, although ever ſo frequently purſued by the dogs, ſeldom leaves the place where ſhe was brought forth, or even the form in which ſhe uſually ſits. It is common to find them in the ſame place next day, after being long and keenly chaſed the day before. The females are more groſs than the males, and have leſs ſtrength and agility; they are likewiſe more timid, and never allow the dogs to approach ſo near their form before riſing as the males. They likewiſe practiſe more arts, and double more frequently, than the males.

The hare is diffuſed almoſt over every climate; and, notwithſtanding they are every where hunted, their ſpecies never diminiſhes. They are in a condition of propagating the firſt year of their lives; the females go with young about 30 days, and produce four or five at a time; and as ſoon as they have brought forth, they again admit the embraces of the male; ſo that they may be ſaid to be always pregnant. The eyes of the young are open at birth; the mother ſuckles them about 20 days, after which they ſeparate from her and procure their own food. The young never go far from the place where they were brought forth; but ſtill they live ſolitary, and make forms about thirty paces diſtant from each other: Thus, if a young hare be found any where, you may almoſt be certain of finding ſeveral others within a very ſmall diſtance. The hare is not ſo ſavage as his manners would indicate. He is gentle, and ſuſceptible of a kind of education. He is pretty eaſily tamed, and will even ſhow a kind of attachment to the people of the houſe: But ſtill this attachment is not ſo ſtrong or laſting as to engage him to become altogether domeſtic; for although taken when very young, and brought up in the houſe, he no ſooner arrives at a certain age, than he takes the firſt opportunity of recovering his liberty and flying to the fields. The hare lives about ſeven or eight years. He feeds upon graſs, and other vegetables. His fleſh is excellent food. See Plate CIII. fig 2.

2. The cuniculus, or rabbit, has a very ſhort tail, and naked ears. The rabbit, though it has a great reſemblance to the hare, is very different in his manners; and they have ſuch a rooted antipathy to one another, that no art can engage them to have any ſexual intercourſe. The fecundity of the rabbit is ſtill greater than that of the hare; they multiply ſo prodigiouſly in ſome countries, that the product of the fields is hardly ſufficient to maintain them. They devour herbage of all kinds, roots, grain, fruits, *&c.* They are in a condition for producing at the age of ſix months; like the hare, the female is almoſt conſtantly in ſeaſon; ſhe goes with young about 30 days, and brings forth from four to eight at a litter. A few days before littering, ſhe digs a new hole in the earth, not in a ſtraight line, but in a zigzag form; the bottom of the hole ſhe enlarges every way; ſhe the npulls off a great quantity of hair from her belly, of which ſhe makes a kind of bed for her young. During the two firſt days after birth, ſhe never leaves them, but when preſſed with hunger, and and then ſhe eats quickly and returns: In this manner ſhe ſuckles and attends her young for ſix weeks. All this time, both the hole and the young are concealed from the male; ſometimes when the female goes out, in order to deceive the male, ſhe fills up the mouth of the hole with earth mixed with her own urine. But when the young ones begin to come to the mouth of the hole, and to eat ſuch herbs as the mother brings to them, the father ſeems to know them; he takes them betwixt his paws, ſmooths their hair, and careſſes them with great fondneſs. The rabbit is ſuppoſed not to be a native of the northern parts of Europe, but to have been originally brought from Greece and Spain. The rabbit lives about ſeven years, and his fleſh is good. Their colour is various, ſome of them being red, others white, but the moſt general colour is grey. See Plate CIII. fig. 3.

3. The capenſis, has a tail about the length of his head, and red legs. It is a native of the Cape of Good Hope.

4. The braſilienſis has no tail. It is found in South America.

Lepus, in aſtronomy. See Astronomy, p. 487.

LERIA, a city and biſhop's ſee of Portugal: W. long. 9° 15′, and N. lat. 39° 30′.

LERIDA, a city and biſhop's ſee of Catalonia in Spain: E. long. 5′, N. lat 41° 20′.

LERINS, two iſlands on the coaſt of Provence, five or ſix miles ſouth of Antibes, called St. Margaret and St. Honorat.

LERNEA, the Sea-hare, in zoology, a ſea-inſect of the order of the gymnarthria, the body of which is of an oblong cylindric figure, and is perforated in the forehead; the tentacula reſemble ears. See Gymnarthria.

LE ROY LE VEUT, the king's aſſent to public bills. See the articles Bill, Statute, and Parliament.

LESBOS, or Metelin, an iſland of the Archipelago, ſixty miles north-weſt of Smyrna. Its chief town is Caſtro.

LESCAR, a city and biſhop's ſee of France, forty miles eaſt of Bayonne.

LESCARD, a borough-town of Cornwal, fifteen miles weſt of Launceſton, which ſends two members to parliament.

LESSINES, a town of the Auſtrian Netherlands, fourteen miles north of Mons.

LESSONS, among eccleſiaſtical writers, portions of the Holy Scriptures, read in Chriſtian churches, at the time of divine ſervice.

LESTWITHIEL, a borough-town of Cornwal, twenty three miles ſouth-weſt of Launceſton, which ſends two members to parliament.

LETHARGY, in medicine. See Medicine.

LETHE, in the ancient mythology, one of the rivers of hell, ſignifying oblivion or forgetfulneſs; its waters having, according to poetical fiction, the peculiar quality of making thoſe who drank of them forget every thing that was paſt.

LETRIM, or Leitrim, a county of Ireland, in the province of Connaught; bounded by Fermanagh on the north, by Cavan on the eaſt, by Roſcommon on the ſouth, and by Sligo on the weſt.

LETTER, a character uſed to expreſs one of the ſimple ſounds of the voice; and as the different ſimple ſounds are expreſſed by different letters, theſe, by being differently compounded, become the viſible ſigns or characters of all the modulations and mixtures of ſounds uſed to expreſs our ideas in a regular language.

Letter *of attorney*, in law, is a writing by which one perſon authoriſes another to do ſome lawful act in his ſtead; as, to give ſeiſin of lands, to receive debts, ſue a third perſon, *&c.*

The nature of this inſtrument is to transfer to the perſon to whom it is given, the whole power of the maker, to enable him to accompliſh the act intended to be performed. It is either general or ſpecial; and ſometimes it is made revocable, which is when a bare authority is only given; and ſometimes it is irrevocable, as where debts, *&c.* are aſſigned from one perſon to another. It is generally held, that the power granted to the attorney muſt be ſtrictly purſued; and that where it is made to three perſons, two cannot execute it. In moſt caſes, the power given by a letter of attorney determines upon the death of the perſon who gave it. No letter of attorney made by any ſeaman, *&c.* in any ſhip of war, or having letters of marque, or by their executors, *&c.* in order to impower any perſon to receive any ſhare of prizes, or bounty-money, ſhall be valid, unleſs the ſame be made revocable, and for the uſe of ſuch ſeamen, and be ſigned and executed before, and atteſted by, the captain and one other of the ſigning officers of the ſhip, or the mayor or chief magiſtrate of ſome corporation.

Letter *of mart*, or *marque*, a letter granted to one of the king's ſubjects, under the privy ſeal, impowering him to make repriſals for what was formerly taken from him by the ſubjects of another ſtate contrary to the law of mart. See the article Marque.

Letters-patent, are writings ſealed with the great ſeal; ſo called, becauſe they are open, with the ſeal affixed to them. Theſe are granted to authoriſe a man to do or enjoy what of himſelf he could not do.

LETTUCE, in botany. See Lactuca.

LEVANT, a name given to the eaſt part of the Mediterranean ſea, bounded by Natolia or the leſſer Aſia on the north, by Syria and Paleſtine on the eaſt, by Egypt and Barca on the ſouth, and by the iſland of Candia and the other part of the Mediterranean on the weſt.

LEVATOR, in anatomy, a name given to ſeveral muſcles. See Anatomy, Part II.

LEUCADENDRON, in botany, a genus of the tetrandria monogynia claſs. The floſculi have two petals, one of them being divided into ſegments; the receptacle is ſomewhat hairy; it has no proper calix; and the antheræ are joined together. There are 15 ſpecies, none of them natives of Britain.

LEUCOIUM, the GREAT SNOW-DROP, in botany, a genus of the hexandria monogynia claſs. The corolla is bell-ſhaped, and divided into ſix ſegments; and the ſtigma is ſimple. There are three ſpecies, none of them natives of Britain.

LEUCOMA, in ſurgery, a diſtemper of the eye, otherwiſe called albugo. See Albugo and Medicine.

LEUCOPHLEGMATIA, in medicine, a kind of dropſy, otherwiſe called anaſarca. See Anasarca and Medicine.

LEVEL, an inſtrument wherewith to draw a line parallel to the horizon, by means of which the true level, or the difference of aſcent or deſcent between ſeveral places, may be found for conveying water, draining fens, *&c.*

There are ſeveral inſtruments of different contrivance and matter, invented for the perfection of levelling; all of which, for the practice, may be reduced to thoſe that follow.

Air Level, that which ſhews the line of level by means of a bubble or air incloſed with ſome liquor in a glaſs-tube of an indeterminate length and thickneſs, whoſe two ends are hermetically ſealed. When the bubble fixes itſelf at a certain mark, made exactly in the middle of the tube, the plane or ruler wherein it is fixed is level. When it is not level, the bubble will riſe to one end. This glaſs tube may be ſet in another of braſs, having an aperture in the middle, whence the buble of air may be obſerved. The liquor wherewith the tube is filled, is oil of tartar, or aqua ſecunda; thoſe not being liable to freeze as common water, nor to rarefaction and condenſation, as ſpirit of wine is. There is one of theſe inſtruments with ſights, being an improvement upon that laſt deſcribed, which, by the addition of more apparatus, becomes more commodious and exact. It conſiſts of an air level, (ſee Plate CIV. fig. 1.) n° 1. about eight inches long, and ſeven or eight lines in diameter, ſet in a braſs-tube,

2. with

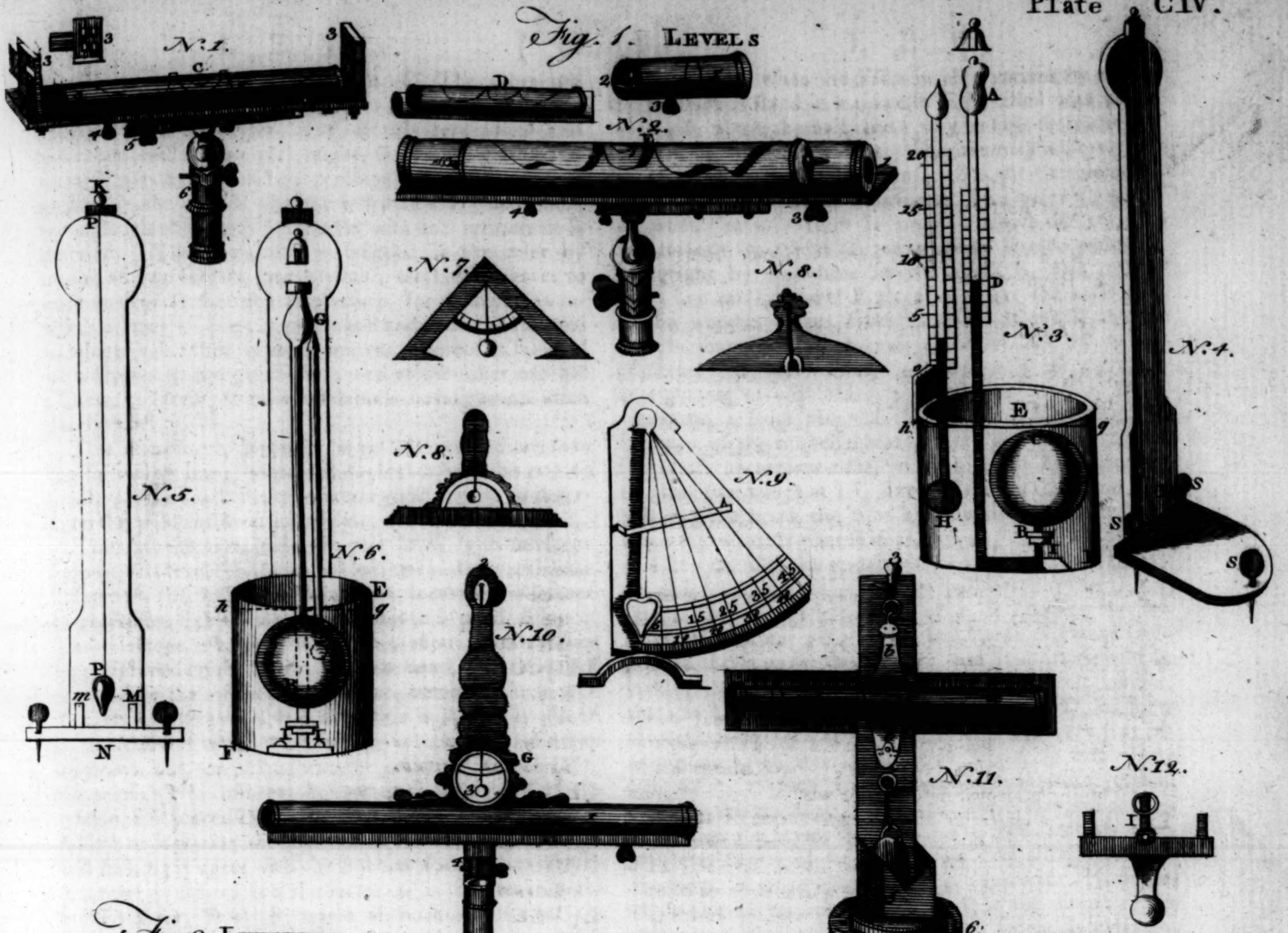

Fig. 1. LEVELS

N.1.
N.2.
N.3.
N.4.
N.5.
N.6.
N.7.
N.8.
N.8.
N.9.
N.10.
N.11.
N.12.
A
B
C
D
E
F
G
H
K
M
m
N
P
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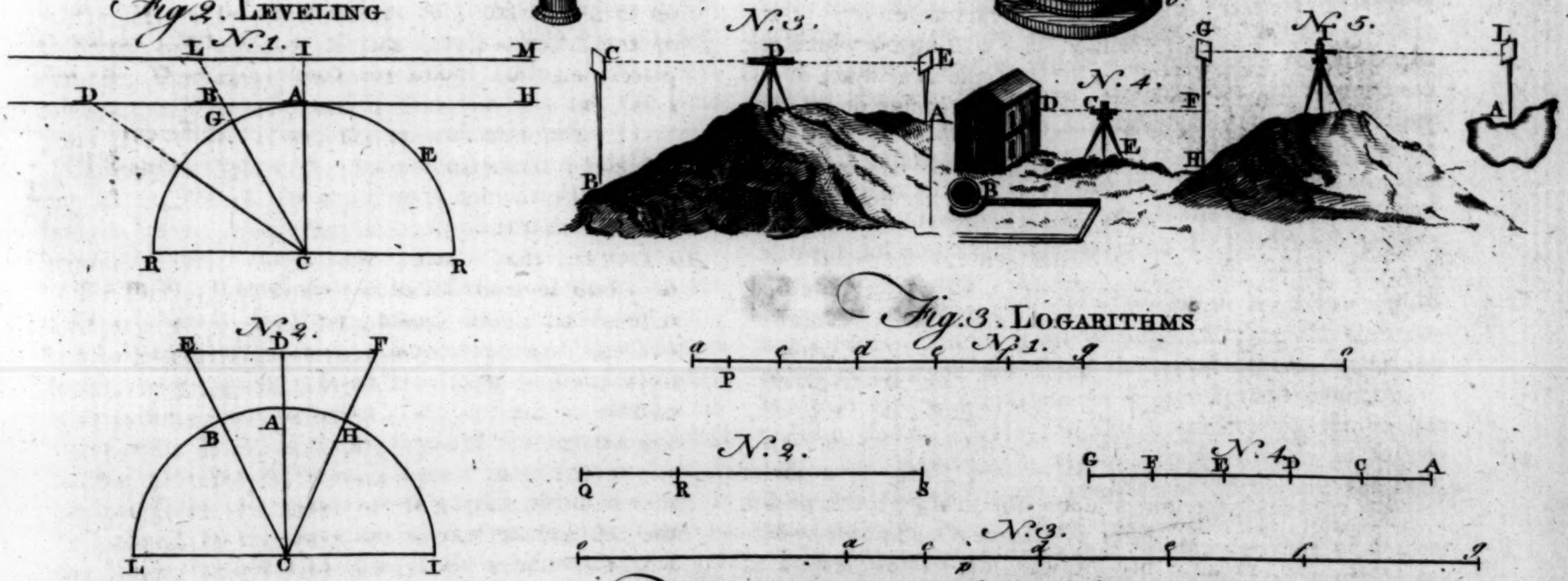

Fig. 2. LEVELING

N.1.
L
I
M
D
B
A
H
G
E
R
C
R
N.2.
E
D
F
B
A
H
L
C
I
N.3.
N.4.
N.5.
C
D
E
A
B
C
D
E
F
G
H
L
A

Fig. 3. LOGARITHMS

N.1.
a
P
c
d
e
g
N.2.
Q
R
S
N.3.
o
a
c
p
d
e
f
g
N.4.
G
F
E
D
C
A

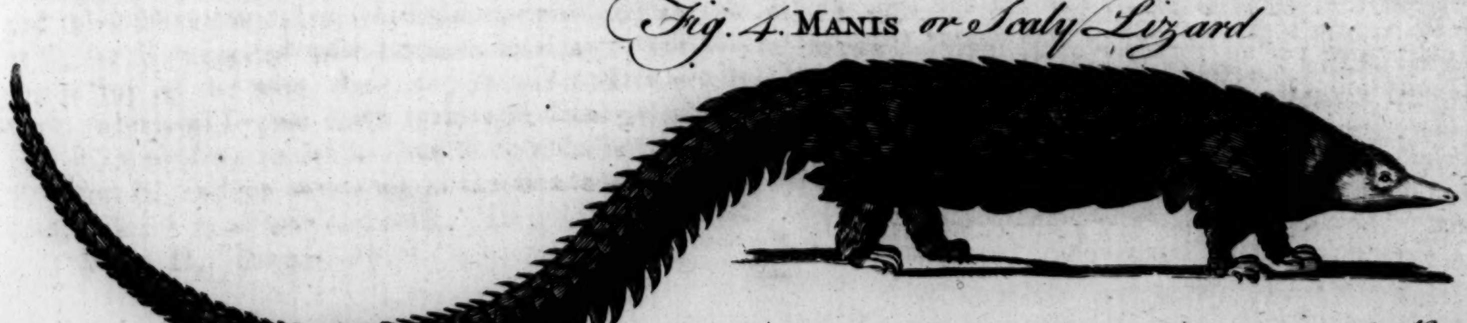

Fig. 4. MANIS or Scaly Lizard

A. Bell Sc.

4 AP 54

2. with an aperture in the middle, C. The tubes are carried in a ſtrong ſtraight ruler, a foot long; at whoſe ends are fixed two ſights, 3, 3, exactly perpendicular to the tubes, and of an equal height, having a ſquare hole, formed by two fillets of braſs croſſing each other at right angles; in the middle whereof is drilled a very little hole, through which a point on a level with the inſtrument is deſcried. The braſs-tube is faſtened on the ruler by means of two ſcrews, one whereof, marked 4, ſerves to raiſe or depreſs the tube at pleaſure, for bringing it towards a level. The top of the ball and ſocket is rivetted to a little ruler that ſprings, one end whereof is faſtened with ſcrews to the great ruler, and at the other end has a ſcrew, 5, ſerving to raiſe and depreſs the inſtrument when nearly level.

This inſtrument, however, is yet leſs commodious than the following one; becauſe though the holes be ever ſo ſmall, yet they will ſtill take in too great a ſpace to determine the point of level preciſely.

This inſtrument conſiſts of an air level, with teleſcope ſights: this level (*ibid.* n° 2.) is like the laſt, with this difference, that inſtead of plain ſights, it carries a teleſcope to determine exactly a point of level at a good diſtance. The teleſcope is a little braſs-tube, about fifteen inches long, faſtened on the ſame ruler as the level. At the end of the tube of the teleſcope, marked 1, enters the little tube 1, carrying the eye-glaſs and an hair horizontally placed in the focus of the object-glaſs, 2; which little tube may be drawn out, or puſhed into the great one, for adjuſting the teleſcope to different ſights: at the other end of the teleſcope is placed the object-glaſs. The ſcrew 3, is for raiſing or lowering the little fork, for carrying the hair, and making it agree with the bubble of air, when the inſtrument is level; and the ſcrew 4, is for making the bubble of air, D or E, agree with the teleſcope: the whole is fitted to a ball and ſocket. M. Huygens is ſaid to be the firſt inventor of this level, which has this advantage, that it may be inverted by turning the ruler and teleſcope half round; and if then the hair cut the ſame point that it did before, the operation is juſt.

It may be obſerved, that one may add a teleſcope to any kind of level, by applying it upon or parallel to the baſe or ruler, when there is occaſion to take the level of remote objects.

Dr Deſaguliers contrived an inſtrument, by which the difference of level of two places, which could not be taken in leſs than four or five days with the beſt teleſcope-levels, may be taken in as few hours. The inſtrument is as follows: to the ball C (*ibid.* n° 3.) is joined a recurve tube B A, with a very fine bore, and a ſmall bubble at top, A, whoſe upper part is open. It is evident from the make of this inſtrument, that if it be inclined in carrying, no prejudice will be done to the liquor, which will always be right both in the ball and tube when the inſtrument is ſet upright. If the air at C, be ſo expanded with heat, as to drive the liquor to the top of the tube, the cavity A will receive the liquor, which will come down again and ſettle at D, or near it, according to the level of the place where the inſtrument is, as ſoon as the air at C returns to the ſame temperament as to heat and cold. To preſerve the ſame degree of heat, when the different obſervations are made, the machine is fixed in a tin veſſel E F, filled with water up to *g b*, above the ball, and a very ſenſible thermometer has alſo its ball under water, than one may obſerve the liquor at D, in each experiment, when the thermometer ſtands at the ſame height as before. The water is poured out when the inſtrument is carried, which one may do conveniently by means of the wooden frame, which is ſet upright by the three ſcrews S, S, S, *ibid.* n° 4. and a line and plummet P P, n° 5. At the back part of the wooden frame, from the piece at top K, hangs the plummet P, over a braſs point at N; M *m* are brackets, to make the upright board K N continue at right angles with the horizontal one at N. N° 6. repreſents a front view of the machine, ſuppoſing the fore part of the tin-veſſel tranſparent; and here the braſs-ſocket of the recurve-tube, into which the ball is ſcrewed, has two wings at I I, fixed to the bottom, that the ball may not break the tube by its endeavour to emerge when the water is poured in as high as *g b*.

After the Dr had contrived this machine, he conſidered, that as the tube is of a very ſmall bore, if the liquor ſhould riſe into the ball at A, n° 3. in carrying the inſtrument from one place to another, ſome of it would adhere to the ſides or the ball A, and upon its deſcent in making the experiment, ſo much might be left behind, that the liquor would not be high enough at D, to ſhew the difference of the level: therefore, to prevent that inconveniency, he contrived a blank ſcrew, to ſhut up the hole at A, as ſoon as one experiment is made, that in carrying the machine, the air in A may balance that in C, ſo that the liquor ſhall not run up and down the tube, whatever degree of heat and cold may act upon the inſtrument, in going from one place to another. Now, becauſe one experiment may be made in the morning, the water may be ſo cold, that when a ſecond experiment is made at noon the water cannot be brought to the ſame degree of cold it had in the morning; therefore, in making the firſt experiment, warm water muſt be mixed with the cold, and when the water has ſtood ſome time before it comes to be as cold as it is likely to be at the warmeſt part of that day, obſerve and ſet down the degree of the thermometer at which the ſpirit ſtands, and likewiſe the degree of the water in the barometer at D; then ſcrew on the cape at A, pour out the water, and carry the inſtrument to the place whoſe level you would know; then pour in your water, and when the thermometer is come to the ſame degree as before, open the ſcrew at top, and obſerve the liquor in the barometer.

The doctor's ſcale for the barometer is ten inches long, and divided into tenths; ſo that ſuch an inſtrument will ſerve for any heights not exceeding ten feet, each tenth of an inch anſwering to a foot in height.

The Dr made no allowance for the decreaſe of denſity in the air, becauſe he did not propoſe this machine for meaſuring mountains, (though with a proper allowance for the decreaſing denſity of the air, it will do very well), but for heights that want to be known in gardens, plantations, and the conveyance of water, where an experiment that anſwers two or three feet in a diſtance of twenty miles, will render this a very uſeful inſtrument.

Artillery Foot-**Level** is in form of a ſquare, having its two legs or branches of an equal length; at a juncture whereof is a little hole, whence hangs a thread and plummet playing on a perpendicular line in the middle of a quadrant. It is divided into twice 45 degrees from the middle, *ibid.* n° 7.

This inſtrument may be uſed on other occaſions, by placing the ends of its two branches on a plane; for when the thread plays perpendicularly over the middle diviſion of the quadrant, that plane is aſſuredly level. To uſe it in gunnery, place the two ends on the piece of artillery, which you may raiſe to any propoſed height, by means of the plummet, whoſe thread will give the degree above the level.

Carpenters and Paviour's **Level**, conſiſts of a long ruler, in the middle whereof is fitted, at right angles, another ſomewhat bigger, at the top of which is faſtened a line, which, when it hangs over a fiducial line at right angles with the baſe, ſhews that the ſaid baſe is horizontal. Sometimes this level is all of one board. *Ibid.* n° 8.

Gunner's **Level**, for levelling cannons and mortars, conſiſts of a triangular braſs-plate, about four inches high, *ibid.* 9. at the bottom of which is a portion of a circle, divided into 45 degrees; which number is ſufficient for the higheſt elevation of cannons and mortars, and for giving ſhot the greateſt range: on the center of this ſegment of a circle is ſcrewed a piece of braſs, by means of which it may be fixed or ſcrewed at pleaſure; the end of this piece of braſs is made ſo as to ſerve for a plummet and index, in order to ſhew the different degrees of elevation of pieces of artillery. This inſtrument has alſo a braſs-foot, to ſet upon cannons or mortars, ſo as, when thoſe pieces are horizontal, the inſtrument will be perpendicular. The foot of this inſtrument is to be placed on the piece to be elevated, in ſuch a manner, as that the point of the plummet may fall on the proper degree: this is what they call levelling the piece.

Maſon's **Level**, is compoſed of three rules, ſo joined as to form an iſoceles-rectangle, ſomewhat like a roman A; at the vertex whereof is faſtened a thread, from which hangs a plummet, that paſſes over a fiducial line, marked in the middle of the baſe, when the thing to which the level is applied is horizontal; but declines from the mark, when the thing is lower on one ſide than on the other.

Plumb, or *Pendulum*-**Level**, that which ſhews the horizontal lines by means of another line perpendicular to that deſcribed by a plummet or pendulum. This inſtrument, *ibid.* n° 10. conſiſts of two legs or branches, joined together at right angles, whereof that which carries the thread and plummet is about a foot and a half long; the thread is hung towards the top of the branch, at the point 2. The middle of the branch where the thread paſſes is hollow, ſo that it may hang free every where: but towards the bottom, where there is a little blade of ſilver, whereon is drawn a line perpendicular to the teleſcope, the ſaid cavity is covered by two pieces of braſs, making as it were a kind of caſe, leſt the wind ſhould agitate the thread; for which reaſon the ſilver blade is covered with a glaſs G, to the end that it may be ſeen when the thread and plummet play upon the perpendicular: the teleſcope is faſtened to the other branch of the inſtrument, and is about two feet long: having an hair placed horizontally acroſs the focus of the object-glaſs, which determines the point of the level. The teleſcope muſt be fitted at right angles to the perpendicular. It has a ball and ſocket, by which it is faſtened to the foot, and was invented by M. Picard.

Reflecting **Level**, that made by means of a pretty long ſurface of water repreſenting the ſame object inverted which we ſee erected by the eye, ſo that the point where theſe two objects appear to meet is a level with the place where the ſurface of the water is found. This is the invention of M. Marriotte.

There is another reflecting level conſiſting of a mirror of ſteel, or the like, well poliſhed, and placed a little before the object-glaſs of a teleſcope, ſuſpended perpendicularly. This mirror muſt make an angle of 45° with the teleſcope, in which caſe the perpendicular line of the ſaid teleſcope is converted into a horizontal line, which is the ſame with the line of level. This is the invention of M. Caſſini.

Water **Level**, that which ſhews the horizontal line by means of a ſurface of water or other liquor, founded on this principle, that water always places itſelf level. See the article **Fluid**.

The moſt ſimple is made of a long wooden trough, or canal, whoſe ſides are parallel to the baſe, ſo that being equally filled with water, its ſurface ſhews the line of level. This is the chorobates of the ancients. See **Chorobata**.

It is alſo made with two cups fitted to the two ends of a pipe, three or four feet long, about an inch in diameter, by means whereof the water communicates from the one to the other cup; and this pipe being moveable on its ſtand by means of a ball and ſocket, when the two cups become equally full of water, their two ſurfaces mark the line of level.

This inſtrument, inſtead of cups, may alſo be made with two ſhort cylinders of glaſs three or four inches long, faſtened to each extreme of the pipe with wax or maſtic. Into the pipe is poured ſome common or coloured water, which ſhews itſelf through the cylinders, by means whereof the line of level is determined; the height of the water, with reſpect to the center of the earth, being always the ſame in both cylinders: this level, though very ſimple, is yet very commodious for levelling ſmall diſtances.

Level *of Mr Huygens's invention*, conſiſts of a teleſcope *a*, *ibid.* n° 11. in form of a cylinder, going through a ferril, in which it is faſtened by the middle. This ferril has two flat branches *b b*, one above, and the other below; at the ends whereof are faſtened little moving pieces, which carry two rings, by one of which the teleſcope is ſuſpended to an hook at the end of the ſcrew 3, and by the other a pretty heavy weight is ſuſpended, in order to keep the teleſcope in equilibrio. This weight hangs in the box 5, which is almoſt filled with linſeed oil, oil of walnuts, or other matter that will not eaſily coagulate, for more aptly ſettling the balance of the weight and teleſcope. The inſtrument carries two teleſcopes cloſe and very parallel to each other; the eye glaſs of the one being againſt the object-glaſs of the other, that one may ſee each way without turning the level. In the focus of the object-glaſs of each teleſcope muſt a little hair be ſtrained horizontally, to be raiſed and lowered as occaſion requires by a little ſcrew. If the tube of the teleſcope be not found level when ſupended, a ferril or ring, 4, is put on it, and is to be ſlid along till it fixes to a level. The hook on which the inſtrument is hung, is fixed to a flat wooden croſs; at the ends of each arm whereof there is a hook ſerving to keep the teleſcope from too much agitation in uſing or carriage. To the ſaid flat croſs is applied another hollow one, that ſerves as a caſe for the inſtrument; but the two ends are left open, that the teleſcope may be ſecured from the weather, and always in a condition to be uſed. The foot of this inſtrument is a round braſs plate, to which are faſtened three braſs ferils, moveable by means of joints wherein are put ſtaves, and on this foot is placed the box.

N° 12. marked I, is a balance-level; which being ſuſpended by the ring, the two ſights, when in equilibrio, will be horizontal, or in a level.

LEVELLING, the art of finding a line parallel to the horizon at one or more ſtations, in order to determine the height of one place with regard to another. See the preceding article.

A truly level ſurface is a ſegment of a ſpherical ſurface, which is concentric to the globe of the earth. A true line of level is an arch of a great circle, which is imagined to be deſcribed upon a truly level ſurface. The apparent level is a ſtraight line drawn tangent to an arch or line of true level. Every point of the apparent level, except the point of contact, is higher than the true level: thus let EAG (Plate CIV. fig. 2. n° 1.) be an arch of a great circle drawn upon the earth; to a perſon who ſtands upon the earth at A, the line HD is the apparent level parallel to his rational horizon RR; but this line, the farther it is extended from his ſtation A, the farther it recedes from the center; for BC is longer than AC, and DC is longer than BC, *&c.* The common methods of levelling are ſufficient for laying pavements of walks, for conveying water to ſmall diſtances, for placing horizontal dials, or aſtronomical inſtruments; but in levelling the bottoms of canals which are to convey water to the diſtance of many miles, the difference between the apparent and true level muſt be taken into the account: thus let IAL (*ibid.* n° 2.) be an arch of a great circle upon the earth: let it be required to cut a canal whoſe bottom ſhall be a true level from A to B, of the length of 5078 feet: the common method is to place the levelling inſtrument in the bottom of the canal at A, and looking through the ſights placed horizontally at a ſtick ſet up perpendicular at B, to make a mark where the viſual ray or point of the apparent level points at E, and then to ſink the bottom of the canal at B as much below E as A is below D. But this will not give the true level: for according to Caſſini's calculation, at the diſtance of 5078 feet the apparent level is ſeven inches above the true; and therefore, to make a true level, B muſt be ſunk ſeven inches lower than the apparent level directs; ſo that if A be four feet below D, B muſt be four feet ſeven inches below the mark E. We have here mentioned the error which will ariſe from placing the level at one end of the line to be levelled, and ſhewn how to correct it; but in moſt caſes it is better to take a ſtation in the middle of the line to be levelled: thus, if the points H and B are to be levelled, place the inſtrument in the middle at A, and ſetting up ſticks perpendicular at H and B, make marks upon each ſtick where the apparent level points, as E and F; thoſe points are level: and if you ſink H as much below F, as B is below E, HAB will be a true level.

The operation of levelling is as follows: ſuppoſe the height of the point A. (*ibid.* n° 3.) on the top of a mountain above that of the point B, and at the foot thereof, be required. Place the level about the middle diſtance between the two points as in D, and ſtaffs in A and B; and let there be perſons inſtructed with ſignals for raiſing and lowering, on the ſaid ſtaffs, little marks of paſteboard or other matter, the level being placed horizontally by the bubble, *&c.* Look towards the ſtaff AE, and cauſe the mark ſo raiſed to be lowered till the middle, upper edge, or other moſt conſpicuous part, appear in the viſual ray. Then meaſuring exactly the perpendicular height of the point E above the point A, which ſuppoſe ſix feet four inches; ſet that down in your book: then turn the level horizontally about, that the eye-glaſs of the teleſcope may be ſtill next the eye when you look the other way; if you have only plain ſights, the inſtrument need not be turned; and cauſe the perſon at the ſtaff B, to raiſe or lower his mark, till ſome conſpicuous part of it fall in the viſual ray, as at C: then meaſure the perpendicular height of C above B, which ſuppoſe ſixteen feet ſix inches: ſet this alſo down in the book above the other number of the firſt obſervation; ſubtract the one from the other, the remainder will be ten feet two inches, which is the difference of the level between A and B, or the height of the point A above the point B.

If the point D, where the inſtrument is fixed, be in the middle between the two points A and B, there will be no neceſſity for reducing the apparent level to the true level; the viſual ray in that caſe being raiſed equally above the true level. If it be further required to know whether there be a ſufficient deſcent for conveying water from the ſpring A (*ibid.* n° 4.) to the point B. Here, in regard the diſtance from A to B is conſiderable, it is required that ſeveral operations be made. Having then choſen a proper place for the firſt ſtation, as at I, ſet up a ſtaff in the point A, near the ſpring, with a proper mark to ſlide up and down the ſtaff, as L, and meaſure the diſtance from A to I, which ſuppoſe two thouſand yards. Then the level being adjuſted in the point I, let the mark L be raiſed and lowered till ſuch time as you ſpy ſome conſpicuous part of it through the teleſcope or ſights of the level, and meaſure the height AL, which ſuppoſe thirteen feet five inches. But in regard the diſtance AI is two thouſand yards, you muſt have recourſe to your table for a reduction, ſubtracting eleven inches, which will leave the height of AL twelve feet ſix inches, and this note down in your book. Now turn the level horizontally about, ſo that the eye-glaſs of the teleſcope may be towards A, and fixing up another ſtaff at H, cauſe the mark G to be moved up and down till you ſpy ſome conſpicuous part through the teleſcope or ſights. Meaſure the height HG, which ſuppoſe ſeven yards one foot two inches. Meaſure likewiſe the diſtance of the points IH, which ſuppoſe one thouſand three hundred yards; for which diſtance four inches eight lines muſt be ſubtracted from the height HG, which conſequently will only leave ſeven yards nine inches four lines, to be taken down in your book. This done, remove the level forwards to ſome other eminence, as E, whence the ſtaff H may be viewed; as alſo another ſtaff at D, near the place whither the water is to be conveyed. The level being again adjuſted in the point E, look back to the ſtaff H; and managing the mark as before, the viſual ray will give the point F. Meaſure the height HF, which ſuppoſe eleven feet ſix inches. Meaſure likewiſe the diſtance HE, which ſuppoſe a thouſand yards, for which there is two inches nine lines of abatement; which being taken from the height HF, there will remain eleven feet three inches three lines; which enter in your book. Laſtly, turning the level to look at the next ſtaff D, the viſual ray will give the point D. Meaſure the height of D from the ground, which ſuppoſe eight feet three inches. Meaſure alſo the diſtance from the ſtation E to B, which ſuppoſe nine hundred yards, for which diſtance there are two inches three lines of abatement; which being taken from the height BD, there will remain eight feet nine lines; which enter as before.

For the manner of entering down obſervations in your book, obſerve, that when a proper place or ſtation for the level between the two points has been pitched upon, write down the two heights obſerved at that ſtation in two different columns, *viz.* under the firſt column, thoſe obſerved in looking through the teleſcope when the eye was from the ſpring, or towards the point, which we may call back ſights; and under the ſecond column, thoſe obſerved when the eye was next the ſpring, which we call foreſights. Having ſummed up the heights of each column ſeparately, ſubtract the leſſer from the greater, the remainder will be the difference of the level between the points A and B. If the diſtance of the two points be required, add all the diſtances meaſured together; and dividing the difference of height by the yards of the diſtances, for each two hundred yards you will have a deſcent of about two inches nine lines.

Dr. Halley ſuggeſts a new method of levelling, performed wholly by means of the barometer, in which the mercury is found to be ſuſpended to ſo much the leſs height, as the place is farther remote from the center of the earth; whence the different heights of the mercury in two places give the difference of level. This method has been put in practice by ſome of the French academy.

Levelling-staves, inſtruments uſed in levelling, ſerving to carry the marks to be obſerved, and at the ſame time to meaſure the heights of thoſe marks from the ground. They uſually conſiſt each of two long wooden rulers, made to ſlide over one another, and divide into feet, inches, *&c.*

LEVER, or **Leaver**, in mechanics. See Mechanics.

LEVERET, among ſportſmen, denotes a hare in the firſt year of her age.

LEVIGATION, in pharmacy and chemiſtry, the reducing hard and ponderous bodies to an impalpable powder, by grinding them on a prophyry, or the like.

LEVITE, in a general ſenſe, means all the deſcendants of Levi, among whom were the Jewiſh prieſts themſelves, who being deſcended from Aaron, were likewiſe of the race of Levi: but it is more particularly uſed for an order of officers in that church, who were employed in performing the manual ſervice of the temple, ſuch as in fetching wood, water, and other things neceſſary for the ſacrifices, and in ſinging and playing upon inſtruments of muſic.

LEVITICUS, a canonical book of the Old Teſtament, ſo called from its containing the laws and regulations relating to the prieſts, Levites, and ſacrifices.

LEVITY, in phyſiology, the privation or want of weight in any body, when compared with another that is heavier than it, in which ſenſe it ſtands oppoſed to gravity.

LEVY, in law, ſignifies to gather or collect, as to levy money; and to levy a fine of lands, is the paſſing a fine.

LEWARDEN, a city of the United Provinces, the capital of weſt Frieſland: E. long. 5° 35′, N. lat. 53° 20′.

LEWES, a borough-town of Suſſex, forty miles ſouth of London, which ſends two members to parliament.

LEWIS, the moſt northerly of any of the weſtern iſlands of Scotland, lying in 8° odd minutes W. long. and between 58° and 59° odd minutes N. lat.

LEXICON, the ſame as dictionary, but chiefly uſed in ſpeaking of Greek dictionaries. See Dictionary.

LEYDEN, a city of Holland, in which there is a famous univerſity, ſituated twenty miles ſouth of Amſterdam.

LEYTE, one of the Philippine iſlands, ſeparated from the iſland Philippina by a narrow channel: E. long. 123°, N. lat. 11°.

LIBANUS, a range of mountains in Aſiatic Turky, between Syria and Paleſtine, which extend from Sidon on the Levant, eaſtward beyond Damaſcus.

LIBATION, a religious ceremony among the ancient pagans, which conſiſted in an effuſion of liquors poured on the head of the victims prepared for ſacrifice.

LIBAW, a port-town of Poland, in the duchy of Courland, ſituated on a bay of the Baltic: E. long. 21°, N. lat. 56° 40′.

LIBELLULA, in the hiſtory of inſects, a genus of four-winged flies, called in Engliſh dragon-flies, or adder-flies; the characters of which are theſe: The mouth is furniſhed with jaws; the feelers are ſhorter than the breaſt; and the tail of the male terminates in a kind of hooked forceps. There are 21 ſpecies, chiefly diſtinguiſhed by their colour.

LIBER, among botaniſts, denotes the rind or inner bark of trees.

LIBERIA, in Roman antiquity, a feſtival obſerved on the ſixteenth of the calends of April, at which time the youth laid aſide their juvenile habit for the toga virilis, or habit peculiar to grown men.

LIBERTUS, in Roman antiquity, a perſon who from being a ſlave had obtained his freedom.

The difference between the liberti and libertini was this: the liberti were ſuch as had been actually made free themſelves, and the libertini were the children of ſuch perſons.

LIBERTY, in general, denotes a ſtate of freedom, in contradiſtinction to ſlavery.

According to Cicero, liberty is the power of living as a man pleaſes, or without being controlled by another.

In a legal ſenſe, liberty ſignifies ſome privilege that is held by charter or preſcription.

LIBRA, the BALANCE, in aſtronomy. See ASTRONOMY, p. 487.

LIBRA, in Roman antiquity, a pound weight; alſo a coin, equal in value to twenty denarii.

LIBRARY, an edifice or apartment deſtined for holding a conſiderable number of books placed regularly on ſhelves; or, the books themſelves lodged in it.

The firſt who erected a library at Athens was the tyrant Piſiſtratus, which was tranſported by Xerxes into Perſia, and afterwards brought back by Seleucus Nicanor to Athens. Plutarch ſays, that under Eumenes there was a library at Pergamus that contained 200,000 books. That of Ptolemy Philadelphus, according to A. Gellius, contained 700,000, which were all burnt by Cæſar's ſoldiers. Conſtantine and his ſucceſſors erected a magnificent one at Conſtantinople, which in the eighth century contained 300,000 volumes; and among the reſt, one in which the Iliad and Odyſſey were written in letters of gold, on the guts of a ſerpent: but this library was burnt by order of Leo Iſaurus. The moſt celebrated libraries of ancient Rome, were the Ulpian and the Palatine, and in modern Rome that of the Vatican. The foundation of the Vatican library was laid by pope Nicholas, in the year 1450; it was afterwards deſtroyed in the ſacking of Rome by the conſtable of Bourbon, and reſtored by pope Sixtus V. and has been conſiderably enriched with the ruins of that of Heidelberg, plundered by count Tilly in 1682. One of the moſt complete libraries in Europe, is that erected by Coſmo de Medicis; though it is now exceeded by that of the French king, which was begun by Francis I. augmented by cardinal Richelieu, and completed by M. Colbert. The emperor's library at Vienna, according to Lambecius, conſiſts of 80,000 volumes, and 15,940 curious medals. The Bodleian library at Oxford exceeds that of any univerſity in Europe, and even thoſe of any of the ſovereigns of Europe, except the emperor's and the French king's, which are each of them older by a hundred years. It was firſt opened in 1602, and has ſince been increaſed by a great number of benefactors: indeed the Medicean library, that of Beſſarion at Venice, and thoſe juſt mentioned, exceed it in Greek manuſcripts; but it outdoes them all in Oriental manuſcripts; and as to printed books, Ambroſian at Milan, and that of Wolfembuttle, are two of the moſt famous, and yet both are inferior to the Bodleian. The Cotton library conſiſts wholly of manuſcripts, particularly of ſuch as relate to the hiſtory and antiquities of Britain; which, as they are now bound, make about 1000 volumes.

In Edinburgh there is a good library belonging to the univerſity, well furniſhed with books; which are kept in good order, and cloiſtered up with wire-doors, that none but the keeper can open, and are now lent out only upon conſignation of the price; a method much more commodious than the multitude of chains uſed in other libraries. There is alſo a noble library of books and manuſcripts belonging to the faculty of Advocates. See ADVOCATE.

LIBRATION, in aſtronomy, an apparent irregularity of the moon's motion, whereby ſhe ſeems to librate about her axis, ſometimes from the eaſt to the weſt, and now and then from the weſt to the eaſt. See ASTRONOMY.

LIBYA, in ancient geography, a large extent of Africa, lying ſouth-weſt of Egypt.

LICENCE, in law, an authority given to a perſon to do ſome lawful act.

LICENTIATE, one who has obtained the degree of a licence.

The greateſt number of the officers of juſtice in Spain, are diſtinguiſhed by no other title but that of licentiate. In order to paſs licentiate in common law, civil law, and phyſic, they muſt have ſtudied ſeven years; and in divinity, ten. Among us, a licentiate uſually means a phyſician who has a licence to practiſe, granted by the college of phyſicians.

LICHEN, LIVER-WORT, in botany, a genus of the cryptogamia algæ claſs. The receptacle is roundiſh, plain, and ſhining; and the farina is diſperſed upon the leaves. There are 85 ſpecies, all natives of Britain.

LICTORS, in Roman antiquity, the ſerjeants or beadles who carried the faſces before the ſupreme magiſtrates: it was alſo a part of their office to be the public executioners in beheading, ſcourging, *&c.*

LIDDESDALE, a county of Scotland, bounded by Tiviotdale, on the north; Cumberland, on the ſouth-eaſt; and Annandale, on the ſouth-weſt.

LIEGE, in law, a term ſometimes uſed for liege lord, or one who owns no ſuperior.

LIEGE POUSTIE, in Scots law, is oppoſed to death bed; and ſignifies a perſon's enjoying that ſtate of health, in which only he can diſpoſe of his property at pleaſure. See law, Tit. xxvii. 28.

LIEGE, in geography, the capital of the biſhopric of the ſame name in Germany, ſituated on the river Maes, twelves miles ſouth of Maeſtricht; E. long. 5° 36′, N. lat. 50° 40′.

LIENTERY, is a flux of the belly, in which, whatever is taken in is diſcharged by ſtool as it is ſwallowed, or very little altered either in colour or ſubſtance. See MEDICINE.

LIEUTENANT, an officer who ſupplies the place and diſcharges the office of a ſuperior in his abſence. Of theſe, ſome are civil, as the lords-lieutenants of kingdoms, and the lord-lieutenants of counties; and others are military, as the lieutenant general, lieutenant-general of the artillery, lieutenant-colonel, lieutenant of the artillery of the tower, lieutenants of horſe, foot, ſhips of war, *&c.*

Lord LIEUTENANT *of Ireland*, is properly a viceroy, and has all the ſtate and grandeur of a king of England, except being ſerved upon the knee. He has the power of making war and peace, of beſtowing all the offices under the government, of dubbing knights, and of pardoning all crimes except high treaſon; he alſo calls and prorogues the parliament, but no bill can paſs without the royal aſſent. He is aſſiſted in his government by a privy-counſel; and, on his leaving the kingdom, he appoints the lords of the regency, who govern in his abſence.

Lords LIEUTENANTS *of counties*, are officers, who, upon any invaſion or rebellion, have power to raiſe the militia, and to give commiſſions to colonels and other officers, to arm and form them into regiments, troops and companies. Under the lords lieutenants, are deputy-lietenants, who have the ſame power; theſe are choſen by the lords-lieutenants out of the principal gentlemen of each county, and preſented to the king for his approbation.

LIEUTENANT-GENERAL, is an officer next in rank to the general: in battle, he commands one of the wings; in a march, a detachment, or a flying camp; alſo a quarter, at a ſiege, or one of the attacks, when it is his day of duty.

LIFE, is peculiarly uſed to denote the animated ſtate of living creatures, or the time that the union of their ſoul and body laſts.

LIFERENT, in Scots law. When the uſe or enjoyment of a ſubject is given to a perſon during his life, it is ſaid to belong to him in liferent. See LAW, Tit. xvi. 21.

LIGAMENT, in anatomy, a ſtrong compact ſubſtance, ſerving to join two bones together. See ANATOMY.

LIGATURE, in ſurgery, is a chord, band, or ſtring; or the binding any part of the body with a chord, band, fillet, *&c.* whether of leather, linnen, *&c.*

Ligatures are uſed to extend and replace bones that are broken or diſlocated; to tie the patients down in lithotomy and amputations; to tie upon the veins in phlebotomy, or the arteries in amputations, or in large wounds; to ſecure the ſplints that are applied to fractures; to tie up the proceſſes of the peritonæum, with the ſpermatic veſſels in caſtration; and, laſtly, in taking off warts or other excreſcences by ligature.

LIGHT, in phyſiology, certain ſubtile particles of matter, capable of exciting in us the ſenſation of colours. See OPTICS.

LIGHTENING, the burſting of fire from a cloud or the earth. See ELECTRICITY.

LIGHTER, in naval achitecture, a large kind of boat uſed in the river of Thames for carrying heavy goods, as coals, timber, *&c.*

LIGNICENSIS *terra*, in the materia medica, the name of a fine yellow hole, dug in many parts of Germany, particularly about Emeric in the circle of Weſtphalia, and uſed in cordial and aſtringent compoſitions.

LIGULATED, among botaniſts, an appellation given to ſuch floſcules as have a ſtraight end turned downwards, with three indentures, but not divided into ſegments.

LIGUSTICUM, LOVAGE, in botany, a genus of the pentandria digynia claſs. The fruit is oblong, with five furrows on each ſide. There are ſix ſpecies, two of them natives of Britain, *viz.* the ſcotticum, or Scottiſh ſea-parſley; and the cornubienſe, or Cornwal ſaxifrage.

LIGUSTRUM, PRIVET, in botany, a genus of trees belonging to the diandria monogynia claſs. The corolla conſiſts of four ſegments; and the berry has four ſeeds. There is but one ſpecies, *viz.* the vulgare or privet, a native of Britain.

LILIADEOUS, an appellation given to ſuch flowers as reſemble that of the lily.

LILIUM, in botany, a genus of the hexandria monogynia claſs. The corolla is bell-ſhaped, and conſiſts of ſix petals, with a longitudinal nectariferous line; and the valves of the capſule are connected with a lattice-work of hair. There are nine ſpecies, none of them natives of Britain. The root of the white lily is reckoned emollient and ſuppurative.

LIMA, a province of Peru, in South America; the capital of which, called alſo Lima, was almoſt entirely deſtroyed by an earthquake in 1746: W. long. 76°, and S. lat. 12° 30′.

LIMAX, in zoology, a genus of inſects belonging to the order of vermes molluſca; the characters of which are theſe: The body is oblong, fitted for crawling, with a kind of muſcular coat on the upper part; and the belly is plain: they have a roundiſh hole in the ſide, near the neck, which ſerves the purpoſes of genitals, and for voiding their excrements: they have likewiſe four tentacula or horns, ſituate above the mouth, which they extend or retract at pleaſure. There are eight ſpecies, diſtinguiſhed entirely by their colour, as the black ſnail; the white ſnail; the reddiſh ſnail; the aſh-coloured ſnail; *&c.* Snails are ſaid to be hermaphrodites, and mutually impregnate each other.

LIMB, in a general ſenſe, denotes the border or edge of a thing: thus, we ſay, the limb of a quadrant, of the ſun, of a leaf, *&c.*

LIMB, in anatomy, an appellation given to the extremities of the body, as the arms and legs.

LIMB, *limbus*, in the church of Rome, is uſed in two different ſenſes. 1. The limb of the patriarchs is ſaid to be the place where the patriarchs waited the redemption of mankind: in this place, they ſuppoſe our Saviour's ſoul continued from the time of his death to his reſurrection. 2. The limb of infants, dying without baptiſm; a place ſuppoſed to be diſtinct both from heaven and hell; ſince, ſay they, children dying innocent of any actual ſin do not deſerve hell, and by reaſon of their original ſin cannot be admitted into heaven.

LIMBURG, the capital of a dutchy of the ſame name, in the Auſtrian Netherlands, twenty miles ſouth-eaſt of Liege: E. long. 6° 5′, and N. lat. 50° 37′.

LIME. See CHEMISTRY, p. 76.

LIMERIC, the capital of a county of the ſame name in Ireland, ſituated on the river Shannon, fifty two miles north of Cork: W. long. 8°30′, N. lat 52° 35′.

LIMINGTON, or LEMINGTON, a borough-town of Hampſhire, twelve miles ſouth-weſt of Southampton. It ſends two members to parliament.

LIMIT, in a reſtrained ſenſe, is uſed by mathematicians for a determinate quantity to which a variable one continually approaches; in which ſenſe, the circle may be ſaid to be the limit of its circumſcribed and inſcribed polygons. In algebra, the term limits is applied to two quantities, one of which is greater, and the other leſs, than another quantity; and in this ſenſe it is uſed, in ſpeaking of the limits of equations, whereby their ſolution is much facilitated. See ALGEBRA.

LIMNING, the art of painting in water-colours, in contradiſtinction to painting, which is done in oil-colours. See PAINTING.

Limning is by far more ancient than painting in oil; this laſt being firſt invented by John Van Eych, a Flemiſh painter, in 1410.

In limning, all colours are proper enough, except the white, made of lime, which is only uſed in freſco. The azure and ultramarine muſt always be mixt with ſize or gum: but there are always applied two lays of hot ſize, before the ſize colours are laid on: the colours are all ground in water, each by itſelf, and, as they are required in working, are diluted with ſize water.

When the piece is finiſhed, they go over it with the white of an egg, well beaten; and then with varniſh, if required.

To limn or draw a face in colours: having all the materials in readineſs, lay the prepared colour on the card even and thin, free from hairs and ſpots, over the place where the picture is to be. The ground being laid, and the party placed in a due poſition, begin the work; which is to be done at three ſittings. At the firſt, you are only to dead-colour the face, which will require about two hours. At the ſecond ſitting, go over the work more curiouſly, adding its particular graces or deformities. At the third ſitting, finiſh the whole; carefully remarking whatever may conduce to render the piece perfect, as the caſt of the eyes, moles, ſcars, geſtures, and the like.

LIMODORUM, in botany, a genus of the gynandria diandria claſs. The nectarium conſiſts of one concave, pedicellated leaf, ſituate with the undermoſt petal. There is but one ſpecies, a native of North America.

LIMON. See CITRUS.

LIMOSELLA, in botany, a genus of the didynamia angioſpermia claſs. The calix conſiſts of five ſegments, and the corolla of five equal diviſions; the ſtamina are approximated in pairs; and the capſule has one cell and two valves, containing many ſeeds.

LIMPET. See PATELLA.

LINARIA, in ornithology. See FRINGILLA.

LINCOLN, the capital city of the county of Lincoln: W. long. 27′, N. lat. 53° 16′. It ſends two members to parliament.

LINE, in geometry, a quantity extended in length only, without any breadth or thickneſs. It is formed by the flux or motion of a point. See FLUXIONS, and GEOMETRY.

LINE, in the art of war, is underſtood of the diſpoſition of an army, ranged in order of battle, with the front extended as far as may be, that it may not be flanked.

LINE *of battle*, is alſo underſtood of the diſpoſition of a fleet on the day of the engagement, on which occaſion the veſſels are uſually drawn up as much as poſſible in a ſtraight line, as well to gain and keep the advantage of the wind, as to run the ſame board.

Ship of the LINE, a veſſel large enough to be drawn up in the line, and to have a place in a ſea-fight.

LINE, in genealogy, a ſeries or ſucceſſion of relations in various degrees, all deſcending from the ſame common father.

LINE alſo denotes a French meaſure, containing the twelfth part of an inch, or the hundred and forty-fourth part of a foot. Geometricians conceive the line ſubdivided into ſix points. The French line anſwers to the Engliſh barley-corn.

LINES, in heraldry, the figures uſed in armories, to divide the ſhield into different parts, and to compoſe different figures. Theſe lines, according to their different forms and names, give denomination to the pieces or figures which they form, except the ſtraight or plain lines.

LINEA ALBA, in anatomy. See ANATOMY, p. 192.

LINEAMENT, among painters, is uſed for the out-lines of a face.

LINEAR NUMBERS, in mathematics, ſuch as have relation to length only; ſuch is a number which repreſents one ſide of a plane figure. If the plane figure be a ſquare, the linear number is called a root.

LINEAR PROBLEM, that which may be ſolved geometrically by the interſection of two right lines. This is called a ſimple problem, and is capable but of one ſolution.

LINEN. See LINNEN.

LING, in ichthyology. See GADUS.

LINGEN, a town of Germany, in the circle of Weſtphalia, capital of a county of the ſame name, ſituated on the river Ems, forty-five miles north of Munſter.

LINGUATULA, in ichthyology. See PLEURONECTES.

LINIMENT, in pharmacy, a compoſition of a conſiſtence ſomewhat thinner than an unguent, and thicker than an oil, uſed for anointing different parts of the body in various intentions.

The materials proper for compoſing of a liniment, are oils, fats, balſams, and whatever enters the compoſition of unguents and plaſters.

LINLITHGOW, a town of Scotland, in the county of Lothian, capital of the county of Linlithgow, ſituated ſixteen miles weſt of Edinburgh.

LINNÆA, in botany, a genus of the didynamia angioſpermia claſs. The calix is double; the corolla is bell-ſhaped; and the berry is dry, and contains two ſeeds. There is but one ſpecies, a native of Sweeden.

LINNEN, in commerce, a well-known kind of cloth, chiefly made of flax. See FLAX.

In order to ſucceed in the linnen-manufacture, one ſet of people ſhould be confined to the plowing and preparing the ſoil, ſowing and covering the ſeed, to the weeding, pulling, rippling, taking care of the new ſeed, and watering and graſſing the flax, till it is lodged at home; others ſhould be concerned in the drying, breaking, ſcutching, and heckling the flax, to fit it for the ſpinners; and others in ſpinning and reeling it, to fit it for the weaver; others ſhould be concerned in taking due care of the weaving, bleaching, beetling, and finiſhing the cloth for the market. It is reaſonable to believe, that if theſe ſeveral branches of the manufacture were carried on by diſtinct dealers in Scotland and Ireland, where our home-made linnens are manufactured, the ſeveral parts would be better executed, and the whole would be afforded cheaper, and with greater profit.

LINNET, in ornithology. See FRINGILLA.

LINSEED, the ſeed of the plant linum. Linſeed bruiſed and ſteeped in water, gives it very ſoon a thick mucilaginous nature, and communicates much of its emollient virtues to it.

LINT. See LINNEN and FLAX.

LINTEL, in architecture, a piece of ſtone or timber that lies horizontally over door-poſts and window-jambs, as well to bear the thickneſs of the wall over it, as to bind the ſides of the wall together.

LINTON, a market town of Cambridgeſhire, ſituated ten miles ſouth-eaſt of Cambridge.

LINTS, or LINTZ, a beautiful city, capital of Upper Auſtria, with a ſtrong citadel.

LINUM, FLAX, in botany, a genus of the pentandria pentagynia claſs. The calix conſiſts of five leaves, and the corolla of five petals; the capſule has five valves, and ten cells; and the ſeeds are ſolitary. There are 22 ſpecies, five of them natives of Britain, *viz.* the uſitatiſſimum, or common flax; the perenne, or blue flax; the tenuifolium, or narrow-leaved wild flax; the catharticum, or purging flax; and the radiola, leaſt rupture-wort, or all-ſeed. See FLAX.

LION, in zoology. See FELIS.

LIONCELLES, in heraldry, a term uſed for ſeveral lions borne in the ſame coat of arms.

LIP, in anatomy. See ANATOMY, p. 305.

Hare-LIP, a diſorder, in which the upper lip is in a manner ſlit or divided, ſo as to reſemble the upper lip of a hare, whence the name. See SURGERY.

LIPOTHYMIA, FAINTING, in medicine, may ariſe from ſeveral cauſes, as too violent exerciſes, ſuppreſſion of the menſes or other accuſtomed evacuations, *&c.* See MEDICINE.

LIPPIA, in botany, a genus of the didynamia angioſpermia claſs. The calix conſiſts of four roundiſh, erect, and membranaceous teeth; the capſule is ſtraight, has two valves, one cell, and two ſeeds. There are two ſpecies, none of them natives of Britain.

LIQUIDAMBER, in botany, a genus of the monœcia polyandria claſs. The calix has four leaves; it has no corolla, but numerous filaments: the calix of the male conſiſts of four leaves in the form of a globe; it has no corolla, but a couple of ſtyli; and the capſules, which are numerous, are round, with a double valve, and contains many ſeeds. There are two ſpecies, both natives of America. This tree yields a fragrant reſin, called liquidamber, which reſolves and opens obſtructions.

LIQUOR, a name ſignifying any fluid ſubſtance.

LIQUORICE. See GLYCYRRHIZA.

LIRIODENDRUM, the TULIP-TREE, in botany, a genus of the polyandria polygynia claſs. The calix conſiſts of three leaves, and the corolla of nine petals; and the ſeeds are imbricated upon a ſtrobilus. There are two ſpecies, none of them natives of Britain.

LISBON, the capital of Portugal, ſituated on the north bank of the Tagus, about ten miles from its mouth, and eighty miles weſt of the frontiers of Spain: W. long. 9° 25′, N. lat. 38° 25′. It is about ſix miles long, winding with the river, from whence it riſes with an eaſy aſcent, and is computed to contain about 30,000 houſes, 200,000 inhabitants, forty pariſh-churches, and forty convents of both ſexes.

LISIEUX, a large city and biſhop's ſee of France, in the province of Normandy: E. long. 16′, and N. lat. 40° 14′.

LISLE, or RYSSEL, a large and populous city, the capital of French Flanders, ſituated on the river Deule, twelve miles weſt of Tournay: E. long. 3°, and N. lat. 50° 42′.

LIST, in commerce, the bordure of cloth, or of ſtuff; ſerving not only to ſhew their quality, but to preſerve them from being torn in the operations of fulling, dying, *&c.*

Liſt is uſed on various occaſions; but chiefly by gardeners for ſecuring their wall-trees.

LITANY, a ſolemn form of ſupplication to God, in which the prieſt utters ſome things fit to be prayed for, and the people join in their interceſſion, ſaying, *We beſeech thee to hear us, good Lord*, &c.

LITCHFIELD, a city of Staffordſhire, one hundred miles north-weſt of London, and twelve ſouth-eaſt of Stafford. This city and Coventry have one biſhop between them; it ſends two members to parliament.

LITERATI, in general, denotes men of learning; but is more particularly uſed by the Chineſe for ſuch perſons as are able to read and write their language.

LITHANTHRAX, PIT-COAL, in natural hiſtory, a genus of foſſils, defined to be ſolid, dry, opake, inflammable ſubſtances, found in large ſtrata, ſplitting horizontally more eaſily than in any other direction, of a gloſſy hue, ſoft and friable, not fuſible, but eaſily inflammable, and leaving a large reſiduum of aſhes.

Of this genus there are three ſpecies: 1. The hard, duſky, black coal, known by the name of Scotch coal. 2. The hard, gloſſy, black coal, known by the ſame name. 3. The friable, gloſſy, black coal, called Newcaſtle coal, as being chiefly dug about that town.

LITHARGE, is properly a recrement of lead, or lead vitrified, either alone, or with a mixture of copper. See CHEMISTRY, p 84.

LITHIDIA, in natural hiſtory, the name of a large claſs of foſſils, including the flint and pebble kinds.

The lithidia are defined to be ſtones of a debaſed cryſtalline matter, covered by, and ſurrounded with, an opake cruſt, and frequently of great beauty, and conſiderable brightneſs within, though of but a ſlight degree of tranſparency, approaching to the nature of the ſemi pellucid gems, and like them found in not very large maſſes.

LITHOGINESIA, a term uſed by ſome authors for the formation of ſtones. See STONE.

LITHOMARGA, *Stone-marle*, a name given by ſome authors to a ſparry ſubſtance highly debaſed by earth, which is found in great plenty in the caves of the Hart's foreſt in Germany, and uſed there.

LITHONTRIPTICS, medicines which either break, or are ſuppoſed to have the virtue of breaking, ſtones in the urinary paſſages. See MEDICINE.

LITHOPHYTA, the name of Linnæus's third order of vermes. See NATURAL HISTORY.

LITHOSPERMUM, GROMWELL, in botany, a genus of the pentandria monogynia claſs. The corolla is funnel-ſhaped, with a naked perforated faux; and the calix conſiſts of five ſegments. There are ſix ſpecies, three of them natives of Britain; viz. the officinale, or gromwell; the purpuro-cæruleum, or leſſer creeping gromwell; and the arvenſe, or baſtard alkanet. The ſeeds of the officinale are accounted diuretic.

LITHOSTROTION, in natural hiſtory, a name of a ſpecies of foſſil coral, compoſed of a great number of long and ſlender columns, ſometimes round, ſometimes angular, joined nicely to one another, and of a ſtarry or radiated ſurface at their tops. Theſe are found in conſiderable quantities in the northern and weſtern parts of this kingdom, ſometimes in ſingle, ſometimes in complex ſpecimens.

LITHOTOMY, in ſurgery, cutting for the ſtone. See SURGERY.

LITHOZUGIA, in natural hiſtory, a genus of foſſils, compoſed of a ſimple ſtony matter, making a kind of cement, and holding firmly together ſmall pebbles *&c.* embodied in it.

LITHUANIA, a province of Poland, bounded by Samogitia, Livonia, and part of Ruſſia, on the north; by another part of Ruſſia, on the eaſt; by Volhinia and Poleſia, on the ſouth; and by Pruſſia and Polachia, on the weſt.

LITISCONTESTATION, in Scots law. See LAW, Tit. xxx. 33.

LITURGY, a name given to thoſe ſet forms of prayer which have been generally uſed in the Chriſtian church. Of theſe there are not a few aſcribed to the apoſtles and fathers, but they are almoſt univerſally allowed to be ſpurious.

LITUUS, in Roman antiquity, a ſhort ſtraight rod, only bending a little at one end, uſed by the augurs. See AUGUR.

LIVADIA, the capital of a province of European Turky, the ancient Achaia, ſituated on the north ſide of the gulph of Lepanto: E. long. 23° 15', N. lat. 27° 30'.

LIVER, in anatomy. See ANATOMY, p. 264.

LIVER-WORT, in botany. See LICHEN.

LIVERPOOL, or LEVERPOOL, a port town of Lancaſhire, fifteen miles north of Cheſter, which ſends two members to parliament.

LIVERYMEN *of London* are a number of men choſen from among the freemen of each company. Out of this body the common council, ſheriff, and other ſuperior officers for the government of the city are elected, and they alone have the privilege of giving their votes for members of parliament; from which the reſt of the citizens are excluded.

LIVONIA, a province of Ruſſia, 160 miles long, and 120 broaded; bounded by the gulph of Finland, on the north; by Ingria and great Novogorod, on the eaſt; by Lithuania and Courland, on the ſouth; and by the Baltic, on the weſt: its chief towns are Narva, Revel, and Riga.

LIVONICA TERRA, a kind of fine bole uſed in the ſhops of Germany and Italy. Theſe earths are both dug out of the ſame pit, in the place from whence they have their name, and in ſome other parts of the world. They are generally brought to us made up into little cakes, and ſealed with the impreſſion of a church and an eſcutcheon with two croſs keys. In Spain and Portugal they are much uſed, ſometimes ſingly, ſometimes mixed together, and are good in fevers and in fluxes of all kinds.

LIVRE, a French money of account, containing twenty ſols.

LIXIVIOUS, an appellation given to ſalts obtained from burnt vegetables by lotion.

LIXIVIUM, in pharmacy, *&c.* a ley, obtained by pouring ſome liquor upon the aſhes of plants; which is more or leſs powerful, as it has imbibed the fixed ſalts contained in the aſhes.

LIZZARD, in zoology. See LACERTA.

LIZZARD, in geography, a cape, or promontory of Cornwall, fifteen miles ſouth of Falmouth: W. long. 5° 47', N. lat. 49° 50'.

LOACH, in ichthyology. See COBITIS.

LOADSTONE. See MAGNET.

LOAMS, in natural hiſtory, are defined to be earths compoſed of diſſimilar particles, hard, ſtiff, denſe, and hard and rough to the touch; not eaſily ductile while moiſt, readily diffuſible in water, and compoſed of ſand and a tough viſcid clay. Of theſe loams, ſome are whitiſh, and others brown or yellow.

LOBE, in anatomy, any fleſhy protuberant part, as the lobes of the lungs, lobes of the ears, *&c.*

LOBELIA, in botany, a genus of the ſyngeneſia monogynia claſs. The calix conſiſts of five ſegments, and the corolla of one irregular petal; and the capſule has two and ſometimes three cells. There are 26 ſpecies, only one of them a native af Britain, *viz.* the dortinanna, or water gladiale.

LOCAL, in law, ſomething fixed to the freehold, or tied to a certain place: thus real actions are local, ſince they muſt be brought in the country where they lie: and local cuſtoms are thoſe peculiar to certain countries and places.

LOCAL MEDICINES, thoſe deſtined to act upon particular parts; ſuch are fomentations, epithems, veſicatories, *&c.*

Decree of **LOCALITY**, in Scots law, a decree proportioning a miniſter's ſtipend among the different perſons liable in payment of it. See LAW, Tit. v. 13.

LOCATELLUS's BALSAM, in pharmacy, a celebrated balſam, the preparation whereof is directed in the Edinburgh diſpenſatory thus: Take of yellow-wax, one pound; oil olive, a pint and a half; Venice turpentine, a pound and a half; balſam of Peru, two ounces; dragon's blood, one ounce: melt the wax in the oil over a gentle fire; then add the turpentine; and having taken them from the fire, mix in the balſam of Peru and dragon's blood, keeping them continually ſtirring till grown cold.

This balſam is uſed in internal bruiſes and hæmorrhages, eroſions of the inteſtines, ulcerations of the lungs, dyſenteries, and in ſome coughs and aſthmas.

LOCHIA, in medicine, a flux from the uterus, conſequent to delivery. See MIDWIFERY.

LOCHMABEN, a town of Scotland, fifteen miles eaſt of Dumfries.

LOCK, a well-known inſtrument uſed for faſtening doors, cheſts, *&c.* generally opened by a key.

LOCKMAN, an officer in the iſle of Man, who executes the orders of the government, much like our under ſheriff.

LOCRIDA, a town of Turky in Europe, ſeventy miles ſouth-eaſt of Durazzo: E. long. 21°, N. lat. 41.

LOCUS GEOMETRICUS, denotes a line, by which a local or indeterminate problem is ſolved.

A locus is a line, any point of which may equally ſolve an indeterminate problem. Thus, if a right line ſuffice for the conſtruction of the equation, it is called *locus ad rectum*; if a circle, *locus ad circulum*; if a parabola, *locus ad parabolam*; if an ellipſis, *locus ad ellipſin*; and ſo of the reſt of the conic ſections.

LOCULAMENT, among botaniſts, denotes a cell, or partition, in a ſeed pod, for the ſeed of a plant.

LOCUST, in zoology. See GRYLLUS.

LODGMENT, in military affairs, is a work raiſed with earth, gabions, faſcines, wool-packs, or mantelets, to cover the beſiegers from the enemies fire, and to prevent their loſing a place which they have gained, and are reſolved, if poſſible, to keep.

LOEFLINGIA, in botany, a genus of the triandria monogynia claſs. The calix conſiſts of five leaves, and the corolla of five ſmall petals; and the capſule has one cell, and three valves. There is but one ſpecies, a native of Spain.

LOESELIA, in botany, a genus of the didynamia angioſpermia claſs. The calix conſiſts of four ſegments; and the capſule has three cells. There is but one ſpecies, a native of America.

LOG, in naval affairs, is a flat piece of wood, ſhaped ſomewhat like a flounder, with a piece of lead faſtened to its bottom, which makes it ſtand or ſwim upright in the water. See Plate CIII. fig. 4.

LOGARITHMIC CURVE. If on the line AN (Plate CIII. fig. 5.) both ways indefinitely extended, be taken, A C, C E, E G, G I, I L, on the right hand; and alſo A *g*, *g* P, *&c.* on the left, all equal to one another: and if at the points P *g*, A, C, E, G, I, L, be erected to the right line A N, the perpendiculars P S, *g d*, A B, C D, E F, G H, I K, L M, which let be continually proportional, and repreſent numbers, *viz.* A B, 1; C D, 10; E F, 100, *&c.* then ſhall we have two progreſſions of lines, arithmetical and geometrical: for the lines A C, A E, A G, *&c.* are in arithmetical progreſſion, or as 1, 2, 3, 4, 5, *&c.* and ſo repreſent the logarithms to which the geometrical lines A B, C D, E F, *&c.* do correſpond. For ſince A G is triple of the firſt line A C, the number G H ſhall be in the third place from unity, if C D be in the firſt: ſo likewiſe ſhall L M be in the fifth place, ſince A L = 5 A C. If the extremities of the proportionals S, *d*, B, D, F, *&c.* be joined by right lines, the figures S B M L will become a polygon, conſiſting of more or leſs ſides, according as there are more or leſs terms in the progreſſion.

If the parts A C, C E, E G, *&c.* be biſected in the points, *c*, *e*, *g*, *i*, *l*, and there be again raiſed the perpendiculars *c d*, *e f*, *g h*, *i k*, *l m*, which are mean proportionals between A B, C D; C D, E F, *&c.* then there will ariſe a new ſeries of proportionals, whoſe terms, beginning from that which immediately follows unity, are double of thoſe in the firſt ſeries, and the difference of the terms is become leſs, and approach nearer to a ratio of equality than before. Likewiſe, in this new ſeries, the right lines A L, A *c*, expreſs the diſtances of the terms L M, *c d*, from unity, *viz.* ſince A L is ten times greater than A *c*, L M ſhall be the tenth term of the ſeries from unity; and becauſe A *e* is three times greater than A *c*, *e f* will be the third term of the ſeries if *c d* be the firſt, and there ſhall be two mean proportionals between AB and *ef*, and between A B and L M there will be nine mean proportionals. And if the extremities of the lines B *d*, D *f*, F *h*, *&c.* be joined by right lines, there will be a new polygon made, conſiſting of more but ſhorter ſides than the laſt.

If, in this manner, mean proportionals be continually placed between every two terms, the number of terms at laſt will be made ſo great, as alſo the number of the ſides of the polygon, as to be greater than any given number, or to be infinite; and every ſide of the polygon ſo leſſened, as to become leſs than any given right line; and conſequently the polygon will be changed into a curve-lined figure; for any curve-lined figure may be conceived as a polygon, whoſe ſides are infinitely ſmall and infinite in number. A curve deſcribed after this manner, is called logarithmical.

It is manifeſt from this deſcription of the logarithmic curve, that all numbers at equal diſtances are continually proportional. It is alſo plain, that if there be four numbers, AB, CD, IK, LM, ſuch that the diſtance between the firſt and ſecond be equal to the diſtance between the third and the fourth, let the diſtance from the ſecond to the third be what it will, theſe numbers will be proportional. For becauſe the diſtances A C, I L, are equal, A B ſhall be to the increment D *s*, as I K is to the increment M T. Wherefore,

fore, by compoſition, AB : DC : : IK : ML. And, contrariwiſe, if four numbers be proportional, the diſtance between the firſt and ſecond ſhall be equal to the diſtance between the third and fourth.

The diſtance between any two numbers, is called the logarithm of the ratio of thoſe numbers; and, indeed, doth not meaſure the ratio itſelf, but the number ot terms in a given ſeries of geometrical proportionals, proceeding from one number to another, and defines the number of equal ratios by the compoſition whereof the ratio of numbers is known.

LOGARITHMS, are the indexes or exponents (moſtly whole numbers and decimal fractions, conſiſting of ſeven places of figures at leaſt) of the powers or roots (chiefly broken) of a given number; yet ſuch indexes or exponents, that the ſeveral powers or roots they expreſs, are the natural numbers, 1, 2, 3, 4, 5, &c. to 10 or 100000, &c. (as, if the given number be 10, and its index be aſſumed 1.0000000, then the 0.0000000 root of 10, which is 1, will be the logarithm of 1; the 0.301036 root of 10, which is 2, will be the logarithm of 2; the 0,477121 root of 10, which is 3, will be the logarithm of 3; the 1.612060 root of 10, the logarithm of 4; the 1.041393 power of 10 the logarithm of 11; the 1.079181 power of 10 the logarithm of 12, &c.) being chiefly contrived for eaſe and expedition in performing of arithmetical operations in large numbers, and in trigonometrical calculations; but they have likewiſe been found of extenſive ſervice in the higher geometry, particularly in the method of fluxions. They are generally founded on this conſideration, that if there be any row of geometrical proportional numbers, as 1, 2, 4, 8, 16, 32, 64, 128, 256, &c. or 1, 10, 100, 1000, 10000, &c. and as many arithmetical progreſſional numbers adapted to them, or ſet over them, beginning with 0,

$$\text{thus, }\left\{\begin{array}{lllllllll} 0, & 1, & 2, & 3, & 4, & 5, & 6, & 7, & \&c. \\ 1, & 2, & 4, & 8, & 16 & 32, & 64, & 128, & \&c. \end{array}\right\}$$

$$\text{or, }\left\{\begin{array}{llllll} 0, & 1, & 2, & 3, & 4, & \&c. \\ 1, & 10, & 100, & 1000, & 10000, & \&c. \end{array}\right\}$$

then will the ſum of any two of theſe arithmetical progreſſionals, added together, be that arithmetical progreſſional which anſwers to or ſtands over the geometrical progreſſional, which is the product of the two geometrical progreſſionals over which the two aſſumed arithmetical progreſſionals ſtand: again, if thoſe arithmetical progreſſionals be ſubtracted from each other, the remainder will be the arithmetical progreſſional ſtanding over that geometrical progreſſional which is the quotient of the diviſion of the two geometrical progreſſionals belonging to the two firſt aſſumed arithmetical progreſſionals; and the double, triple, &c. of any one of the arithmetical progreſſionals, will be the arithmetical progreſſional ſtanding over the ſquare, cube, &c. of that geometrical progreſſional which the aſſumed arithmetical progreſſional ſtands over, as well as the $\frac{1}{2}$, $\frac{1}{3}$, &c. of that arithmetical progreſſional will be the geometrical progreſſional anſwering to the ſquare root, cube root, &c. of the arithmetical progreſſional over it; and from hence ariſes the following common, though lame and imperfect definition of logarithms; *viz.* "That they are ſo many arithmetical progreſſionals, anſwering to the ſame number of geometrical ones." Whereas, if any one looks into the tables of logarithms, he will find, that theſe do not all run on in an arithmetical progreſſion, nor the numbers they anſwer to in a geometrical one; theſe laſt being themſelves arithmetical progreſſionals. Dr Wallis, in his hiſtory of algebra, calls logarithms the indexes of the ratios of numbers to one another. Dr Halley, in the philoſophical tranſactions, nº 216, ſays, they are the exponements of the ratios of unity to numbers. So alſo Mr Cotes, in his Harmonia Menſurarum, ſays, they are the numerical meaſures of ratios. But all theſe definitions convey but a very confuſed notion of logarithms. Mr Maclaurin, in his Treatiſe of Fluxions, has explained the natural and geneſis of logarithms agreeably to the notion of their firſt inventor lord Naper. Logarithms then, and the quantities to which they correſpond, may be ſuppoſed to be generated by the motion of a point; and if this point moves over equal ſpaces in equal times, the line deſcribed by it increaſes equally.

Again a line decreaſes proportionably, when the point that moves over it deſcribes ſuch parts in equal times as are always in the ſame conſtant ratio to the lines from which they are ſubducted, or to the diſtances of that point, at the beginning of thoſe lines, from a given term in that line. In like manner, a line may increaſe proportionably, if in equal times the moving point deſcribes ſpaces proportional to its diſtances from a certain term at the beginning of each time. Thus, in the firſt caſe, let *a c* (Plate CIV. fig. 3.) be to *a o*, *c d* to *c o*, *d e* to *d o*, *e f* to *e o*, *f g* to *f o*, always in the ſame ratio of Q R to Q S; and ſuppoſe the point P ſets out from *a*, deſcribing *a c*, *c d*, *d e*, *e f*, *f g*, in equal parts of the time; and let the ſpace deſcribed by P in any given time be always in the ſame ratio to the diſtance of P from *o* at the beginning of that time; then will the right line *a o* decreaſe proportionably.

In like manner, the line *o a*, (*ibid.* nº 3.) increaſes proportionally, if the point *p*, in equal times, deſcribes the ſpaces *a c*, *c d*, *de*, *f g*, &c. ſo that *a c* is to *a o*, *c d* to *c o*, *de* to *d o*, &c. in a conſtant ratio. If we now ſuppoſe a point P deſcribing the line A G (*ibid.* nº 4.) with an uniform motion, while the point *p* deſcribes a line increaſing or decreaſing proportionally, the line A P, deſcribed by P, with this uniform motion, in the ſame time that *o a*, by increaſing or decreaſing proportionally, becomes equal to *o p*, is the logarithm of *o p*. Thus A C, A D, A E, &c. are the logarithms of *o c*, *o d*, *o e*, &c. reſpectively; and *o a* is the quantity whoſe logarithm is ſuppoſed equal to nothing.

We have here abſtracted from numbers, that the doctrine may be the more general; but it is plain, that if A C, A D, A E, &c. be ſuppoſed, 1, 2, 3, &c. in arithmetic progreſſion; *o c*, *o d*, *o e*, &c. will be in geometric progreſſion, and that the logarithm of *o a*, which may be taken for unity, is nothing.

Lord Naper, in his firſt ſcheme of logarithms, ſuppoſes, that while *o p* increaſes or decreaſes proportionally, the uniform motion of the point P, by which the logarithm of *o p* is generated, is equal to the velocity of *p* at *a*; that is, at the term of time when the logarithms begin to be generated. Hence logarithms, formed after this model, are called Naper's Logarithms, and ſometimes Natural Logarithms.

When a ratio is given, the point *p* deſcribes the difference of the terms of the ratio in the ſame time. When a ratio is duplicate of another ratio, the point *p* deſcribes the difference of the terms in a double time. When a ratio is triplicate of another, it deſcribes the difference of the terms in a triple time; and ſo on. Alſo, when a ratio is compounded of two or more ratios, the point *p* deſcribes the difference of the terms of that ratio in a time equal to the ſum of the times in which it deſcribes the differences of the terms of the ſimple ratios of which it is compounded. And what is here ſaid of the times of the motion of *p* when *op* increaſes proportionally, is to be applied to the ſpaces deſcribed by P, in thoſe times, with its uniform motion.

Hence the chief properties of logarithms are deduced. They are the meaſures of ratios. The exceſs of the logarithm of the antecedent above the logarithm of the conſequent, meaſures the ratio of thoſe terms. The meaſure of the ratio of a greater quantity to a leſſer is poſitive; as this ratio, compounded with any other ratio, increaſes it. The ratio of equality, compounded with any other ratio, neither increaſes nor diminiſhes it; and its meaſure is nothing. The meaſure of the ratio of a leſſer quantity to a greater is negative; as this ratio, compounded with any other ratio, diminiſhes it. The ratio of any quantity A to unity, compounded with the ratio of unity to A, produces the ratio of A to A, or the ratio of equality; and the meaſures of thoſe two ratios deſtroy each other when added together; ſo that when the one is conſidered as poſitive, the other is to be conſidered as negative. By ſuppoſing the logarithms of quantities greater than *oa* (which is ſuppoſed to repreſent unity) to be poſitive, and the logarithms of quantities leſs than it to be negative, the ſame rules ſerve for the operations by logarithms, whether the quantities be greater or leſs than *oa*. When *op* increaſes proportionally, the motion of *p* is perpetually accelerated; for the ſpaces *ac*, *cd*, *de*, *&c.* that are deſcribed by it in any equal times that continually ſucceed after each other, perpetually increaſe in the ſame proportion as the lines *oa*, *oc*, *od*, *&c.* When the point *p* moves from *a* towards *o*, and *op* decreaſes proportionally, the motion of *p* is perpetually retarded; for the ſpaces deſcribed by it in any equal times that continually ſucceed after each other, decreaſe in this caſe in the ſame proportion as *op* decreaſes.

If the velocity of the point *p* be always as the diſtance *op*, then will this line increaſe or decreaſe in the manner ſuppoſed by lord Naper; and the velocity of the point *p* being the fluxion of the line *op*, will always vary in the ſame ratio as this quantity itſelf. This, we preſume, will give a clear idea of the geneſis, or nature of logarithms; but for more of this doctrine, ſee Maclaurin's Fluxions.

Conſtruction of LOGARITHMS.

The firſt makers of logarithms had in this a very laborious and difficult taſk to perform; they firſt made choice of their ſcale or ſyſtem of logarithms, that is, what ſet of arithmetical progreſſionals ſhould anſwer to ſuch a ſet of geometrical ones, for this is entirely arbitrary; and they chuſe the decuple geometrical progreſſionals, 1, 10, 100, 1000, 10000, *&c.* and the arithmetical one, 0, 1, 2, 3, 4. *&c.* or 0,000000; 1,000000; 2,000000; 3,000000; 4,000000, *&c.* as the moſt convenient. After this they were to get the logarithms of all the intermediate numbers between 1 and 10, 10 and 100, 100 and 1000, 1000 and 10000, *&c.* But firſt of all they were to get the logarithms of the prime numbers 3, 5, 7, 11, 13, 17, 19, 23, *&c.* and when theſe were once had, it was eaſy to get thoſe of the compound numbers made up of the prime ones, by the addition or ſubtraction of their logarithms.

In order to this, they found a mean proportion between 1 and 10, and its logarithm will be $\frac{1}{2}$ that of 10; and ſo given, then they found a mean proportional between the number firſt found and unity, which mean will be nearer to 1 than that before, and its logarithm will be $\frac{1}{2}$ of the former logarithm, or $\frac{1}{4}$ of that of 10; and having in this manner continually found a mean proportional between 1 and the laſt mean, and biſected the logarithms, they at length, after finding 54 ſuch means, came to a number 1 0000000000000001278191493200323442, ſo near to 1 as not to differ from it ſo much as $\frac{1}{100000000000000000}$dth part, and found its logarithm to be 0.00000000000000005551115123125782702, and 00000000000000012781914932003235 to be the difference whereby 1 exceeds the number of roots or mean proportionals found by extraction; and then, by means of theſe numbers, they found the logarithms of any other numbers whatſoever; and that after the following manner: between a given number, whoſe logarithm is wanted, and 1, they found a mean proportional, as above, until at length a number (mixed) be found, ſuch a ſmall matter above 1, as to have 1 and 15 cyphers after it, which are followed by the ſame number of ſignificant figures; then they ſaid, as the laſt number mentioned above is to the mean proportional thus found, ſo is the logarithm above, *viz.* 0.00000000000000005551115123125782702, to the logarithm of the mean proportional number, ſuch a ſmall matter exceeding 1 as but now mentioned; and this logarithm being as often doubled as the number of mean proportionals (formed to get that number) will be the logarithm of the given number. And this was the method Mr. Briggs took to make the logarithms. But if they are to be made to only ſeven places of figures, which are enough for common uſe, they had only occaſion to find 25 mean proportionals, or, which is the ſame thing, to extract the $\frac{1}{33554432}$th root of 10. Now having the logarithms of 3, 5, and 7, they eaſily got thoſe of 2, 4, 6, 8 and 9; for ſince $\frac{10}{5}=2$, the logarithm of 2 will be the difference of the logarithms of 10 and 5, the logarithm of 4 will be two times the logarithm of 2, the logarithm of 6 will be the ſum of the logarithm of 2 and 3, and the logarithm of 9 double the logarithm of 3. So, alſo having found the logarithms of 13, 17 and 19, and alſo of 23 and 29, they did eaſily get thoſe of all the numbers between 10 and 30, by addition and ſubtraction only; and ſo having found the logarithms of other prime numbers, they got thoſe of other numbers compounded of them.

But ſince the way above hinted at, for finding the logarithms of the prime numbers is ſo intolerably laborious and troubleſome, the more ſkilful mathematicians that came after the firſt inventors, employing their thoughts about abbreviating this method, had a vaſtly more eaſy and ſhort way offered to them from the contemplation and menſuration of hyperbolic ſpaces contained between the portions of an aſymptote, right lines perpendicular to it, and the curve of the hyperbola: for if ECN (Plate CIII. fig. 6. n° 1.) be an hyperbola, and AD, AQ the aſymptotes, and AB, AP, AQ, *&c.* taken upon one of them, be repreſented by numbers, and the ordinates BC, PM, QN, *&c.* be drawn from the ſeveral points B, P, Q, *&c.* to the curve, then will the quadrilinear ſpaces BCMP, PMNQ, *&c.* *viz.* their numerical meaſures be the logarithms of the quotients of the diviſion of AB by AP, AP by AQ, *&c.* ſince when AB, AP, AQ, *&c.* are continual proportionals, the ſaid ſpaces are equal, as is demonſtrated by ſeveral writers concerning conic ſections. Se HYPERBOLA.

Having ſaid that theſe hyperbolic ſpaces, numerically expreſſed, may be taken for logarithms, we ſhall next give a ſpecimen, from the great Sir Iſaac Newton, of the method how to meaſure theſe ſpaces, and conſequently of the conſtruction of logarithms.

Let CA (*ibid.* n° 2.) =AF be $=1$, and AB=A*b*$=x$; then will $\frac{1}{1+x}$ be =BD, and $\frac{1}{1-x}=bd$; and putting theſe expreſſions into ſerieſes, it will be $\frac{1}{1+x}=1-x+x^2-x^3+x^4-x^5$, *&c.* and $\frac{1}{1-x}=1+x+x^2+x^3+x^4+x^5$, *&c.* and $\frac{\dot{x}}{1+x}=\dot{x}-x\dot{x}+x^2\dot{x}-x^3\dot{x}+x^4\dot{x}-x^5\dot{x}$, *&c.* and $\frac{\dot{x}}{1-x}=\dot{x}+x\dot{x}+x^2\dot{x}+x^3\dot{x}+x^4\dot{x}+x^5\dot{x}$, *&c.* and taking the fluents, we ſhall have the area AFDB $=x-\frac{xx}{2}+\frac{x^3}{3}-\frac{x^4}{4}+\frac{x^5}{5}$, *&c.* and the area AF*db*, $=x+\frac{xx}{2}+\frac{x^3}{3}+\frac{x^4}{4}+\frac{x^5}{5}$, *&c.* and the ſum *bd*DB$=2x+\frac{2x^3}{3}+\frac{2}{5}x^5+\frac{2}{7}x^7+\frac{2}{9}x^9$, *&c.* Now if AB or *ab* be $\frac{1}{10}=x$, C*b* being=0.9, and CB=1.1, by putting this value of x in the equations above, we ſhall have the area *bd* DB=0.2006706954621511 for the terms of the ſeries will ſtand as you ſee in this table,

0.2000000000000000 = firſt
6666666666666 = ſecond
40000000000 = third
285714286 = fourth
2222222 = fifth
18182 = ſixth
154 = ſeventh
1 = eighth

Term of the ſeries.

0.2006706954621511

If the parts A*d* and AD of this area be added ſeparately, and the leſſer DA be taken from the greater *d*A, we ſhall have A*d*—AD$=x^2+\frac{x^4}{2}+\frac{x^6}{3}+\frac{x^8}{4}$, *&c.* =0.0100503358535014, for the terms reduced to decimals will ſtand thus:

0.0100000000000000 = firſt
500000000000 = ſecond
3333333333 = third
25000000 = fourth
200000 = fifth
1667 = ſixth
14 = ſeventh

Term of the ſeries.

0.0100503358535014.

Now if this difference of the areas be added to, and ſubtracted from their ſum before found, half the agregate, *viz.* 0.1053605156578263 will be the greater area A*d*, and half the remainder, *viz.* 0.0953101798043249, will be the leſſer area AD.

By the ſame tables, theſe areas AD and A*d*, will be obtained alſo when AB=A*b* are ſuppoſed to be $\frac{1}{100}$ or CB=1.01, and C*b*=0.99, if the numbers are but duly transferred to lower places, as

0.0200000000000000 = firſt
6666666666 = ſecond
400000 = third
28 = fourth

Term of the ſeries.

Sum=0.0200006667066694 = area *b*D.

0.0001000000000000 = firſt
50000000 = ſecond
3333 = third

Term of the ſeries.

0.0001000050003333 = area A*d*—AD.

Half the agregate 0.0100503358535014=A*d*, and half the remainder, *viz.* 0.0099503308531681=AD.

And ſo putting AB=A*b*$=\frac{1}{1000}$, or CB=1.001 and C*b*=0.999, there will be obtained A*d*=0.0010005000333583 5, and AD=0.0009995001333083 5.

After the ſame manner, if AB=A*b*, be =0.2, or 0.02, or 0.002, theſe areas will ariſe.

A*d*=0.2231435513142097, and
AD=0.1823215576939546, or
A*d*=0.0202027073175194, and
AD=0.1098026272961797, or
A*d*=0.002002, and AD=0.001.

From theſe areas thus found, others may be eaſily had from addition and ſubtraction only. For ſince $\frac{1.2}{0.8}\times\frac{1.2}{0.9}=2$, the ſum of the areas belonging to the ratios $\frac{1.2}{0.8}$ and $\frac{1.2}{0.9}$ (that is, inſiſting upon the parts of the abſciſs 1.2, 0.8; and 1.2, 0.9) *viz.*

0.405465, *&c.* and AD=0.18232, *&c.*
A*d*=0.10536, *&c.*

Sum=0.28768, *&c.*

added thus, 0.40546, *&c.*
0.28768, *&c.*

Total=0.69314, *&c.* = the area of AFHG, when CG is $=2$. Alſo, ſince $\frac{1.2}{0.8}\times 2=3$, the ſum 1.0986122, *&c.* of the areas belonging to $\frac{1.2}{0.8}$, and 2, will be the area of AFGH, when CG$=3$. Again, ſince $\frac{2\times 2}{0.8}=5$, and $2\times 5=10$; by adding Ad=0.2231, *&c.* AD=0.1823, *&c.* and Ad=0.1053, *&c.* together, their ſum is 0.5108, *&c.* and this added to 1.0986, *&c.* the area of AFGH, when CG$=3$. You will have 1.6093379124341004=AFGH, when CG is 5; and adding that of 2 to this, gives 2.3025850929940457 =AFGH, when CG is equal to 10: and ſince $10\times 10=100$; and $10\times 100=1000$; and $\sqrt{5\times 10\times 0.98}=7$, and $10\times 1.1=11$, and $\frac{1000\times 1.091}{7\times 11}=13$, and $\frac{1000\times 0.998}{2}=499$; it is plain that the area AFGH may be found by the compoſition of the areas found before, when CG=100, 1000, or any other of the numbers above mentioned; and all theſe areas are the hyperbolic logarithms of thoſe ſeveral numbers.

Having thus obtained the hyperbolic logarithms of the numbers 10, 0.98, 0.99, 1.01, 1.02; if the logarithms of the four laſt of them be divided by the hyperbolic logarithm 2.3025850, *&c.* of 10, and the index 2, be added; or, which is the ſame thing, if it be multiplied by its reciprocal 0.4342944819032518, the value of the ſubtangent of the logarithmic curve, to which Briggs's logarithms are adapted, we ſhall have the true tabular logarithms of 98, 99, 100, 101, 102. Theſe are to be interpolated by ten intervals, and then we ſhall have the logarithms of all the numbers between 980 and 1020; and all between 980 and 1000, being again interpolated by ten intervals, the table will be as it were conſtructed. Then from theſe we are to get the logarithms of all the prime numbers, and their multiples leſs than 100, which may be done by addition and ſubtraction only: for $\frac{\sqrt[10]{84\times 1020}}{9945}=2$; $\frac{\sqrt[4]{8\times 9963}}{984}=3$; $\frac{10}{2}=5$; $\frac{\sqrt{98}}{2}=7$; $\frac{99}{9}=11$; $\frac{1001}{7\times 11}=13$; $\frac{102}{6}=17$; $\frac{988}{4\times 13}=19$; $\frac{9936}{16\times 27}=23$; $\frac{986}{2\times 17}=29$; $\frac{992}{32}=31$; $\frac{999}{27}=37$; $\frac{984}{24}=41$; $\frac{989}{23}=43$; $\frac{987}{21}=47$; $\frac{9911}{11\times 17}=53$; $\frac{9971}{13\times 13}=59$; $\frac{9882}{2\times 81}=61$; $\frac{9949}{3\times 49}=67$; $\frac{994}{14}=71$; $\frac{9928}{8\times 17}=73$; $\frac{9954}{7\times 18}=79$; $\frac{996}{12}=83$; $\frac{9968}{7\times 16}=89$; $\frac{9894}{6\times 17}=97$; and thus having the logarithms of all the numbers leſs than 100, you have nothing to do but interpolate the ſeveral times, through ten intervals.

Now the void places may be filled up by the following theorem. Let n be a number, whoſe logarithm is wanted; let x be the difference between that and the two neareſt numbers, equally diſtant on each ſide, whoſe logarithms are already found; and let d be half the difference of their logarithms: then the required logarithm of the number n, will be had by adding $d+\frac{dx}{2n}+\frac{dx^3}{12n^3}$, *&c.* to the logarithm of the leſſer number; for if the numbers are repreſented by Cp, CG, CP, (*ibid.* n° 2.) and the ordinates ps, PQ, be raiſed; if n be wrote for CG, and x for GP, or Gp, the area psQP, or $\frac{2x}{n}+\frac{x^2}{2n^2}+\frac{x^3}{3n^3}$, *&c.* will be to the area psHG, as the difference between the logarithms of the extreme numbers, or $2d$, is to the difference between the logarithms of the leſſer, and of the middle one; which, therefore, will be

$$\frac{\frac{dx}{n}+\frac{dx^2}{2n}+\frac{dx^3}{3n}, \&c.}{\frac{x}{n}+\frac{x^3}{3n}+\frac{x^5}{5n}, \&c.}=d+\frac{dx}{2n}+\frac{dx^3}{12n^3}, \&c.$$

The two firſt terms $d+\frac{dx}{2n}$ of this ſeries, being ſufficient for the conſtruction of a canon of logarithms, even to 14 places of figures, provided the number, whoſe logarithm is to be found, be leſs than 1000; which cannot be very troubleſome, becauſe x is either 1 or 2: yet it is not neceſſary to interpolate all the places by help of this rule, ſince the logarithms of numbers, which are produced by the multiplication or diviſion of the number laſt found, may be obtained by the numbers whoſe logarithms were had before, by the addition or ſubtraction of their logarithms. Moreover, by the difference of their logarithms, and by their ſecond and third differences, if neceſſary, the void places may be ſupplied more expeditiouſly; the rule afore-going being to be applied only where the continuation of ſome full places is wanted, in order to obtain theſe differences.

By the ſame method rules may be found for the intercalation of logarithms, when of three numbers the logarithm of the leſſer and of the middle number are given, or of the middle number and the greater; and this although the numbers ſhould not be in arithmetical progreſſion. Alſo by purſuing the ſteps of this method, rules may be eaſily diſcovered for the conſtruction of artificial ſines and tangents, without the help of the natural tables. Thus far the great Newton, who ſays, in one of his letters to Mr Leibnitz, that he was ſo much delighted with the conſtruction of logarithms, at his firſt ſetting out in thoſe ſtudies, that he was aſhamed to tell to how many places of figures he had carried them at that time: and this was before the year 1666; becauſe, he ſays, the plague made him lay aſide thoſe ſtudies, and think of other things.

Dr. Keil, in his Treatiſe of Logarithms, at the end of his Commandine's Euclid, gives a ſeries, by means of which may be found eaſily and expeditiouſly the logarithms of large numbers. Thus, let z be an odd number, whoſe logarithm is ſought: then ſhall the numbers $z-1$ and $z+1$ be even, and accordingly their logarithms, and the difference of the logarithms will be had, which let be called y. Therefore, alſo the logarithm of a number, which is a geometrical mean between $z-1$ and $z+1$, will be given, *viz.* equal to half the ſum of the logarithms.

Now the ſeries $y\times\frac{1}{4z}+\frac{1}{24z^3}+\frac{181}{15120z^7}+\frac{25200z^9}{13}$, *&c.* ſhall be equal to the logarithm of the ratio, which the geometrical mean between the numbers $z-1$ and $z+1$, has to the arithmetical mean, *viz.* to the number z. If the number exceeds 1000, the firſt term of the ſeries, *viz.* $\frac{y}{4z}$, is ſufficient for producing the logarithm to 13 or 14 places of figures, and the ſecond term will give the logarithm to 20 places of figures. But if z be greater than 10000, the firſt term will exhibit the logarithm to 18 places of figures; end ſo this ſeries is of great uſe in filling up the chiliads omitted by Mr Briggs. For example, it is required to find the logarithm of 20001; the logarithm of 20000 is the ſame as the logarithm of 2, with the index 4 prefixed to it; and the difference of the logarithms of 20000 and 20001, is the ſame as the difference of the logarithms of the numbers 10000 and 10001, *viz.* 0.0000434272, *&c.* And if this difference be divided by $4z$, or 80004, the quotient $\frac{y}{4z}$ ſhall be 0.000000000542813; and if the logarithm of the geometrical mean, *viz.* 4.301051709302416 be added to the quotient, the ſum will be

4.301051709845230= the logarithm of 20001.

Wherefore it is manifeſt that to have the logarithm to 14 places of figures, there is no neceſſity of continuing out the quotient beyond 6 places of figures. But if you have a mind to have the logarithm to 10 places of figures only, the two firſt figures are enough. And if the logarithms of the numbers above 20000 are to be found by this way, the labour of doing them will moſtly conſiſt in ſetting down the numbers. This ſeries is eaſily deduced from the conſideration of the hyperbolic ſpaces aforeſaid. The firſt figure of every logarithm towards the left hand, which is ſeparated from the reſt by a point, is called the index of that logarithm; becauſe it points out the higheſt or remoteſt place of that number from the place of unity in the infinite ſcale of proportionals towards the left hand: thus, if the index of the logarithm be 1, it ſhews that its higheſt place towards the left hand is the tenth place from unity; and therefore all logarithms which have 1 for their index, will be found between the tenth and hundredth place, in the order of numbers. And for the ſame reaſon all logarithms which have 2 for their index, will be found between the hundredth and thouſandth place, in the order of numbers, *&c.* Whence univerſally the index or characteriſtic of any logarithm is always leſs by one than the number of figures in whole numbers, which anſwer to the given logarithm; and, in decimals, the index is negative.

As all ſyſtems of logarithms whatever, are compoſed of ſimilar quantities, it will be eaſy to form, from any ſyſtem of logarithms, another ſyſtem in any given ratio; and conſequently to reduce one table of logarithms into another of any given form. For as any one logarithm in the given form, is to its correſpondent logarithm in another form; ſo is any other logarithm in the given form, to its correſpondent logarithm in the required form; and hence we may reduce the logarithms of lord Napier into the form of Briggs's, and contrariwiſe. For as 2.302585092, *&c.* lord Napier's logarithm of 10, is to 1.0000000000, Mr Briggs's logarithm of 10; ſo is any other logarithm in lord Napier's form, to the correſpondent tabular logarithm in Mr Briggs's form; and becauſe the two firſt numbers conſtantly remain the ſame; if lord Napier's logarithm of any one number be divided by 2.302585, *&c.* or multiplied by 4342944, *&c.* the ratio of 1.0000, *&c.* to 2.30258, *&c.* as is found by dividing 1.00000, *&c.* by 2.30258, *&c.* the quotient in the former, and the product in the latter, will give the correſpondent logarithm in Briggs's form, and the contrary. And, after the ſame manner, the ratio of natural logarithms to that of Briggs's, will be found=868588963806.

The uſe and application of LOGARITHMS.

It is evident, from what has been ſaid of the conſtruction of logarithms, that addition of logarithms muſt be the ſame thing as multiplication in common arithmetick; and ſubſtraction in logarithms the ſame as diviſion: therefore, in multiplication by logarithms, add the logarithms of the multiplicand and multiplier together, their ſum is the logarithm of the product.

		num.	logarithms.
Example.	Multiplicand	8.5	0.1294189
	Multiplier	10	1.0000000
	Product	85	1.9294189

And in diviſion, ſubtract the logarithm of the diviſor from the logarithm of the dividend, the remainder is the logarithm of the quotient.

		num.	logarithms.
Example.	Dividend	9712 8	3.9873444
	Diviſor	456	2.6589648
	Quotient	21.3	1.3283796

To find the complement of a LOGARITHM.

Begin at the left hand, and write down what each figure wants of 9, only what the laſt ſignificant figure wants of 10; ſo the complement of the logarithm of 456, *viz.* 2.6589648, is 7.3410352.

In the rule of three. Add the logarithms of the ſecond and third terms together, and from the ſum ſubtract the logarithm of the firſt, the remainder is the logarithm of the fourth. Or, inſtead of ſubtracting a logarithm, add its complement, and the reſult will be the ſame.

To raiſe powers by LOGARITHMS.

Multiply the logarithm of the number given, by the index of the power required, the product will be the logarithm of the power ſought.

Example. Let the cube of 32 be required by logarithms. The logarithm of 32=1.5051500. which multiplied by 3, is 4.5154500, the logarithm of 32768, the cube of 32. But in raiſing powers, *viz.* ſquaring, cubing, *&c.* of any decimal fraction by logarithms, it muſt be obſerved, that the firſt ſignificant figure of the power be put ſo many places below the place of units, as the index of its logarithm wants of 10, 100, *&c.* multiplied by the index of the power.

To extract the roots of powers by LOGARITHMS.

Divide the logarithm of the number by the index of the power, the quotient is the logarithm of the root ſought.

To find mean proportionals between any two numbers.

Subtract the logarithm of the leaſt term from the logarithm of the greateſt, and divide the remainder by a number more by one than the number of means deſired; then add the quotient to the logarithm of the leaſt term (or ſubtract it from the logarithm of the greateſt) continually, and it will give the logarithms of all the mean proportionals required.

Example. Let three mean proportionals be ſought, between 106 and 100.

Logarithm of 106= 2.0253058
Logarithm of 100= 2.0000000

Divide by 4)0.0253059(0.0063264.75

Logarithm of the leaſt term 100 added		2.0000000
Logarithm of the firſt mean	101.4673846	2.0063264.75
Logarithm of the ſecond mean	102.9563014	2.0126529.5
Logarithm of the third mean	104 4670483	2.0189794.25
Logarithm of the greateſt term	106	2.0253059.

L O G I C.

LOGIC, the art of thinking and reaſoning juſtly; or, it may be defined the ſcience or hiſtory of the human mind, inaſmuch as it traces the progreſs of our knowledge from our firſt and moſt ſimple through all their different combinations, conceptions, and all thoſe numerous deductions that reſult from variouſly comparing them one with another.

The preciſe buſineſs of logic, therefore, is to explain the nature of the human mind, and the proper manner of conducting its ſeveral powers, in order to the attainment of truth and knowledge. It lays open thoſe errors and miſtakes we are apt, through inattention, to run into; and teaches us how to diſtinguiſh between truth, and what only carries the appearance of it. By this means we grow acquainted with the nature and force of the underſtanding; ſee what things lie within its reach; where we may attain certainty and demonſtration; and when we muſt be contented with probability.

This ſcience is generally divided into four parts, *viz. Perception*, *Judgment*, *Reaſoning*, and *Method*. This diviſion comprehends the whole hiſtory of the ſenſations and operations of the human mind. But we muſt refer the reader for the firſt part, *viz. Perception*, and *Ideas*, to METAPHYSICS, where it will be more conveniently and fully treated, and confine ourſelves in this place to the three laſt, *viz. Judgment*, *Reaſoning*, *and Method.*

PART I. *Of* JUDGMENT.

THE mind being furniſhed with ideas, its next ſtep in the way to knowledge is, the comparing theſe ideas together, in order to judge of their agreement or diſagreement. In this joint view of our ideas, if the relation is ſuch, as to be immediately diſcoverable by the bare inſpection of the mind; the judgments thence obtained are called *intuitive*; for in this caſe, a mere attention to the ideas compared, ſuffices to let us ſee, how far they are connected or disjoined. Thus, *that the whole is greater than any of its parts*, is an intuitive judgment, nothing more being required to convince us of its truth, than an attention to the ideas of *whole* and *part*, And this too is the reaſon, why we call the act of the mind forming theſe judgments, *intuition*; as it is indeed no more, than an immediate perception of the agreement or diſagreement of any two ideas.

But it is to be obſerved, that our knowledge of this kind reſpects only our ideas, and the relations between them; and therefore can ſerve only as a foundation to ſuch reaſonings as are employed in inveſtigating theſe relations. Now many of our judgments are converſant about facts, and the real exiſtence of things, which cannot be traced by the bare contemplation of our ideas. It does not follow, becauſe I have the idea of a circle in my mind, that therefore a figure anſwering to that idea, has a real exiſtence in nature. I can form to myſelf the notion of a centaur, or golden mountain, but never imagine on that account, that either of them exiſt. What then are the grounds of our judgment in relation to facts? *Experience* and *teſtimony*. By *experience* we are informed of the exiſtence of the ſeveral objects which ſurround us, and operate upon our ſenſes. *Teſtimony* is of a wider extent, and reaches not only to objects beyond the preſent ſphere of our obſervation, but alſo to facts and tranſactions, which being now paſt, and having no longer any exiſtence, could not without this conveyance, have fallen under our cognizance.

Here then we have three foundations of human judgment, from which the whole ſyſtem of our knowledge may with eaſe and advantage be derived. Firſt, *intuition*, which reſpects our ideas themſelves, and their relations, and is the foundation of that ſpecies of reaſoning, which we call *demonſtration*. For whatever is deduced from our intuitive perceptions, by a clear and connective ſeries of proofs, is ſaid to be demonſtrated, and produces abſolute certainty in the mind. Hence the knowledge obtained in this manner, is what we properly term *ſcience*; becauſe in every ſtep of the procedure, it carries its own evidence along with it, and leaves no room for doubt or heſitation. And, what is highly worthy of notice, as the truths of this claſs expreſs the relations between our ideas, and the ſame relations muſt ever and invariably ſubſiſt between the ſame ideas, our deductions in the way of ſcience, conſtitute what we call eternal, neceſſary, and immutable truths. If it be true that the whole is equal to all its parts, it muſt be ſo unchangeably; becauſe the relation of equality being attached to the ideas themſelves, muſt ever intervene where the ſame ideas are compared. Of this nature are all the truths of natural religion, morality, and mathematicks, and in general, whatever may be gathered from the bare view and conſideration of our ideas.

The ſecond ground of human judgment is *experience*; from which we infer the exiſtence of thoſe objects that ſurround us, and fall under the immediate notice of our ſenſes. When we ſee the ſun, or caſt our eyes towards a building, we not only have ideas of theſe objects within ourſelves, but aſcribe to them a real exiſtence out of the mind. It is alſo by the information of the ſenſes, that we judge of the qualities of bodies; as when we ſay that ſnow is white, fire hot, or ſteel hard. For as we are wholy unacquainted with the internal ſtructure and conſtitution of the bodies that produce theſe ſenſations in us, and are unable to trace any connection between that ſtructure and the ſenſations themſelves, it is evident, that we build our judgments altogether upon obſervation, aſcribing to bodies ſuch qualities, as are anſwerable to the perceptions they excite in us. But this is not the only advantage derived from experience; for we are likewiſe indebted to it for all our knowledge regarding the coexiſtence of ſenſible qualities in objects, and the operations of bodies one upon another. Ivory, for inſtance, is hard and elaſtic; this we know by experience, and indeed by that alone. For being altogether ſtrangers to the true nature both of elaſticity and hardneſs, we cannot by the bare contemplation of our ideas determine, how far the one neceſſarily implies the other, or whether there may not be a repugnance between them. But when we obſerve them to exiſt both in the ſame object, we are then aſſured from experience, that they are not incompatible; and when we alſo find that a ſtone is hard and not elaſtic, and that air though elaſtic is not hard, we alſo conclude upon the ſame foundation, that the ideas are not neceſſarily conjoined; but may exiſt ſeparately in different objects. In like manner with regard to the operations of bodies one upon another, it is evident, that our knowledge this way, is all derived from obſervation. *Aqua regia* diſſolves gold, as has been found by frequent trial, nor is there any other way of arriving at the diſcovery. Naturaliſts may tell us if they pleaſe, that the parts of *aqua regia* are of a texture apt to inſinuate between the corpuſcles of gold, and thereby looſen and ſhake them aſunder. If this is a true account of the matter, we believe it will notwithſtanding be allowed, that our conjecture in regard to the conformation of theſe bodies is deduced from the experiment, and not the experiment from the conjecture. It was not from any previous knowledge of the intimate ſtructure of *aqua regia* and *gold*, and the aptneſs of their parts to act or be acted upon, that we came by the concluſion above mentioned. The internal conſtitution of bodies is in a manner wholly unknown to us, and could we even ſurmount this difficulty, yet as the ſeparation of the parts of gold, implies ſomething like an active force in the *menſtruum*, and we are unable to conceive how it comes to be poſſeſſed of this activity; the effect muſt be owned to be altogether beyond our comprehenſion. But when repeated trials had once confirmed it, inſomuch that it was admitted as an eſtabliſhed truth in natural knowledge, it was then eaſy for men, to ſpin out theories of their own invention, and contrive ſuch a ſtructure of parts, both for *gold* and *aqua regia*, as would beſt ſerve to explain the phænomenon, upon the principles of that ſyſtem of philoſophy they had adopted.

From what has been ſaid it is evident, that as intuition is the foundation of what we call *ſcientifical* knowledge, ſo is experience of *natural*. For this laſt, being wholly taken up with objects of ſenſe, or thoſe bodies that conſtitute the natural world; and their properties, as far as we can diſcover them, being to be traced only by a long and painful ſeries of obſervations, it is apparent, that in order to improve this branch of knowledge, we muſt betake ourſelves to the method of trial and experiment.

But though experience is what we may term the immediate foundation of natural knowledge, yet with reſpect to particular perſons, its influence is very narrow and confined. The bodies that ſurround us are numerous, many of them lie at a great diſtance, and ſome quite beyond our reach. Life too is ſhort, and ſo crouded with cares, that but little time is left for any ſingle man to employ himſelf in unfolding the myſteries of nature. Hence it is neceſſary to admit many things upon the teſtimony of others, which by this means becomes the foundation of a great part of our knowledge of body. No man doubts of the power of *aqua regia* to diſſolve gold, though perhaps he never himſelf made the experiment. In theſe therefore and ſuch like caſes, we judge of the facts and operations of nature, upon the mere ground of teſtimony. However, as we can always have recourſe to experience, where any doubt or ſcruple ariſes, this is juſtly conſidered as the true foundation of natural philoſophy; being indeed the ultimate ſupport upon which our aſſent reſts, and whereto we appeal, when the higheſt degree of evidence is required.

But there are many facts that will not allow of an appeal to the ſenſes, and in this caſe teſtimony is the true and only foundation of our judgments. All human actions of whatever kind, when conſidered as already paſt, are of the nature here deſcribed; becauſe having now no longer any exiſtence, both the facts themſelves, and the circumſtances attending them, can be known only from the relations of ſuch as had ſufficient opportunities of arriving at the truth. *Teſtimony* therefore is juſtly accounted a third ground of human judgment; and as from the other two we have deduced *ſcientifical* and *natural* knowledge, ſo may we from this derive *hiſtorical;* by which we mean, not merely a knowledge of the civil tranſactions of ſtates and kingdoms, but of all facts whatſoever, where teſtimony is the ultimate foundation of our belief.

Of affirmative and negative propoſitions.

WHILE the comparing of our ideas, is conſidered merely as an act of the mind, aſſembling them together, and joining or disjoining them according to the reſult of its preceptions, we call it *judgment*; but when our judgments are put into words, they then bear the name of *propoſitions*. A propoſition therefore is a ſentence expreſſing ſome judgment of the mind, whereby two or more ideas are affirmed to agree or diſagree. Now as our judgments include at leaſt two ideas, one of which is affirmed or denied of the other, ſo muſt a propoſition have terms anſwering to theſe ideas. The idea of which we affirm or deny, and of courſe the term expreſſing that idea, is called the *ſubject* of the propoſition. The idea affirmed or denied, as alſo the term anſwering it is called the *predicate*. Thus in the propoſition, *God is omnipotent: God* is the ſubject, it being of him that we affirm omnipotence; and *omnipotent* is the predicate, becauſe we affirm the idea expreſſed by that word to belong to God.

But as in propoſitions, ideas are either joined or disjoined; it is not enough to have terms expreſſing thoſe ideas, unleſs we have alſo ſome words to denote their agreement or diſagreement. That word in a propoſition which connects two ideas together, is called the *copula*; and if a negative particle be annexed, we thereby underſtand that the ideas are disjoined. The *ſubſtantive verb*, is commonly made uſe of for the copula, as in the abovementioned propoſition, *God is omnipotent;* where *is* repreſents the copula, and ſignifies the agreement of the ideas of *God* and *omnipotence*. But if we mean to ſeparate two ideas: then, beſides the ſubſtantive verb, we muſt alſo uſe ſome particle of negation, to expreſs this repugnance. The propoſition, *Man is not perfect;* may ſerve as an example of this kind, where the notion of *perfection*, being removed from the idea of *man*, the negative particle *not* is inſerted after the copula, to ſignify the diſagreement between the ſubject and predicate.

Every propoſition neceſſarily conſiſts of theſe three parts, but then it is not alike needful that they be all ſeverally expreſſed in words; becauſe the copula is often included in the term of the predicate, as when we ſay, *He ſits;* which imports the ſame as *he is ſitting*. In the *Latin* language, a ſingle word has often the force of a whole ſentence. Thus, *ambulat* is the ſame as *ille eſt ambulans*; *amo*, as *ego ſum amans*, and ſo in innumerable other inſtances; by which it appears, that we are not ſo much to regard the number of words in a ſentence, as the ideas they repreſent, and the manner in which they are put together. For where ever two ideas are joined or disjoined in an expreſſion, though of but a ſingle word, it is evident that we have a ſubject, predicate, and copula, and of conſequence a complete propoſition.

When the mind joins two ideas, we call it an *affirmative* judgment; when it ſeparates them, a *negative*; and as any two ideas compared together, muſt neceſſarily either agree or not agree, it is evident, that all our judgments fall under theſe two diviſions. Hence likewiſe, the propoſitions expreſſing theſe judgments, are all either affirmative or negative.

Hence we ſee the reaſon of the rule commonly laid down by logicians; that in all negative propoſitions, the negation ought to affect the copula. For as the copula, when placed by itſelf, between the ſubject and the predicate, manifeſtly binds them together; it is evident, that in order to render a propoſition negative, the particle of negation muſt enter it in ſuch manner, as to deſtroy this union. In a word, then only are two ideas disjoined in a propoſition, when the negative particle may be ſo referred to the copula, as to break the affirmation included in it, and undo that connection it would otherwiſe eſtabliſh. When we ſay, for inſtance, *No man is perfect;* take away the negation, and the copula of itſelf plainly unites the ideas in the propoſition. On the contrary, in this ſentence; *The man who departs not from an upright behaviour, is beloved of God*; the predicate *beloved of God*, is evidently affirmed of the ſubject *an upright man*; ſo that notwithſtanding the negative particle, the propoſition is ſtill affirmative. The reaſon is plain; the negation here affects not the copula, but making properly a part of the ſubject, ſerves with other terms in the ſentence, to form one complex idea, of which the predicate *beloved of God*, is directly affirmed.

Of univerſal and particular propoſitions.

THE next conſiderable diviſion of propoſition, is into *univerſal and particular*. Our ideas, are all ſingular as they enter the mind, and repreſent individual objects. But as by abſtraction we can render them univerſal, ſo as to comprehend a whole claſs of things, and ſometimes ſeveral claſſes at once; hence the terms expreſſing theſe ideas, muſt be in like manner univerſal. (See METAPHYSICS.) If therefore we ſuppoſe any general term to become the ſubject of a propoſition, it is evident, that whatever is affirmed of the abſtract idea belonging to that term, may be affirmed of all the individuals to which that idea extends. Thus when we ſay, *Men are mortal;* we conſider mortality, not as confined to one or any number of particular men, but as what may be affirmed without reſtriction of the whole ſpecies. By this means the propoſition becomes as general as the idea which makes the ſubject of it, and indeed derives its univerſality entirely from that idea, being more or leſs ſo, according as this may be extended to more or fewer individuals. But theſe general terms ſometimes enter a propoſition in their full latitude, as in the example given above; and ſometimes appear with a mark of limitation. In this laſt caſe we are given to underſtand, that the predicate agrees not to the whole univerſal idea, but only to a part of it; as in the propoſition, *ſome men are wiſe*: for here wiſdom is not affirmed of every particular man, but reſtrained to a few of the human ſpecies.

Now from this different appearance of the general idea, that conſtitutes the ſubject of any judgment, ariſes the diviſion of propoſitions into *univerſal* and *particular*. An *univerſal* propoſition is that wherein the ſubject is ſome general term, taken in its full latitude, inſomuch that the predicate agrees to all the individuals comprehended under it, if it denotes a proper ſpecies; and to all the ſeveral ſpecies, and their individuals, if it marks an idea of a higher order. The words *all*, *every*, *no*, *none*, &c. are the proper ſigns of this univerſality; and as they ſeldom fail to accompany general truths, ſo they are the moſt obvious criterion whereby to diſtinguiſh them. *All animals have a power of beginning motion.* This is an univerſal propoſition; as we know from the word *all*, prefixed to the ſubject *animal*, which denotes that it muſt be taken in its full extent. Hence the power of beginning motion, may be affirmed of all the ſeveral ſpecies of animals.

A *particular* propoſition has in like manner ſome general term for its ſubject, but with a mark of limitation added, to denote, that the predicate agrees only to ſome of the individuals comprehended under a ſpecies, or to one or more of the ſpecies belonging to any genus, and not to the whole univerſal idea. Thus, *ſome ſtones are heavier than iron; ſome men have an uncommon ſhare of prudence.* In the laſt of theſe propoſitions, the ſubject *ſome men*, implies only a certain number of individuals, comprehended under a ſingle ſpecies. In the former, where the ſubject is a genus, that extends to a great variety of diſtinct claſſes, *ſome ſtones* may not only imply any number of particular ſtones, but alſo ſeveral whole ſpecies of ſtones; inaſmuch as there may be not a few, with the property there deſcribed. Hence we ſee, that a propoſition does not ceaſe to be particular, by the predicate's agreeing to a whole ſpecies, unleſs that ſpecies ſingly and diſtinctly conſidered, makes alſo the ſubject of which we affirm or deny.

There is ſtill one ſpecies of propoſitions that remains to be deſcribed; and which the more deſerve our notice, as it is not yet agreed among logicians to which of the two claſſes mentioned above they ought to be referred, I mean *ſingular* propoſitions; or thoſe where the ſubject is an individual. Of this nature are the following: *Sir* Iſaac Newton *was the inventor of fluxions; This book contains many uſeful truths.* What occaſions ſome difficulty, as to the proper rank of theſe propoſitions, is, that the ſubject being taken according to the whole of its extenſion, they ſometimes have the ſame effect in reaſoning, as univerſals. But if it be conſidered, that they are in truth the moſt limited kind of particular propoſitions, and that no propoſition can with any propriety be called univerſal, but where the ſubject is ſome univerſal idea; we ſhall not be long in determining to which claſs they ought to be referred. When we ſay, *Some books contain uſeful truths*; the propoſition is particular, becauſe the general term appears with a mark of reſtriction. If therefore we ſay, *This book contains uſeful truths*; it is evident that the propoſition muſt be ſtill more particular, as the limitation implied in the word *this* is of a more confined nature than in the former caſe.

We ſee therefore, that all propoſitions are either *affirmative* or *negative*; nor is it leſs evident, that in both caſes they may be *univerſal* or *particular*. Hence ariſes that celebrated fourfold diviſion of them, into *univerſal affirmative*, and *univerſal negative*; *particular affirmative*, and *particular negative*; which comprehends indeed all their varieties. The uſe of this method of diſtinguiſhing them will appear more fully afterwards, when we come to treat of reaſoning and ſyllogiſm.

Of abſolute and conditional propoſitions.

THE objects about which we are chiefly converſant in this world, are all of a nature liable to change. What may be affirmed of them at one time, cannot often at another; and it makes no ſmall part of our knowledge, to diſtinguiſh rightly theſe variations, and trace the reaſons upon which they depend. For it is obſervable, that amidſt all the viciſſitudes of nature, ſome things remain conſtant and invariable; nor are even the changes, to which we ſee others liable, effected, but in conſequence of uniform and ſteady laws, which when known, are ſufficient to direct us in our judgments about them. Hence philoſophers, in diſtinguiſhing the objects of our perception into various claſſes, have been very careful to note, that ſome properties belong eſſentially to the general idea, ſo as not to be ſeparable from it, but by deſtroying its very nature: while others are only accidental, and may be affirmed or denied of it in different circumſtances. Thus, ſolidity, a yellow colour, and great weight, are conſidered as eſſential qualities of gold; but whether it ſhall exiſt as an uniform conjoined maſs, is not alike neceſſary. We ſee that, by a proper menſtruum, it may be reduced to a fine powder; and that intenſe heat will bring it into a ſtate of fuſion.

From this diverſity in the ſeveral qualities of things, ariſes a conſiderable difference as to the manner of our judging about them. For all ſuch properties as are inſeparable from objects, when conſidered as belonging to any genus or ſpecies, are affirmed abſolutely and without reſerve of that general idea. Thus we ſay, *Gold is very weighty, a ſtone is hard, animals have a power of ſelf-motion.* But in the caſe of mutable or accidental qualities, as they depend upon ſome other conſideration, diſtinct from the general idea; that alſo muſt be taken into the account, in order to form an accurate judgment. Should we affirm, for inſtance, of ſome ſtones, that they are very ſuſceptible of a rolling motion; the propoſition while it remains in the general form, cannot with any advantage be introduced into our reaſonings. An aptneſs to receive that mode of motion, flows from the figure of the ſtone; which, as it may vary infinitely, our judgment then only becomes applicable and determinate, when the particular figure, of which volubility is a conſequence, is alſo taken into the account. Let us then bring in this other conſideration, and the propoſition will run as follows: *Stones of a ſpherical form, are eaſily put into a rolling motion.* Here we ſee the condition upon which the predicate is affirmed, and therefore know in what particular caſes the propoſition may be applied.

This conſideration of propoſitions, reſpecting the manner in which the predicate is affirmed of the ſubject, gives riſe to the diviſion of them into *abſolute* and *conditional*. *Abſolute* propoſitions are thoſe, wherein we affirm ſome property inſeparable from the idea of the ſubject, and which therefore belongs to it in all poſſible caſes; as, *God is infinitely wiſe. Virtue tends to the ultimate happineſs of man.* But where the predicate is not neceſſarily connected with the idea of the ſubject, unleſs upon ſome conſideration diſtinct from that idea, there the propoſition is called *conditional*. The reaſon of the name is taken from the ſuppoſition annexed, which is of the nature of a condition, and may be expreſſed as ſuch. Thus, *If a ſtone is expoſed to the rays of the ſun, it will contract ſome degree of heat. If a river runs in a very declining channel, its rapidity will conſtantly increaſe.*

There is not any thing of greater importance in philoſophy, than a due attention to this diviſion of propoſitions. If we are careful never to affirm things abſolutely, but where the ideas are inſeparably conjoined; and if in our other judgments, we diſtinctly mark the conditions which determine the predicate to belong to the ſubject, we ſhall be the leſs liable to miſtake in applying general truths to the particular concerns of human life. It is owing to the exact obſervance of this rule, that mathematicians have been ſo happy in their diſcoveries, and that what they demonſtrate of magnitude in general, may be applied with eaſe in all obvious occurrences.

The truth is, particular propoſitions are then known to be true, when we can trace their connection with univerſals; and it is accordingly the great buſineſs of ſcience, to find out general truths, that may be applied with ſafety in all obvious inſtances. Now the great advantage ariſing from determining with care the conditions upon which one idea may be affirmed or denied of another, is this; that thereby particular propoſitions really become univerſal, may be introduced with certainty into our reaſonings, and ſerve as ſtandards to conduct and regulate our judgments. To illuſtrate this by a familiar inſtance. If we ſay, *Some water acts very forcibly;* the propoſition is particular: And as the conditions on which this forcible action depends, are not mentioned, it is as yet uncertain in what caſes it may be applied. Let us then ſupply theſe conditions, and the propoſition will run thus: *Water conveyed in ſufficient quantity, along a ſteep deſcent, acts very forcibly.* Here we have an univerſal judgment, inaſmuch as the predicate *forcible action*, may be aſcribed to all water under the circumſtances mentioned. Nor is it leſs evident, that the propoſition in this new form is of eaſy application; and in fact we find, that men do apply it, in inſtances where the forcible action of water is required; as in corn-mills, and many other works of art.

Of ſimple and compound propoſitions.

HITHERTO we have treated of propoſitions, where only two ideas are compared together. Theſe are in the general called *ſimple;* becauſe having but one ſubject and one predicate, they are the effect of a ſimple judgment, that admits of no ſubdiviſion. But if ſeveral ideas offer themſelves to our thoughts at once, whereby we are led to affirm the ſame thing of different objects, or different things of the ſame object; the propoſitions expreſſing theſe judgments are called *compound:* becauſe they may be reſolved into as many others as there are ſubjects or predicates in the whole complex determination of the mind. Thus: *God is infinitely wiſe, and infinitely powerful.* Here there are two predicates, *infinite wiſdom, and infinite power*, both affirmed of the ſame ſubject; and accordingly, the propoſition may be reſolved into two others, affirming theſe predicates ſeverally, in like manner in the propoſition, *neither kings nor people are exempt from death;* the predicate is denied of both ſubjects, and may therefore be ſeparated from them, in diſtinct propoſitions. Nor is it leſs evident, that if a complex judgment conſiſts of ſeveral ſubjects and predicates, it may be reſolved into as many ſimple propoſitions as are the number of different ideas compared together. *Riches and honours are apt to elate the mind, and increaſe the number of our deſires.* In this judgment, there are two ſubjects and two predicates, and it is at the ſame time apparent, that it may be reſolved into four diſtinct propoſitions. *Riches are apt to elate the mind. Riches are apt to increaſe the number of our deſires.* And ſo of honours.

Logicians have divided theſe compound propoſitions into a great many different claſſes; but not with a due regard to their proper definition. Thus, *conditionals, cauſals, relatives,* &c. are mentioned as ſo many diſtinct ſpecies of this kind, though in fact they are no more than ſimple propoſitions. To give an inſtance of a conditional: *If a ſtone is expoſed to the rays of the ſun, it will contract ſome degree of heat.* Here we have but one ſubject and one predicate; for the complex expreſſion, *a ſtone expoſed to the rays of the ſun*, conſtitutes the proper ſubject of this propoſition, and is no more than one determinate idea. The ſame thing happens in cauſals. Rehoboam *was unhappy becauſe he followed evil counſel.* There is here an appearance of two propoſitions, ariſing from the complexity of the expreſſion; but when we come to conſider the matter more nearly, it is evident, that we have but a ſingle ſubject and predicate. *The purſuit of evil counſel brought miſery upon* Rehoboam. It is not enough therefore, to render a propoſition compound, that the ſubject and predicate are complex notions, requiring ſometimes a whole ſentence to expreſs them: For in this caſe, the compariſon is ſtill confined to two ideas, and conſtitutes what we call a ſimple judgment. But where there are ſeveral ſubjects, or predicates, or both, as the affirmation or negation may be alike extended to them all, the propoſition expreſſing ſuch a judgment, is truly a collection of as many ſimple ones as there are different ideas compared. Confining ourſelves therefore to this more ſtrict and juſt notion of compound propoſitions, they are all reducible to two kinds, *viz. copulatives* and *diſjunctives*.

A *copulative* propoſition is, where the ſubjects and predicates are ſo linked together, that they may be all ſeverally affirmed or denied one of another. Of this nature are the examples of compound propoſitions given above. *Riches and honours are apt to elate the mind, and increaſe the number of our deſires. Neither kings nor people are exempt from death.* In the firſt of theſe, the two predicates may be affirmed ſeverally of each ſubject, whence we have four diſtinct propoſitions. The other furniſhes an example of the negative kind, where the ſame predicate being disjoined from both ſubjects, may be alſo denied of them in ſeparate propoſitions.

The other ſpecies of compound propoſitions are thoſe called disjunctives; in which, comparing ſeveral predicates with the ſame ſubject, we affirm that one of them neceſſarily belongs to it, but leave the particular predicate undetermined. If any one, for example, ſays, *This world either exiſts of itſelf, or is the work of ſome all-wiſe and powerful cauſe;* it is evident, that one of the two predicates muſt belong to the world; but as the propoſition determines not which, it is therefore of the kind we call *disjunctive*. Such too are the following. *The ſun either moves round the earth, or is the centre about which the earth revolves. Friendſhip finds men equal, or makes them ſo.* It is the nature of all propoſitions of this claſs, ſuppoſing them to be exact in point of form, that upon determining the particular predicate, the reſt are of courſe to be removed; or if all the predicates but one are removed, that one neceſſarily takes place. Thus in the example given above; if we allow the world to be the work of ſome wiſe and powerful cauſe, we of courſe deny it to be ſelf-exiſtent; or if we deny it to be ſelf-exiſtent, we muſt neceſſarily admit that it was produced by ſome wiſe and powerful cauſe. Now this particular manner of linking the predicates together, ſo that the eſtabliſhing of one diſplaces all the reſt, or the excluding all but one neceſſarily eſtabliſhes that one, cannot otherwiſe be effected than by means of *disjunctive* particles. And hence it is, that propoſitions of this claſs take their name from theſe particles, which make ſo neceſſary a part of them, and indeed conſtitute their very nature conſidered as a diſtinct ſpecies.

Of the diviſion of propoſitions into ſelf-evident and demonſtrable.

WHEN any propoſition is offered to the view of the mind, if the terms in which it is expreſſed are underſtood; upon comparing the ideas together, the agreement or diſagreement aſſerted is either immediately perceived, or found to lie beyond the preſent reach of the underſtanding. In the firſt caſe, the propoſition is ſaid to be *ſelf-evident*, and admits not of any proof, becauſe a bare attention to the ideas themſelves produces full conviction and certainty; nor is it poſſible to call in any thing more evident, by way of confirmation. But where the connection or repugnance comes not ſo readily under the inſpection of the mind, there we muſt have recourſe to reaſoning; and if by a clear ſeries of proofs we can make out the truth propoſed, inſomuch that ſelf-evidence ſhall accompany every ſtep of the procedure, we are then able to demonſtrate what we aſſert, and the propoſition itſelf is ſaid to be *demonſtrable*. When we affirm, for inſtance, *that it is impoſſible for the ſame thing to be and not to be;* whoever underſtands the terms made uſe of, perceives at firſt glance the truth of what is aſſerted; nor can he by any efforts bring himſelf to believe the contrary. The propoſition therefore is *ſelf evident*, and ſuch that it is impoſſible by reaſoning to make it plainer; becauſe there is no truth more obvious, or better known, from which as a conſequence it may be deduced. But if we ſay, *This world had a beginning;* the aſſertion is indeed equally true, but ſhines not forth with the ſame degree of evidence. We find a great difficulty in conceiving how the world could be made out of nothing; and are not brought to a free and full conſent, until by reaſoning we arrive at a clear view of the abſurdity involved in the contrary ſuppoſition. Hence this propoſition is of the kind we call *demonſtrable*, in as much as its truth is not immediately perceived by the mind, but yet may be made appear by means of others more known and obvious, whence it follows as an unavoidable conſequence.

From what has been ſaid it appears, that reaſoning is employed only about demonſtrable propoſitions, and that our intuitive and ſelf-evident perceptions are the ultimate foundation on which it reſts.

Self-evident propoſitions furniſh the firſt principles of reaſoning; and it is certain, that if in our reſearches we employ only ſuch principles as have this character of ſelf evidence, and apply them according to the rules to be afterwards explained, we ſhall be in no danger of error in advancing from one diſcovery to another. For this we may appeal to the writings of the mathematicians, which being conducted by the expreſs model here mentioned, are an inconteſtable proof of the firmneſs and ſtability of human knowledge, when built upon ſo ſure a foundation. For not only have the propoſitions of this ſcience ſtood the teſt of ages; but are found attended with that invincible evidence, as forces the aſſent of all who duly conſider the proofs upon which they are eſtabliſhed.

Firſt then it is to be obſerved, that they have been very careful in aſcertaining their ideas, and fixing the ſignification of their terms. For this purpoſe they begin with *definitions*, in which the meaning of their words is ſo diſtinctly explained, that they cannot fail to excite in the mind the very ſame ideas as are annexed to them by the writer. And indeed the clearneſs and irreſiſtable evidence of mathematical knowledge is owing to nothing ſo much as this care in laying the foundation. Where the relation between any two ideas is accurately and juſtly traced, it will not be difficult for another to comprehend that relation, if, in ſetting himſelf to diſcover it, he brings the very ſame ideas into compariſon. But if, on the contrary, he affixes to his words ideas different from thoſe that were in the mind of him who firſt advanced the demonſtration; it is evident, that, as the ſame ideas are not compared, the ſame relation cannot ſubſiſt, inſomuch that a propoſition will be rejected as falſe, which, had the terms been rightly underſtood, muſt have appeared unexceptionably true. A ſquare, for inſtance, is a figure bounded by four equal right lines, joined together at right angles. Here the nature of the angles makes no leſs a part of the idea, than the equality of the ſides; and many properties demonſtrated of the ſquare flow entirely from its being a rectangular figure. If therefore we ſuppoſe a man, who has formed a partial notion of a ſquare, comprehending only the equality of its ſides without regard to the angles, reading ſome demonſtration that implies alſo this latter conſideration; it is plain he would reject it as not univerſally true, in as much as it could not be applied where the ſides were joined together

gether at unequal angles. For this laſt figure, anſwering ſtill to his idea of a ſquare, would be yet found without the property aſſigned to it in the propoſition. But if he comes afterwards to correct his notion, and render his idea complete, he will then readily own the truth and juſtneſs of the demonſtration.

We ſee therefore, that nothing contributes ſo much to the improvement and certainty of human knowledge, as the having determinate ideas, and keeping them ſteddy and invariable in all our diſcourſes and reaſonings about them. And on this account it is, that mathematicians always begin by defining their terms, and diſtinctly unfolding the notions they are intended to expreſs. Hence ſuch as apply themſelves to theſe ſtudies, having exactly the ſame views of things, and bringing always the very ſame ideas into compariſon, readily diſcern the relations between them.

When they have taken this firſt ſtep, and made known the ideas whoſe relations they intend to inveſtigate; their next care is, to lay down ſome ſelf evident truths, which may ſerve as a foundation for their future reaſonings. And here indeed they proceed with remarkable circumſpection, admitting no principles but what flow immediately from their definitions, and neceſſarily force themſelves upon the mind. Thus a *circle* is a figure formed by a right line, moving round ſome fixed point in the ſame plane. The fixed point round which the line is ſuppoſed to move, and where one of its extremities terminates, is called the *centre* of the circle. The other extremity, which is conceived to be carried round, until it returns to the point whence it firſt ſet out, deſcribes a curve running into itſelf, and termed the *circumference*. All right lines drawn from the centre to the circumference, are called *radii*. From theſe definitions compared, geometricians derive this ſelf-evident truth, *That the radii of the ſame circle are all equal one to another.*

We now obſerve, that, in all propoſitions, we either affirm or deny ſome property of the idea that conſtitutes the ſubject of our judgment, or we maintain that ſomething may be done or effected. The firſt ſort are called *ſpeculative* propoſitions, as in the example mentioned above, *the radii of the ſame circle are all equal one to another.* The others are called *practical*, for a reaſon too obvious to be mentioned; thus, *that a right line may be drawn from one point to another*, is a practical propoſition, inaſmuch as it expreſſes that ſomething may be done.

From this twofold conſideration of propoſitions ariſes the twofold diviſion of mathematical principles into *axioms* and *poſtulates*. By an *axiom* they underſtand any ſelf-evident *ſpeculative* truth: as, *that the whole is greater than its parts; that things equal to one and the ſame things are equal to one another.* But a ſelf-evident *practical* propoſition is what they call a *poſtulate*. Such are thoſe of *Euclid*; *That a finite right line may be continued directly forwards: That a circle may be deſcribed about any centre with any diſtance.* And as, in an *axiom*, the agreement or diſagreement between the ſubject and predicate muſt come under the immediate inſpection of the mind; ſo, in a *poſtulate*, not only the poſſibility of the thing aſſerted muſt be evident at firſt view, but alſo the manner in which it may be effected. For where this manner is not of itſelf apparent, the propoſition comes under the notion of the demonſtrable kind, and is treated as ſuch by geometrical writers. Thus, *to draw a right line from one point to another*, is aſſumed by *Euclid* as a *poſtulate*, becauſe the manner of doing it is ſo obvious as to require no previous teaching. But then it is not equally evident, *how we are to conſtruct an equilateral triangle*. For this reaſon he advances it as a demonſtrable propoſition, lays down rules for the exact performance, and at the ſame time proves, that if theſe rules are followed, the figure will be juſtly deſcribed.

This leads us to take notice, that as *ſelf-evident truths* are diſtinguiſhed into different kinds, according as they are ſpeculative or practical; ſo is it alſo with *demonſtrable* propoſitions. A demonſtrable ſpeculative propoſition, is by mathematicians called a *theorem*. Such is the 47th propoſition of the firſt book of the *Elements*, *viz. that in every right-angled triangle, the ſquare deſcribed upon the ſide ſubtending the right-angle is equal to both the ſquares deſcribed upon the ſides containing the right-angle.* On the other hand, a demonſtrable practical propoſition, is called a *problem*; as where *Euclid* teaches us *to deſcribe a ſquare upon a given right-line.*

It may not be amiſs to add, that beſides the four kinds of propoſitions already mentioned, mathematicians have alſo a fifth, known by the name of *corollaries*. Theſe are uſually ſubjoined to *theorems*, or *problems*, and differ from them only in this; that they flow from what is there demonſtrated, in ſo obvious a manner, as to diſcover their dependence upon the propoſition whence they are deduced, almoſt as ſoon as propoſed. Thus *Euclid* having demonſtrated, *that in every right-lined triangle all the three angles taken together are equal to two right angles*; adds by way of corollary, *that all the three angles of any one triangle taken together are equal to all the three angles of any other triangle taken together*: which is evident at firſt ſight; becauſe in all caſes they are equal to two right ones, and things equal to one and the ſame thing are equal to one another.

The ſcholia of mathematicians are indifferently annexed to definitions, propoſitions, or corollaries; and anſwer the ſame purpoſes as annotations upon a claſſic author. For in them occaſion is taken to explain whatever may appear intricate and obſcure in a train of reaſoning; to anſwer objections; to teach the application and uſes of propoſitions; to lay open the original and hiſtory of the ſeveral diſcoveries made in the ſcience; and in a word, to acquaint us with all ſuch particulars as deſerve to be known, whether conſidered as points of curioſity or profit.

PART II. *Of* REASONING.

IT often happens, in comparing ideas together, that their agreement or diſagreement cannot be diſcerned at firſt view, eſpecially if they are of ſuch a nature as not to admit of an exact application one to another. When, for inſtance, we compare two figures of a different make, in order to judge of their equality or inequality, it is plain, that by barely conſidering the figures themſelves we cannot arrive at an exact determination ; becauſe, by reaſon of their diſagreeing forms, it is impoſſible ſo to put them together, as that their ſeveral parts ſhall mutually coincide. Here then it becomes neceſſary to look out for ſome third idea, that will admit of ſuch an application as the preſent caſe requires ; wherein if we ſucceed, all difficulties vaniſh, and the relation we are in queſt of may be traced with eaſe. Thus right-lined figures are all reducible to ſquares, by means of which we can meaſure their areas, and determine exactly their agreement or diſagreement in point of magnitude.

But how can any third idea ſerve to diſcover a relation between two others, by being compared ſeverally with theſe others ? for ſuch a compariſon enables us to ſee how far the ideas with which this third is compared are connected or disjoined between themſelves. In the example mentioned above, of two right-lined figures, if we compare each of them with ſome ſquare whoſe area is known, and find the one exactly equal to it, and the other leſs by a ſquare-inch, we imediately conclude, that the area of the firſt figure is a ſquare inch greater than that of the ſecond. This manner of determining the relation between any two ideas, by the intervention of ſome third with which they may be compared, is that which we call *reaſoning*. The great art lies, in finding out ſuch intermediate ideas, as, when compared with the others in the queſtion, will furniſh evident and known truths, becauſe it is only by means of them that we arrive at the knowledge of what is hidden and remote.

Hence it appears, that every act of reaſoning neceſſarily includes three diſtinct judgments; two wherein the ideas whoſe relation we want to diſcover are ſeverally compared with the middle idea, and a third wherein they are themſelves connected or disjoined according to the reſult of that compariſon. Now, as, in the firſt part of logic, our judgments, when put into words, were called propoſitions ; ſo here, in the ſecond part, the expreſſions of our reaſonings are termed *ſyllogiſms*. And hence it follows, that as every act of reaſoning implies three ſeveral judgments, ſo very ſyllogiſm muſt include three diſtinct propoſitions. When a reaſoning is thus put into words, and appears in form of a ſyllogiſm, the intermediate idea made uſe of to diſcover the agreement or diſagreement we ſearch for is called the *middle term* ; and the two ideas themſelves, with which this third is compared, go by the name of the *extremes*.

But as theſe things are beſt illuſtrated by examples ; let us, for inſtance, ſet ourſelves to inquire, *whether men are accountable for their actions*. As the relation between the ideas of *man* and *accountableneſs*, comes not within the immediate view of the mind, our firſt care muſt be, to find out ſome third idea, that will enable us the more eaſily to diſcover and trace it. A very ſmall meaſure of reflection is ſufficient to inform us, that no creature can be accountable for his actions, unleſs we ſuppoſe him capable of diſtinguiſhing the good from the bad. Nor is this alone ſufficient. For what would it avail him to know good from bad actions, if he had no freedom of choice, nor could avoid the one and purſue the other ? hence it becomes neceſſary to take in both conſiderations in the preſent caſe. It is at the ſame time equally apparent, that where-ever there is this ability of diſtinguiſhing good from bad actions, and of purſuing the one and avoiding the other, there alſo a creature is accountable. We have then got a third idea, with which *accountableneſs* is inſeparably connected, *viz. reaſon and liberty* ; which are here to be conſidered as making up one complex conception. Let us now take this middle idea, and compare it with the other term in the queſtion, *viz. man* ; and we all know by experience, that it may be affirmed of him. Having thus, by means of the intermediate idea, formed two ſeveral judgments, *viz. that man is poſſeſſed of reaſon and liberty* ; and *that reaſon and liberty imply accountableneſs* ; a third obviouſly and neceſſarily follows, *viz. that man is accountable for his actions*. Here then we have a complete act of reaſoning, in which there are three diſtinct judgments ; two that may be ſtyled previous, in as much as they lead to the other, and ariſe from comparing the middle idea with the two ideas in the queſtion : the third is a conſequence of theſe previous acts, and flows from combining the extreme ideas between themſelves. If now we put this reaſoning into words, it exhibits what logicians term a ſyllogiſm, and runs this :

Every creature poſſeſſed of reaſon and liberty is accountable for his actions.

Man is a creature poſſeſſed of reaſon and liberty.

Therefore man is accountable for his actions.

In this ſyllogiſm there are three ſeveral propoſitions, expreſſing the three judgments implied in the act of reaſoning, and ſo diſpoſed as to repreſent diſtinctly what paſſes within the mind in tracing the more diſtant relations of its ideas. The two firſt propoſitions anſwer the two previous judgments in reaſoning, and are called the *premiſſes*, becauſe they are placed before the other. The third is termed the *concluſion*, as being gained in conſequence of what was aſſerted in the premiſſes. The terms expreſſing the two ideas whoſe relation we inquire after, as here *man* and *accountableneſs*, are in general called the *extremes* ; and the intermediate idea, by means of which the relation is traced, *viz. a creature poſſeſſed of reaſon and liberty*, takes the name of the *middle term*. Hence it follows, that by the *premiſſes* of a ſyllogiſm we are always to underſtand the two propoſitions where the middle term is ſeverally compared with the *extremes* ; for theſe conſtitute the previous judgments, whence the truth we are in queſt of is by reaſoning deduced. The *concluſion* is that other propoſition, in which the *extremes* themſelves are joined or ſeparated, agreeably to what appears upon the above compariſon.

The concluſion is made up of the extreme terms of the ſyllogiſm ; and the extreme, which ſerves as the predicate of the concluſion, goes by the name of the *major term* ; the other extreme, which makes the ſubject in the ſame propoſition, is called the *minor term*. From this diſtinction of the extremes, ariſes alſo a diſtinction between the premiſſes, where theſe extremes are ſeverally compared with the middle term. That propoſition which compares the greater extreme, or the predicate of the concluſion, with the middle term, is called the *major* *propoſition*; the other, wherein the ſame middle term is compared with the ſubject of the concluſion, or leſſer extreme, is called the *minor propoſition*. All this is obvious from the ſyllogiſm already given, where the concluſion is, *Man is accountable for his actions*. For here the predicate, *accountable for his actions*, being connected with the middle term in the firſt of the two premiſſes, *every creature poſſeſſed of reaſon and liberty is accountable for his actions*, gives what we call the *major propoſition*. In the ſecond of the premiſſes, *Man is a creature poſſeſſed of reaſon and liberty*, we find the leſſer extreme, or ſubject of the concluſion, *viz. man*, connected with the ſame middle term, whence it is known to be the *minor propoſition*. When a ſyllogiſm is propoſed in due form, the major propoſition is always placed firſt, the minor next, and the concluſion laſt.

Theſe things premiſed, we may in the general define reaſoning *to be an act or operation of the mind, deducing ſome unknown propoſition from other previous ones that are evident and known*. Theſe previous propoſitions, in a ſimple act of reaſoning, are only two in number; and it is always required that they be of themſelves apparent to the underſtanding, inſomuch that we aſſent to and perceive the truth of them as ſoon as propoſed. In the ſyllogiſm given above, the premiſſes are ſuppoſed to be ſelf-evident truths, otherwiſe the concluſion could not be inferred by a ſingle act of reaſoning. If, for inſtance, in the major, *every creature poſſeſſed of reaſon and liberty is accountable for his actions*, the connection between the ſubject and predicate could not be perceived by a bare attention to the ideas themſelves; it is evident, that this propoſition would no leſs require a proof than the concluſion deduced from it. In this caſe a new middle term muſt be ſought for, to trace the connection here ſuppoſed; and this of courſe furniſhes another ſyllogiſm, by which having eſtabliſhed the propoſition in queſtion, we are then, and not before, at liberty to uſe it in any ſucceeding train of reaſoning. And ſhould it ſo happen, that in this ſecond eſſay there was ſtill ſome previous propoſition whoſe truth did not appear at firſt ſight, we muſt then have recourſe to a third ſyllogiſm in order to lay open that truth to the mind; becauſe, ſo long as the premiſſes remain uncertain, the concluſion built upon them muſt be ſo too. When by conducting our thoughts in this manner, we at laſt arrive at ſome ſyllogiſm, where the previous propoſitions are intuitive truths; the mind then reſts in full ſecurity, as perceiving that the ſeveral concluſions it has paſſed through ſtand upon the immoveable foundation of ſelf-evidence, and when traced to their ſource terminate in it.

We ſee therefore, that in order to infer a concluſion by a ſingle act of reaſoning, the premiſſes muſt be intuitive propoſitions. Where they are not, previous ſyllogiſms are required; in which caſe reaſoning becomes a complicated act, taking in a variety of ſucceſſive ſteps. This frequently happens in tracing the more remote relations of our ideas, where many middle terms being called in, the concluſion cannot be made out, but in conſequence of a ſeries of ſyllogiſms following one another in a train. But although in this concatenation of propoſitions, thoſe that form the premiſſes of the laſt ſyllogiſm are often conſiderably removed from ſelf evidence; yet if we trace the reaſoning backwards, we ſhall find them the concluſions of previous ſyllogiſms, whoſe premiſſes approach nearer and nearer to intuition, in proportion as we advance, and are found at laſt to terminate in it. And if, after having thus unravelled a demonſtration, we take it the contrary way; and obſerve how the mind, ſetting out with intuitive perceptions, couples them together to form a concluſion; how, by introducing this concluſion into another ſyllogiſm, it ſtill advances one ſtep farther; and ſo proceeds, making every new diſcovery ſubſervient to its future progreſs; we ſhall then perceive clearly, that reaſoning, in the higheſt exerciſe of that faculty, is no more than an orderly combination of thoſe ſimple acts which we have already ſo full explained.

Thus we ſee, that reaſoning, beginning with firſt principles, riſes gradually from one judgment to another, and connects them in ſuch a manner, that every ſtage of the progreſſion brings intuitive certainty along with it. And now at length we may clearly underſtand the definition given above of this diſtinguiſhing faculty of the human mind. Reaſon is the ability of deducing unknown truths from principles or propoſitions that are already known. This evidently appears by the foregoing account, where we ſee, that no propoſition is admitted into a ſyllogiſm, to ſerve as one of the previous judgments on which the concluſion reſts, unleſs it is itſelf a known and eſtabliſhed truth, whoſe connection with ſelf evident principles has been already traced.

Of the ſeveral kinds of reaſoning; and firſt of that by which we determine the genera and ſpecies of things.

ALL the aims of human reaſon may be reduced to theſe two: 1. To rank things under thoſe univerſal ideas to which they truly belong; and, 2. To aſcribe to them their ſeveral attributes and properties in conſequence of that diſtribution.

One great aim of human reaſon is, to determine the genera and ſpecies of things. Now, as in univerſal propoſitions we affirm ſome property of a genus or ſpecies, it is plain, that we cannot apply this property to particular objects, till we have firſt determined whether they are comprehended under that general idea of which the property is affirmed. Thus there are certain properties belonging to all *even* numbers, which nevertheleſs cannot be applied to any particular number, until we have firſt diſcovered it to be of the ſpecies expreſſed by that general name. Hence reaſoning begins with referring things to their ſeveral diviſions and claſſes in the ſcale of our ideas; and as theſe diviſions are all diſtinguiſhed by peculiar names, we hereby learn to apply the terms expreſſing general conceptions to ſuch particular objects as come under our immediate obſervation.

Now, in order to arrive at theſe concluſions by which the ſeveral objects of perception are brought under general names, two things are manifeſtly neceſſary. Firſt, that we take a view of the idea itſelf denoted by that general name, and carefully attend to the diſtinguiſhing marks which ſerve to characterize it. Secondly, that we compare this idea with the object under conſideration, obſerving diligently wherein they agree or differ. If the idea is found to correſpond with the particular object, we then without heſitation apply the general name; but if no ſuch correſpondence intervenes, the concluſion muſt neceſſarily take a contrary turn. Let us, for inſtance, take the number *eight*, and conſider by what ſteps we are led to pronounce it an *even* number. Firſt then we call to mind the idea ſignified by the expreſſion *an even number*, *viz.* that it is *a number diviſible into two equal parts*. We then compare this idea with the number *eight*, and, finding them manifeſtly to agree, ſee at once the neceſſity of admitting the concluſion. Theſe ſeveral judgments therefore, transferred into language, and reduced to the form of a ſyllogiſm, appear thus:

Every number that may be divided into two equal parts is an EVEN *number.*

The number EIGHT *may be divided into two equal parts.*

Therefore the number EIGHT *is an* EVEN *numder.*

Here it may be obſerved, that where the general idea to which particular objects are referred is very familiar to the mind, this reference, and the application of the general name, ſeem to be made without any apparatus of reaſoning. When we ſee a horſe in the fields, or a dog in the ſtreet, we readily apply the name of the ſpecies; habit, and a familiar acquaintance with the general idea, ſuggeſting it inſtantaneouſly to the mind. We are not however to imagine on this account, that the underſtanding departs from the uſual rules of juſt thinking. A frequent repetition of acts begets a habit; and habits are attended with a certain promptneſs of execution that prevents our obſerving the ſeveral ſteps and gradations by which any courſe of action is accompliſhed. But in other inſtances, where we judge not by pre-contracted habits, as when the general idea is very complex, or leſs familiar to the mind; we always proceed according to the form of reaſoning eſtabliſhed above. A goldſmith, for inſtance, who is in doubt as to any piece of metal, whether it be of the ſpecies called *gold*; firſt examines its properties, and then comparing them with the general idea ſignified by that name, if he finds a perfect correſpondence, no longer heſitates under what claſs of metals to rank it.

But the great importance of this branch of reaſoning, and the neceſſity of care and circumſpection in referring particular objects to general ideas, is ſtill farther evident from the practice of the mathematicians. Every one who has read *Euclid* knows, that he frequently requires us to draw lines through certain points, and according to ſuch and ſuch directions. The figures thence reſulting are often ſquares, parallelograms, or rectangles. Yet *Euclid* never ſuppoſes this from their bare appearance, but always demonſtrates it upon the ſtricteſt principles of geometry. Nor is the method he takes in any thing different from that deſcribed above. Thus, for inſtance, having defined a ſquare to be a figure bounded by four equal ſides, joined together at right angles; when ſuch a figure ariſes in any conſtruction previous to the demonſtration of a propoſition, he yet never calls it by that name, until he has ſhewn that its ſides are equal, and all its angles right ones. Now this is apparently the ſame form of reaſoning we have before exhibited, in proving *eight* to be an even number.

Having thus explained the rules by which we are to conduct ourſelves in ranking particular objects under general ideas, and ſhewn their conformity to the practice and manner of the mathematicians; it remains only to obſerve, that the true way of rendering this part of knowledge both eaſy and certain, is, by habituating ourſelves to clear and determinate ideas, and keeping them ſteadily annexed to their reſpective names. For as all our aim is, to apply general words aright; if theſe words ſtand for invariable ideas, that are perfectly known to the mind, and can be readily diſtinguiſhed upon occaſion, there will be little danger of miſtake or error in our reaſonings. Let us ſuppoſe, that by examining any object, and carrying our attention ſucceſſively from one part to another, we have acquainted ourſelves with the ſeveral particulars obſervable in it. If among theſe we find ſuch as conſtitute ſome general idea, framed and ſettled beforehand by the underſtanding, and diſtinguiſhed by a particular name; the reſemblance, thus known and perceived, neceſſarily determines the ſpecies of the object, and thereby gives it a right to the name by which that ſpecies is called. Thus four equal ſides, joined together at right angles, made up the notion of a ſquare. As this is a fixed and invariable idea, without which the general name cannot be applied, we never call any particular figure a *ſquare*, until it appears to have theſe ſeveral conditions; and contrarily, where-ever a figure is found with theſe conditions, it neceſſarily takes the name of a *ſquare*. The ſame will be found to hold in all our other reaſonings of this kind; where nothing can create any difficulty but the want of ſettled ideas. If, for inſtance, we have not determined within ourſelves the preciſe notion denoted by the word *manſlaughter*; it will be impoſſible for us to decide, whether any particular action ought to bear that name: becauſe however nicely we examine the action itſelf, yet being ſtrangers to the general idea with which it is to be compared, we are utterly unable to judge of their agreement or diſagreement. But if we take care to remove this obſtacle, and diſtinctly trace the two ideas under conſideration, all difficulties vaniſh, and the reſolution becomes both eaſy and certain.

Thus we ſee, of what importance it is, towards the improvement and certainty of human knowledge, that we accuſtom ourſelves to clear and determinate ideas, and a ſteady application of words.

Of Reaſoning, as it regards the powers and properties of things, and the relations of our general ideas.

We come now to the ſecond great end which men have in view in their reaſonings, namely, The diſcovering and aſcribing to things their ſeveral attributes and properties. And here it will be neceſſary to diſtinguiſh between reaſoning as it regards the ſciences, and as it concerns common life. In the ſciences, our reaſon is employed chiefly about univerſal truths, it being by them alone that the bounds of human knowledge are enlarged. Hence the diviſion of things into various claſſes, called otherwiſe genera and ſpecies. For theſe univerſal ideas, being ſet up as the repreſentatives of many particular things, whatever is affirmed of them may be alſo affirmed of all the individuals to which they belong. *Murder*, for inſtance, is a general idea, repreſenting a certain ſpecies of human actions. Reaſon tells us that the puniſhment due to it is *death*. Hence every particular action coming under the notion of *murder*, has the puniſhment of *death* allotted to it. Here then we apply the general truth to ſome obvious inſtance, and this is what properly conſtitutes the reaſoning of common life. For men, in their ordinary tranſactions and intercourſe one with another, have for the moſt part to do only with particular objects. Our friends and relations, their characters and behaviour, the conſtitution of the ſeveral bodies that ſurround us, and the uſes to which they may be applied, are what chiefly engage our attention. In all theſe we reaſon about particular things; and the whole reſult of our reaſoning is, the applying the general truths of the ſciences to the ordinary tranſactions of human life. When we ſee a viper, we avoid it. Where-ever we have occaſion for the forcible action of water, to move a body that makes conſiderable reſiſtance, we take care to convey it in ſuch a manner that it ſhall fall upon the object with impetuoſity. Now all this happens in conſequence of our familiar and ready application of theſe two general trruths. *The bite of a viper is mortal. Water falling upon a body with impetuoſity, acts very forcibly towards ſetting it in motion.* In like manner, if we ſet ourſelves to conſider any particular character, in order to determine the ſhare of praiſe or diſpraiſe that belongs to it, our great concern is, to aſcertain exactly the proportion of virtue and vice. The reaſon is obvious. A juſt determination in all caſes of this kind depends entirely upon an application of theſe general maxims of morality: *Virtuous actions deſerve praiſe. Vicious actions deſerve blame.*

Hence it appears, that reaſoning, as it regards common life, is no more than the aſcribing the general properties of things to thoſe ſeveral objects with which we are more immediately concerned, according as they are found to be that particular diviſion or claſs to which the properties belong. The ſteps then by which we proceed are manifeſtly theſe. Firſt, we refer the object under conſideration to ſome general idea or claſs of things. We then recollect the ſeveral attributes of that general idea. And laſtly, aſcribe all thoſe attributes to the preſent object. Thus, in conſidering the character of *Sempronius*, if we find it to be of the kind called *virtuous*; when we at the ſame time reflect, that a *virtuous* character is deſerving of eſteem, it naturally and obviouſly follows that *Sempronius* is ſo too. Theſe thoughts put into a *ſyllogiſm*, in order to exhibit the form of reaſoning here required, run thus.

Every virtuous man is worthy of eſteem.
SEMPRONIUS *is a virtuous man.*
Therefore SEMPRONIUS *is worthy of eſteem.*

By this *ſyllogiſm* it appears, that before we affirm any thing of a particular object, that object muſt be referred to ſome general idea. *Sempronius* is pronounced worthy of eſteem, only in conſequence of his being a virtuous man. Hence we ſee the neceſſary connection of the various parts of reaſoning, and the dependence they have one upon another. The determining the genera and ſpecies of things is, as we have ſaid, one exerciſe of human reaſon; and here we find, that this exerciſe is the firſt in order, and previous to the other, which conſiſts in aſcribing to them their powers, properties, and relations. But when we have taken this previous ſtep, and brought particular objects under general names; as the properties we aſcribe to them are no other than thoſe of the general idea, it is plain, that in order to a ſucceſsful progreſs in this part of knowledge, we muſt thoroughly acquaint ourſelves with the ſeveral relations and attributes of theſe our general ideas. When this is done, the other part will be eaſy, and require ſcarce any labour of thought, as being no more than an application of the general form of reaſoning repreſented in the foregoing *ſyllogiſm*. Now as we have already ſufficiently ſhewn how we are to proceed in determining the genera and ſpecies of things, all that is farther wanting towards a due explanation of it is, to offer ſome conſiderations as to the manner of inveſtigating the general relations of our ideas. This is the higheſt exerciſe of the powers of the underſtanding, and that by means whereof we arrive at the diſcovery of univerſal truths, inſomuch that our deductions in this way conſtitute that particular ſpecies of reaſoning which we have before ſaid regards principally the ſciences.

But that we may conduct our thoughts with ſome order and method, we ſhall begin with obſerving, that the relations of our general ideas are of two kinds. Either ſuch as immediately diſcover themſelves, upon comparing the ideas one with another; or ſuch as, being more remote and diſtant, require art and contrivance to bring them into view. The relations of the firſt kind furniſh us with intuitive and ſelf-evident truths; thoſe of the ſecond are traced by reaſoning and a due application of intermediate ideas. It is of this laſt kind that we are to ſpeak here, having diſpatched what was neceſſary with regard to the other in the former part. As therefore, in tracing the more diſtant relations of things, we muſt always have recourſe to intervening ideas, and are more or leſs ſucceſsful in our reſearches, according to our acquaintance with theſe ideas, and ability of applying them; it is evident, that to make a good reaſoner, two things are principally required. *Firſt*, an extenſive knowledge of thoſe intermediate ideas, by means of which things may be compared one with another. *Secondly*, the ſkill and talent of applying them happily, in all particular inſtances that come under conſideration.

In order to our ſucceſsful progreſs in reaſoning, we muſt have an extenſive knowledge of thoſe intermediate ideas by means of which things may be compared one with another. For as it is not every idea that will anſwer the purpoſe of our inquiries, but ſuch only as are peculiarly related to the objects about which we reaſon, ſo as, by a compariſon with them, to furniſh evident and known truths; nothing is more apparent, than that the greater variety of conceptions we can call into view, the more likely we are to find ſome among them that will help us to the truths here required. And indeed it is found to hold in experience, that in proportion as we enlarge our views of things, and grow acquainted with a multitude of different objects, the reaſoning faculty gathers ſtrength. For by extending our ſphere of knowledge, the mind acquires a certain force and penetration, as being accuſtomed to examine the ſeveral appearances of its ideas, and obſerve what light they caſt one upon another.

This is the reaſon, why, in order to excel remarkably in any one branch of learning, it is neceſſary to have at leaſt a general acquaintance with the whole circle of arts and ſciences. The truth is, all the various diviſions of human knowledge are very nearly related among themſelves, and in innumerable inſtances ſerve to illuſtrate and ſet off each other. And altho' it is not to be denied, that, by an obſtinate application to one branch of ſtudy, a man may make conſiderable progreſs and acquire ſome degree of eminence in it; yet his views will be always narrow and contracted, and he will want that maſterly diſcernment, which not only enables us to purſue our diſcoveries with eaſe, but alſo, in laying them open to others, to ſpread a certain brightneſs around them. But when our reaſoning regards a particular ſcience, it is farther neceſſary, that we more nearly acquaint ourſelves with whatever relates to that ſcience. A general knowledge is a good preparation, and enables us to proceed with eaſe and expedition, in whatever branch of learning we apply to. But then in the minute and intricate queſtions of any ſcience we are by no means qualified to reaſon with advantage, until we have perfectly maſtered the ſcience to which they belong.

We come now to the ſecond thing required, in order to a ſucceſsful progreſs in reaſoning, namely, the ſkill and talent of applying intermediate ideas happily in all particular inſtances that come under conſideration. Uſe and exerciſe are the beſt inſtructors in the preſent caſe. And therefore the true way to acquire this talent is, by being much converſant in thoſe ſciences where the art of reaſoning is allowed to reign in the greateſt perfection. Hence it was that the ancients, who ſo well underſtood the manner of forming the mind, always began with *mathematicks*, as the foundation of their philoſophical ſtudies. Here the underſtanding is by degrees habituated to truth, contracts inſenſibly a certain fondneſs for it, and learns never to yield its aſſent to any propoſition, but where the evidence is ſufficient to produce full conviction. For this reaſon *Plato* has called mathematical demonſtrations the *catharticks* or purgatives of the ſoul, as being the proper means to cleanſe it from error, and reſtore that natural exerciſe of its faculties, in which juſt thinking conſiſts.

If therefore we would form our minds to a habit of reaſoning cloſely and in train, we cannot take any more certain method, than the exerciſing ourſelves in mathematical demonſtrations, ſo as to contract a kind of familiarity with them. Not that we look upon it as neceſſary that all men ſhould be deep mathematicians, but that, having got the way of reaſoning which that ſtudy neceſſarily brings the mind to, they may be able to tranſfer it to other parts of knowledge, as they ſhall have occaſion.

But although the ſtudy of mathematicks be of all others the moſt uſeful to form the mind, and give it an early reliſh of truth, yet ought not other parts of philoſophy to be neglected. For there alſo we meet with many opportunities of exerciſing the powers of the underſtanding: and the variety of ſubjects naturally leads us to obſerve all thoſe different turns of thinking that are peculiarly adapted to the ſeveral ideas we examine and the truths we ſearch after. For this purpoſe, beſides the ſtudy of mathematicks, we ought to apply ourſelves diligently to the reading of ſuch authors as have diſtinguiſhed themſelves for ſtrength of reaſoning, and a juſt and accurate manner of thinking. For it is obſervable, that a mind exerciſed and ſeaſoned to truth, ſeldom reſts ſatisfied in a bare contemplation of the arguments offered by others, but will be frequently eſſaying its own ſtrength, and purſuing its diſcoveries upon the plan it is moſt accuſtomed to. Thus we inſenſibly contract a habit of tracing truth from one ſtage to another, and of inveſtigating thoſe general relations and properties, which we afterwards aſcribe to particular things, according as we find them comprehended under the abſtract ideas to which the properties belong.

Of the forms of Syllogiſms.

HITHERTO we have contented ourſelves with a general notion of ſyllogiſms, and of the parts of which they conſiſt. It is now time to enter a little more particularly into the ſubject, to examine their various forms, and lay open the rules of argumentation proper to each. In the ſyllogiſms mentioned in, we may obſerve, that the *middle term* is the ſubject of the *major* propoſition, and the predicate of the *minor*. This diſpoſition, though the moſt natural and obvious, is not however neceſſary; it frequently happenning, that the *middle term* is the ſubject in both the premiſſes, or the predicate in both; and ſometimes directly contrary, the predicate in the *major*, and the ſubject in the *minor*. Hence the diſtinction of ſyllogiſms into various kinds, called *figures* by logicians. For *figure*, according to their uſe of the word, is nothing elſe but the order and diſpoſition of the *middle term* in any ſyllogiſm. And as this diſpoſition is fourfold, ſo the figures of ſyllogiſms thence ariſing are four in number. When the *middle term* is the ſubject of the *major* propoſition, and the predicate of the *minor*, we have what is called the *firſt figure*. If, on the other hand, it is the predicate of both the premiſſes, the ſyllogiſm is ſaid to be in the *ſecond figure*. Again, in the *third figure*, the *middle term* is the ſubject of the two premiſſes. And laſtly, by making it the predicate of the *major*, and ſubject of the *minor*, we obtain ſyllogiſms in the *fourth figure*.

But beſides this fourfold diſtinction of ſyllogiſms, there is alſo a farther ſubdiviſion of them in every figure, ariſing from the *quantity* and *quality*, as they are called, of the propoſitions. By *quantity* we mean the conſideration of propoſitions as univerſal or particular; by *quality*, as affirmative or negative. Now as, in all the ſeveral diſpoſitions of the *middle term*, the propoſition of which a ſyllogiſm conſiſts may be either univerſal or particular, affirmative or negative; the due determination of theſe, and ſo putting them together as the laws of argumentation require, conſtitute what logicians call the *moods* of ſyllogiſms. Of theſe *moods* there are a determinate number to every figure, including all the poſſible ways in which propoſitions differing in *quantity* or *quality* can be combined, according to any diſpoſition of the *middle term*, in order to arrive at a juſt concluſion.

The diviſion of ſyllogiſms according to mood and figure,

gure, reſpects thoſe eſpecially which are known by the name of plain ſimple ſyllogiſms; that is, which are bounded to three propoſitions, all ſimple, and where the extremes and middle term are connected according to the rules laid down above. But as the mind is not tied down to any one preciſe form of reaſoning, but ſometimes makes uſe of more, ſometimes of fewer premiſſes, and often takes in compound and conditional propoſitions, it may not be amiſs to take notice of the different forms derived from this ſource, and explain the rule by which the mind conducts itſelf in the uſe of them.

When, in any ſyllogiſm, the *major* is a conditional propoſition, the ſyllogiſm itſelf is termed *conditional*. Thus:

If there is a God, he ought to be worſhipped.
But there is a God:
Therefore he ought to be worſhipped.

In this example, the *major* is conditional, and therefore the ſyllogiſm itſelf is alſo of the kind called by that name. All conditional propoſitions are made up of two diſtinct parts: one expreſſing the condition upon which the predicate agrees or diſagrees with the ſubject, as in this now before us, *if there is a God;* the other joining or disjoining the ſaid predicate and ſubject, as here, *he ought to be worſhipped.* The firſt of theſe parts, or that which implies the condition, is called the *antecedent*; the ſecond, where we join or disjoin the predicate and ſubject, has the name of the *conſequent*.

In all propoſitions of this kind, ſuppoſing them to be exact in point of form, the relation between the antecedent and conſequent muſt ever be true and real; that is, the antecedent muſt always contain ſome certain and genuine condition, which neceſſarily implies the conſequent; for otherwiſe the propoſition itſelf will be falſe, and therefore ought not to be admitted into our reaſonings. Hence it follows, that when any conditional propoſition is aſſumed, if we admit the antecedent of that propoſition, we muſt at the ſame time neceſſarily admit the conſequent; but if we reject the conſequent, we are in like manner bound to reject alſo the antecedent. For as the antecedent always expreſſes ſome condition, which neceſſarily implies the truth of the conſequent; by admitting the antecedent we allow of that condition, and therefore ought alſo to admit the conſequent. In like manner if it appears that the conſequent ought to be rejected, the antecedent evidently muſt be ſo too; becauſe the admitting of the antecedent would neceſſarily imply the admiſſion alſo of the conſequent.

There are two ways of arguing in *hypothetical* ſyllogiſms, which lead to a certain and unavoidable concluſion. For as the *major* is always a conditional propoſition, conſiſting of an antecedent and a conſequent; if the *minor* admits the antecedent, it is plain that the concluſion muſt admit the conſequent. This is called arguing from the admiſſion of the antecedent to the admiſſion of the conſequent, and conſtitutes that mood or ſpecies of *hypothetical* ſyllogiſms which is diſtinguiſhed in the ſchools by the name of the *modus ponens*, in as much as by it the whole conditional propoſition both antecedent and conſequent is eſtabliſhed. Thus:

If God is infinitely wiſe, and acts with perfect freedom, he does nothing but what is beſt.
But God is infinitely wiſe, and acts with perfect freedom:
Therefore he does nothing but what is beſt.

Here the antecedent or firſt part of the conditional propoſition is eſtabliſhed in the *minor*, and the conſequent or ſecond part in the concluſion; whence the ſyllogiſm itſelf is an example of the *modus ponens*. But if we, on the contrary, ſuppoſe, that the *minor* rejects the conſequent; then it is apparent, that the concluſion muſt alſo reject the antecedent. In this caſe we are ſaid to argue from the removal of the conſequent to the removal of the antedent, and the particular mood or ſpecies of ſyllogiſms thence ariſing is called by logicians the *modus tollens*; becauſe in it both antecedent and conſequent are rejected or taken away, as appears by the following example.

If God were not a being of infinite goodneſs, neither would he conſult the happineſs of his creatures.
But God does conſult the happineſs of his creatures;
Therefore he is a being of infinite goodneſs.

Theſe two ſpecies take in the whole claſs of *conditional* ſyllogiſms, and include all the poſſible ways of arguing that lead to a legitimate concluſion; becauſe we cannot here proceed by a contrary proceſs of reaſoning, that is, from the removal of the antecedent to the removal of the conſequent, or from the eſtabliſhing of the conſequent to the eſtabliſhing of the antecedent. For although the antecedent always expreſſes ſome real condition, which once admitted neceſſarily implies the conſequent, yet it does not follow that there is therefore no other condition; and if ſo, then, after removing the antecedent, the conſequent may ſtill hold, becauſe of ſome other determination that infers it. When we ſay: *If a ſtone is expoſed ſome time to the rays of the ſun, it will contract a certain degree of heat*; the propoſition is certainly true; and admitting the antecedent, we muſt alſo admit the conſequent. But as there are other ways by which a ſtone may gather heat, it will not follow, from the ceaſing of the before-mentioned condition, that therefore the conſequent cannot take place. In other words, we cannot argue: *But the ſtone has not been expoſed to the rays of the ſun; therefore neither has it any degree of heat:* in as much as there a great many other ways by which heat might have been communicated to it. And if we cannot argue from the removal of the antecedent to the removal of the conſequent, no more can we from the admiſſion of the conſequent to the admiſſion of the antecedent; becauſe as the conſequent may flow from a great variety of different ſuppoſitions, the allowing of it does not determine the preciſe ſuppoſition, but only that ſome one of them muſt take place. Thus, in the foregoing propoſition, *If a ſtone is expoſed ſome time to the rays of the ſun, it will contract a certain degree of heat*; admitting the conſequent, *viz. that it has contracted a certain degree of heat*, we are not therefore bound to admit the antecedent, *that it has been ſome time expoſed to the rays of the ſun*, becauſe there are many other cauſes whence that heat may have proceeded. Theſe two ways of arguing, therefore, hold not in conditional ſyllogiſms.

As from the *major's* being a conditional propoſition, we obtain the ſpecies of conditional ſyllogiſms; ſo where it is a disjunctive propoſition, the ſyllogiſm to which it belongs is alſo called *disjunctive*, as in the following example:

The world is either ſelf-exiſtent, or the work of ſome finite, or of ſome infinite being.
But it is not ſelf-exiſtent, nor the work of a finite being.
Therefore it is the work of an infinite being.

Now a disjunctive propoſition is that where, of ſeveral predicates, we affirm one neceſſarily to belong to the ſubject, to the excluſion of all the reſt, but leave that particular one undetermined. Hence it follows, that as ſoon as we determine the particular predicate, all the reſt are of courſe to be rejected; or if we reject all the predicates but one, that one neceſſarily takes place. When therefore, in a *disjunctive* ſyllogiſm, the ſeveral predicates are enumerated in the *major*; if the *minor* eſtabliſhes any one of theſe predicates, the concluſion ought to remove all the reſt; or if, in the *minor*, all the predicates but one are removed, the concluſion muſt neceſſarily eſtabliſh that one. Thus, in the *disjunctive* ſyllogiſm given above, the *major* affirms one of three predicates to belong to the earth, *viz.* *ſelf-exiſtence*, or that it is *the work of a finite* or that it is *the work of an infinite being.* Two of theſe predicates are removed in the *minor*, viz. *ſelf-exiſtence*, and *the work of a finite being.* Hence the concluſion neceſſarily aſcribes to it the third predicate, and affirms that it is *the work of an infinite being.* If now we give the ſyllogiſm another turn, inſomuch that the minor may eſtabliſh one of the predicates, by affirming the earth to be *the production of an infinite being*; then the concluſion muſt remove the other two, aſſerting it to be neither *ſelf-exiſtent*, nor *the work of a finite being.* Theſe are the forms of reaſoning in this ſpecies of ſyllogiſms, the juſtneſs of which appears at firſt ſight; and that there can be no other, is evident from the very nature of a disjunctive propoſition.

In the ſeveral kinds of ſyllogiſms hitherto mentioned, the parts are complete, that is, the three propoſitions of which they conſiſt are repreſented in form. But it often happens, that ſome one of the premiſſes is not only an evident truth, but alſo familiar and in the minds of all men; in which caſe it is uſually omitted, whereby we have an imperfect ſyllogiſm, that ſeems to be made up of only two propoſitions. Should we, for inſtance, argue in this manner;

Every man is mortal;
Therefore every king is mortal:

the ſyllogiſm appears to be imperfect, as conſiſting but of two propoſitions. Yet it is really complete, only the *minor* [*Every king is a man*] is omitted, and left to the reader to ſupply, as being a propoſition ſo familiar and evident, that it cannot eſcape him.

Theſe ſeemingly imperfect ſyllogiſms are called *enthymemes*, and occur very frequently in reaſoning, eſpecially where it makes a part of common converſation. Nay, there is a particular elegance in them; becauſe, not diſplaying the argument in all its parts, they leave ſomewhat to the exerciſe and invention of the mind. By this means we are put upon exerting ourſelves, and ſeem to ſhare in the diſcovery of what is propoſed to us. Now this is the great ſecret of fine writing, ſo to frame and put together our thoughts, as to give full play to the reader's imagination, and draw him inſenſibly into our very views and courſe of reaſoning. This gives a pleaſure not unlike to that which the author himſelf feels in compoſing. It beſides ſhortens dicourſe, and adds a certain force and livelineſs to our arguments, when the words in which they are conveyed favour the natural quickneſs of the mind in its operations, and a ſingle expreſſion is left to exhibit a whole train of thoughts.

But there is another ſpecies of reaſoning with two propoſitions, which ſeems to be complete in itſelf, and where we admit the concluſion without ſuppoſing any tacit or ſuppreſſed judgment in the mind from which it follows ſyllogiſtically. This happens between propoſitions where the connection is ſuch that the admiſſion of the one neceſſarily and at the firſt ſight implies the admiſſion alſo of the other. For if it ſo falls out, that the propoſition on which the other depends is ſelf-evident, we content ourſelves with barely affirming it, and infer that other by a direct concluſion. Thus, by admitting an univerſal propoſition, we are forced alſo to admit of all the particular propoſitions comprehended under it, this being the very condition that conſtitutes a propoſition univerſal. If then that univerſal propoſition chances to be ſelf-evident, the particular ones follow of courſe, without any farther train of reaſoning. Whoever allows, for inſtance, *that things equal to one and the ſame things are equal to one another*, muſt at the ſame time allow, *that two triangles, each equal to a ſquare whoſe ſide is three inches, are alſo equal between themſelves.* This argument therefore,

Things equal to one and the ſame thing are equal to one another;
Therefore theſe two triangles, each equal to the ſquare of a line of three inches, are equal between themſelves,

is complete in its kind, and contains all that is neceſſary towards a juſt and legitimate concluſion. For the firſt or univerſal propoſition is ſelf-evident, and therefore requires no farther proof. And as the truth of the particular is inſeparably connected with that of the univerſal, it follows from it by an obvious and unavoidable conſequence.

Now in all caſes of this kind, where propoſitions are deduced one from another, on account of a known and evident connection, we are ſaid to reaſon by *immediate conſequence.* Such a coherence of propoſitions, manifeſt at firſt ſight, and forcing itſelf upon the mind, frequently occurs in reaſoning. Logicians have explained at ſome length the ſeveral ſuppoſitions upon which it takes place, and allow of all *immediate conſequences* that follow in conformity to them. It is however obſervable, that theſe arguments, though ſeemingly complete, becauſe the concluſion follows neceſſarily from the ſingle propoſition that goes before, may yet be conſidered as real *enthymemes*, whoſe *major*, which is a conditional propoſition, is wanting. The ſyllogiſm but juſt mentioned, when repreſented according to this view, will run as follows:

If things equal to one and the ſame thing are equal to one another; theſe two triangles, each equal to a ſquare whoſe ſide is three inches, are alſo equal between themſelves.

But things equal to one and the ſame thing, are equal to one another;

Therefore alſo theſe triangles, &c. *are equal between themſelves.*

This obſervation will be found to hold in all *immediate conſequences* whatſoever, inſomuch that they are in fact no more than *enthymemes* of hypothetical ſyllogiſms. But then it is particular to them, that the ground on which the concluſion reſts, namely, its coherence with the *minor*, is of itſelf apparent, and ſeen immediately to flow from the rules and reaſons of logic.

The next ſpecies of reaſoning we ſhall take notice of is what is known by the name of a *ſorites*. This is a way of arguing, in which a great number of propoſitions are ſo linked together, that the predicate of one becomes continually the ſubject of the next following, until at laſt a concluſion is formed, by bringing together the ſubject of the firſt propoſition, and the predicate of the laſt. Of this kind is the following argument.

God is omnipotent.

An omnipotent being can do every thing poſſible.

He that can do every thing poſſible, can do whatever involves not a contradiction.

Therefore God can do whatever involves not a contradiction.

This particular combination of propoſitions, may be continued to any length we pleaſe, without in the leaſt weakening the ground upon which the concluſion reſts. The reaſon is, becauſe the *ſorites* itſelf may be reſolved into as many ſimple ſyllogiſms as there are middle terms in it; where this is found univerſally to hold, that when ſuch a reſolution is made, and the ſyllogiſms are placed in train, the concluſion of the laſt in the ſeries is alſo the concluſion of the *ſorites*. This kind of argument therefore, as it ſerves to unite ſeveral ſyllogiſms into one, muſt ſtand upon the ſame foundation with the ſyllogiſms of which it conſiſts, and is indeed, properly ſpeaking, no other than a compendious way of reaſoning ſyllogiſtically.

What is here ſaid of plain ſimple propoſitions, may be as well applied to thoſe that are conditional; that is, any number of them may be ſo joined together in a ſeries, that the conſequent of one ſhall become continually the antecedent of the next following; in which caſe, by eſtabliſhing the antecedent of the firſt propoſition, we eſtabliſh the conſequent of the laſt, or, by removing the laſt conſequent, remove alſo the firſt antecedent. This way of reaſoning is exemplified in the following argument.

If we love any perſon, all emotions of hatred towards him ceaſe.

If all emotions of hatred towards a perſon ceaſe, we cannot rejoice in his misfortunes.

If we rejoice not in his misfortunes, we certainly wiſh him no injury.

Therefore if we love a perſon, we wiſh him no injury.

It is evident that this *ſorites*, as well as the laſt, may be reſolved into a ſeries of diſtinct ſyllogiſms; with this only difference, that here the ſyllogiſms are all conditional.

We come now to that kind of argument which logicians called *induction*; in order to the right underſtanding of which, it will be neceſſary to obſerve, that our general ideas are for the moſt part capable of various ſubdiviſions. Thus the idea of the loweſt ſpecies may be ſubdivided into its ſeveral individuals, the idea of any genus into the different ſpecies it comprehends, and ſo of the reſt. If then we ſuppoſe this diſtribution to be duly made, and ſo as to take in the whole extent of the idea to which it belongs; then it is plain, that all the ſubdiviſions or parts of any idea together conſtitute that whole idea. Thus the ſeveral individuals of any ſpecies taken together conſtitute the whole ſpecies, and all the various ſpecies comprehended under any genus make up the whole genus. This being allowed, whatever may be affirmed of all the ſeveral ſubdiviſions and claſſes of any idea, ought to be affirmed of the whole general idea to which theſe ſubdiviſions belong. What may be affirmed of all the individuals of any ſpecies, may be affirmed of the whole ſpecies, and what may be affirmed of all the ſpecies of any genus may be alſo affirmed of the whole genus; becauſe all the individuals taken together are the ſame with the ſpecies, and all the ſpecies taken together the ſame with the genus.

This way of arguing, where we infer univerſally concerning any idea what we had before affirmed or denied ſeparately of all its ſeveral ſubdiviſions and parts, is called reaſoning by *induction*. Thus if we ſuppoſe the whole tribe of animals, ſubdivided into men, beaſts, birds, inſects, and fiſhes, and then reaſon concerning them after this manner: *All men have a power of beginning motion; all beaſts, birds, and inſects, have a power of beginning motion; all fiſhes have a power of beginning motion; therefore all animals have a power of beginning motion:* the argument is an *induction*. When the ſubdiviſions are juſt, ſo as to take in the whole general idea, and the enumeration is perfect, that is, extends to all and every of the inferior claſſes or parts; there the *induction* is compleat, and the manner of reaſoning by *induction* is apparently concluſive.

The laſt ſpecies of ſyllogiſms we ſhall take notice of, is that commonly diſtinguiſhed by the name of a *dilemma*. A *dilemma* is an argumeet, by which we endeavour to prove the abſurdity or falſehood of ſome aſſertion. In order to this we aſſume a conditional propoſition, the antecedent of which is the aſſertion to be diſproved, and the conſequent a disjunctive propoſition, enumerating all the poſſible ſuppoſitions upon which that aſſertion can take place. If then it appears, that all the ſeveral ſuppoſitions ought to be rejected, it is plain that the antecedent or aſſertion itſelf muſt be ſo too. When therefore ſuch a propoſition as that before-mentioned is made the *major* of any ſyllogiſm; if the *minor* rejects all the ſuppoſitions contained in the conſequent, it follows neceſſarily, that the concluſion ought to reject the antecedent, which, as we have ſaid, is the very aſſertion to be diſproved. This particular way of arguing is that which logicians call a *dilemma*; and from the account here given of it, it appears, that we may in the general define it to be *a hypothetical ſyllogiſm, where the conſequent of the major is a disjunctive propoſition, which is wholly taken away or removed in the minor.* Of this kind is the following:

If God did not create the world perfect in its kind, it

> *muſt either proceed from want of inclination, or from want of power.*
> *But it could not proceed either from want of inclination, or from want of power:*
> *Therefore he created the world perfect in its kind;* or, which is the ſame thing, *It is abſurd to ſay that he did not create the world perfect in its kind.*

The nature then of a *dilemma* is univerſally this. The *major* is a conditional propoſition, whoſe conſequent contains all the ſeveral ſuppoſitions upon which the antecedent can take place. As therefore theſe ſuppoſitions are wholly removed in the *minor*, it is evident that the antecedent muſt be ſo too; inſomuch that we here always argue from the removal of the conſequent to the removal of the antecedent. That is, a *dilemma* is an argument in the *modus tollens* of hypothetical ſyllogiſms, as logicians ſpeak. Hence it is plain, that if the antecedent of the *major* is an affirmative propoſition, the concluſion of the *dilemma* will be negative; but if it is a negative propoſition, the concluſion will be affirmative.

Of Demonſtration.

Having diſpatched what ſeemed neceſſary with regard to the forms of ſyllogiſms, we ſhall now explain their uſe and application in reaſoning. We have ſeen, that in all the different appearances they put on, we ſtill arrive at a juſt and legitimate concluſion: now it often happens, that the concluſion of one ſyllogiſm becomes a previous propoſition in another, by which means great numbers of them are ſometimes linked together in a ſeries, and truths are made to follow one another in train. And as in ſuch a concatenation of ſyllogiſms, all the various ways of reaſoning that are truly concluſive may be with ſafety introduced; hence it is plain, that in deducing any truth from its firſt principles, eſpecially where it lies at a conſiderable diſtance from them, we are at liberty to combine all the ſeveral kinds of arguments above explained, according as they are found beſt to ſuit the end and purpoſe of our inquiries. When a propoſition is thus, by means of ſyllogiſms, collected from others more evident and known, it is ſaid to be *proved;* ſo that we may in the general define *the proof of the propoſition* to be a ſyllogiſm, or ſeries of ſyllogiſms, collecting that propoſition from known and evident truths. But more particularly, if the ſyllogiſms of which the proof conſiſts admit of no premiſſes but definitions, ſelf-evident truths, and propoſitions already eſtabliſhed, then is the argument ſo conſtituted called a *demonſtration;* whereby it appears, that demonſtrations are ultimately founded on definitions and ſelf-evident propoſitions.

All ſyllogiſms whatſoever, whether compound, multiform, or defective, are reducible to plain ſimple ſyllogiſms in ſome one of the four figures. But this is not all. Syllogiſms of the firſt figure in particular, admit of all poſſible concluſions: that is, any propoſition whatſoever, whether an univerſal affirmative, or univerſal negative, a particular affirmative, or particular negative, which fourfold diviſion embraces all their varieties; any one of theſe may be inferred, by virtue of ſome ſyllogiſm in the firſt figure. By this means the ſyllogiſms of all the other figures are reducible alſo to ſyllogiſms of the firſt figure, and may be conſidered as ſtanding on the ſame foundation with them. We cannot here demonſtrate and explain the manner of this reduction. It is enough to take notice, that the thing is univerſally known and allowed among logicians, to whoſe writings we refer ſuch as deſire farther ſatisfaction in this matter. This then being laid down, it is plain, that any demonſtration whatſoever may be conſidered as compoſed of a ſeries of ſyllogiſms, all in the firſt figure. For ſince all the ſyllogiſms that enter the demonſtration are reducible to ſyllogiſms of ſome one of the four figures, and ſince the ſyllogiſms of all the other figures are farther reducible to ſyllogiſms of the firſt figure, it is evident, that the whole demonſtration may be reſolved into a ſeries of theſe laſt ſyllogiſms. Let us now, if poſſible, diſcover the ground upon which the concluſion reſts, in ſyllogiſms of the firſt figure; becauſe, by ſo doing, we ſhall come at an univerſal principle of certainty, whence the evidence of all demonſtrations in all their parts may be ultimately derived.

The rules then of the firſt figure are theſe. The *middle term* is the ſubject of the *major* propoſition, and the predicate of the *minor*. The *major* is always an univerſal propoſition, and the *minor* always affirmative. Let us now ſee what effect theſe rules will have in reaſoning. The *major* is an univerſal propoſition, of which the *middle term* is the ſubject, and the *predicate of the concluſion* the predicate. Hence it appears, that in the *major*, the *predicate of the concluſion* is always affirmed or denied univerſally of the *middle term*. Again, the *minor* is an affirmative propoſition, whereof the *ſubject of the concluſion* is the ſubject, and the *middle term* the predicate. Here then the *middle term* is affirmed of the *ſubject of the concluſion;* that is, the *ſubject of the concluſion* is affirmed to be comprehended under, or to make a part of the *middle term*. Thus then we ſee what is done in the *premiſſes* of a ſyllogiſm of the firſt figure. The *predicate of the concluſion* is univerſally affirmed or denied of ſome idea. The *ſubject of the concluſion* is affirmed to be or to make a part of that idea. Hence it naturally and unavoidably follows, that the *predicate of the concluſion* ought to be affirmed or denied of the ſubject. To illuſtrate this by an example, we ſhall reſume one of the former ſyllogiſms.

> *Every creature poſſeſſed of reaſon and liberty is accountable for his actions.*
> *Man is a creature poſſeſſed of reaſon and liberty.*
> *Therefore man is accountable for his actions.*

Here, in the firſt propoſition, the predicate of the concluſion, *accountableneſs*, is affirmed of all creatures that have *reaſon and liberty*. Again, in the ſecond propoſition, *man*, the ſubject of the concluſion, is affirmed to be or to make a part of the claſs of creatures. Hence the concluſion neceſſarily and unavoidably follows, *viz. that man is accountable for his actions;* becauſe if reaſon and liberty be that which conſtitutes a creature *accountable*, and *man* has reaſon and liberty, it is plain he has that which conſtitutes him *accountable*. In like manner, where the *major* is a negative propoſition, or denies the *predicate of the concluſion* univerſally of the *middle term*, as the *minor* always aſſerts the *ſubject of the concluſion*, to be or make a part of that *middle term*, it is no leſs evident, that the *predicate of the*

the concluſion ought in this caſe to be denied of the *ſubject*. So that the ground of reaſoning in all ſyllogiſms of the firſt figure is manifeſtly this. *Whatever may be affirmed univerſally of any idea, may be affirmed of every or any number of particulars comprehended under that idea.* And again: *Whatever may be denied univerſally of any idea, may be in like manner denied of every or any number of its individuals.* Theſe two propoſitions are called by logicians the *dictum de omni*, and *dictum de nullo*, and are indeed the great principles of ſyllogiſtic reaſoning, inaſmuch as all concluſions whatſoever either reſt immediately upon them, or upon propoſitions deduced from them. But what adds greatly to their value is, that they are really ſelf-evident truths, and ſuch as we cannot gainſay without running into an expreſs contradiction. To affirm, for inſtance, that *no man is perfect*, and yet argue that *ſome men are perfect*; or to ſay that *all men are mortal*, and yet that *ſome men are not mortal*, is to aſſert a thing to be and not to be at the ſame time.

And now we may affirm, that in all ſyllogiſms of the firſt figure, if the *premiſſes* are true, the *concluſion* muſt needs be true. If it be true that the *predicate of the concluſion*, whether affirmative or negative, agrees univerſally to ſome idea, and if it be alſo true that the *ſubject of the concluſion* is a part of or comprehended under that idea, then it neceſſarily follows, that the *predicate of the concluſion* agrees alſo to the *ſubject*. For to aſſert the contrary, would be to run counter to ſome one of the two principles before eſtabliſhed; that is, it would be to maintain an evident contradiction. And thus we are come at laſt to the point we have been all along endeavouring to eſtabliſh, namely, That every propoſition which can be demonſtrated is neceſſarily true. For as every demonſtration may be reſolved into a ſeries of ſyllogiſms all in the firſt figure, and as, in any one of theſe ſyllogiſms, if the premiſſes are true, the concluſion muſt be ſo too; it evidently follows, that if all the ſeveral premiſſes are true, all the ſeveral concluſions are ſo, and conſequently the concluſion alſo of the laſt ſyllogiſm, which is always the propoſition to be demonſtrated. Now that all the premiſſes of a demonſtration are true, will eaſily appear from the very nature and definition of that form of reaſoning. A demonſtration is a ſeries of ſyllogiſms, all whoſe premiſſes are either definitions, ſelf-evident truths, or propoſitions already eſtabliſhed. Definitions are identical propoſitions, wherein we connect the deſcription of an idea with the name by which we chuſe to have that idea called; and therefore as to their truth there can be no diſpute. Self-evident propoſitions appear true of themſelves, and leave no doubt or uncertainty in the mind. Propoſitions before eſtabliſhed are no other than concluſions gained by one or more ſteps from definitions and ſelf-evident principles, that is, from true premiſſes, and therefore muſt needs be true. Whence all the previous propoſitions of a demonſtration being manifeſtly true, the laſt concluſion or propoſition to be demonſtrated muſt be ſo too. So that demonſtration not only leads to certain truth, but we have here alſo a clear view of the ground and foundation of that certainty. For as, in demonſtrating, we may be ſaid to do nothing more than combine a ſeries of ſyllogiſms together, all reſting on the ſame bottom; it is plain, that one uniform ground of certainty runs through the whole, and that the concluſions are every where built upon ſome one of the two principles before eſtabliſhed as the foundation of all our reaſoning. Theſe two principles are eaſily reduced into one, and may be expreſſed thus. *Whatever predicate, whether affirmative or negative, agrees univerſally to any idea, the ſame muſt needs agree to every or any number of individuals comprehended under that idea.* And thus we have reduced the certainty of demonſtration to one ſimple and univerſal principle, which carries its own evidence along with it, and which is indeed the ultimate foundation of all ſyllogiſtic reaſoning.

Demonſtration therefore ſerving as an infallible guide to truth, and ſtanding on ſo ſure and unalterable a baſis, we may now venture to aſſert, that the rules of logic furniſh a ſufficient *criterion* for the diſtinguiſhing between truth and falſehood. For ſince every propoſition that can be demonſtrated is neceſſarily true, he is able to diſtinguiſh truth from falſehood, who can with certainty judge when a propoſition is duly demonſtrated. Now a demonſtration is nothing more than a concatenation of ſyllogiſms, all whoſe premiſſes are definitions, ſelf-evident truths, or propoſitions previouſly eſtabliſhed. To judge therefore of the validity of a demonſtration, we muſt be able to diſtinguiſh, whether the definitions that enter it are genuine, and truly deſcriptive of the ideas they are meant to exhibit; whether the propoſitions aſſumed without proof as intuitive truths have really that ſelf-evidence to which they lay claim; whether the ſyllogiſms are drawn up in due form, and agreeable to the laws of argumentation; in fine, whether they are combined together in a juſt and orderly manner, ſo that no demonſtrable propoſitions ſerve any where as premiſſes, unleſs they are concluſions of previous ſyllogiſms. Now it is the buſineſs of logic, in explaining the ſeveral operations of the mind, fully to inſtruct us in all theſe points. It teaches the nature and end of definitions, and lays down the rules by which they ought to be framed. It unfolds the ſeveral ſpecies of propoſitions, and diſtinguiſhes the ſelf evident from the demonſtrable. It delineates alſo the different forms of ſyllogiſms, and explains the laws of argumentation proper to each. In fine, it deſcribes the manner of combining ſyllogiſms, ſo as that they may form a train of reaſoning, and lead to the ſucceſſive diſcovery of truth. The precepts of logic therefore, as they enable us to judge with certainty when a propoſition is duly demonſtrated, furniſh a ſure *criterion* for the diſtinguiſhing between truth and falſehood.

But perhaps it may be objected, that demonſtration is a thing very rare and uncommon, as being the prerogative of but a few ſciences, and therefore the *criterion* here given can be of no great uſe. But where ever, by the bare contemplation of our ideas, truth is diſcoverable, there alſo demonſtration may be attained. Now that is an abundantly ſufficient *criterion*, which enables us to judge with certainty in all caſes where the knowledge of truth comes within our reach; for with diſcoveries, that lie beyond the limits of the human mind, we have properly no buſineſs. When a propoſition is demonſtrated, we are certain of its truth. When, on the contrary, our ideas are ſuch as have no viſible connection nor repugnance, and therefore furniſh not the proper means of tracing their agreement or diſagreement, there we are ſure that ſcientifical knowledge is not attainable. But where there is ſome foundation of reaſoning, which yet amounts not to the full evidence of demonſtration, there the precepts of logic, by teaching us to determine aright of the degree of proof, and of what is ſtill wanting to render it full and complete, enable us to make a due eſtimate of the meaſures of probability, and to proportion our aſſent to the grounds on which the propoſition ſtands. And this is all we can poſſibly arrive at, or even ſo much as hope for, in the exerciſe of faculties ſo imperfect and limited as ours.

We conclude it may not be improper to take notice of the diſtinction of demonſtration into *direct* and *indirect*. A *direct demonſtration* is, when beginning with definitions, ſelf-evident propoſitions, or known and allowed truths, we form a train of ſyllogiſms, and combine them in an orderly manner, continuing the ſeries through a variety of ſucceſſive ſteps, until at laſt we arrive at a ſyllogiſm, whoſe concluſion is the propoſition to be demonſtrated. Proofs of this kind leave no doubt or uncertainty behind them, becauſe all the ſeveral premiſſes being true, the concluſions muſt be ſo too, and of courſe the very laſt concluſion or propoſition to be proved. The other ſpecies of demonſtration is the *indirect*, or, as it is ſometimes called, the *apogogical*. The manner of proceeding here is, by aſſuming a propoſition which directly contradicts that we mean to demonſtrate, and thence by a continued train of reaſoning, in the way of a direct demonſtration, deducing ſome abſurdity or manifeſt untruth. For hereupon we conclude that the propoſition aſſumed was falſe, and thence again, by an immediate conſequence, that the propoſition to be demonſtrated is true. Thus *Euclid*, in his third book, being to demonſtrate, *that circles which touch one another inwardly have not the ſame centre*, aſſumes the direct contrary to this, *viz. that they have the ſame centre*, and thence by an evident train of reaſoning proves *that a part is equal to the whole*. That ſuppoſition therefore, leading to this abſurdity, he concludes to be falſe, *viz. that circles touching one another inwardly have the ſame centre*, and thence again immediately infers *that they have not the ſame centre*.

Now becauſe this manner of demonſtration is accounted by ſome not altogether ſo clear and ſatisfactory, we ſhall therefore endeavour here to ſhew, that it equally with the other leads to truth and certainty. Two propoſitions are ſaid to be *contradictory* one of another, when that which is aſſerted to be in the one is aſſerted not to be in the other. Thus the propoſitions, *circles that touch one another inwardly have the ſame centre*, and *circles that touch one another inwardly have not the ſame centre*, are *contradictories*; becauſe the ſecond aſſerts the direct contrary of what is aſſerted in the firſt. Now in all contradictory propoſitions this holds univerſally, that one of them is neceſſarily true, and the other neceſſarily falſe. For if it be true, that circles which touch one another inwardly have not the ſame centre, it is unavoidably falſe that they have the ſame centre. On the other hand, if it be falſe that they have the ſame centre, it is neceſſarily true that they have not the ſame centre. Since therefore it is impoſſible for them to be both true or both falſe at the ſame time, it unavoidably follows, that one is neceſſarily true, and the other neceſſarily falſe. This then being allowed, if any two contradictory propoſitions are aſſumed, and one of them can by a clear train of reaſoning be demonſtrated to be falſe, it neceſſarily follows that the other is true. For as the one is neceſſarily true, and the other neceſſarily falſe, when we come to diſcover which is the falſe propoſition, we thereby alſo know the other to be true.

Now this is preciſely the manner of an indirect demonſtration. For there we aſſume a propoſition, which directly contradicts that we mean to demonſtrate, and having by a continued ſeries of proofs ſhewn it to be falſe, thence infer that its contradictory, or the propoſition to be demonſtrated, is true. As therefore this laſt concluſion is certain and unavoidable, let us next inquire, after what manner we come to be ſatisfied of the falſehood of the aſſumed propoſition, that ſo no poſſible doubt may remain as to the force and validity of demonſtrations of this kind. The manner then is plainly this. Beginning with the aſſumed propoſition, we, by the help of definitions, ſelf-evident truths, or propoſitions already eſtabliſhed, continue a ſeries of reaſoning in the way of a direct demonſtration, until at length we arrive at ſome abſurdity or known falſehood. Thus *Euclid*, from the ſuppoſition that circles touching one another inwardly have the ſame centre, deduces *that a part is equal to the whole*. Since therefore, by a due and orderly proceſs of reaſoning, we come at laſt to a falſe concluſion, it is manifeſt that all the premiſſes cannot be true. For were all the premiſſes true, the laſt concluſion muſt be ſo too. Now as to all the other premiſſes made uſe of in the courſe of reaſoning, they are manifeſt and known truths by ſuppoſition, as being either definitions, ſelf-evident propoſitions, or truths previouſly eſtabliſhed. The aſſumed propoſition is that only as to which any doubt or uncertainty remains. That alone therefore can be falſe, and indeed, from what has been already ſhewn, muſt unavoidably be ſo. And thus we ſee, that, in indirect demonſtrations, two contradictory propoſitions being laid down, one of which is demonſtrated to be falſe, the other, which is always the propoſition to be proved, muſt neceſſarily be true; ſo that here, as well as in the direct way of proof, we arrive at a clear and ſatisfactory knowledge of truth.

This is univerſally the method of reaſoning in all apogogical or indirect demonſtrations; but if any propoſition is aſſumed, from which in a direct train of reaſoning we can deduce its contradictory, the propoſition ſo aſſumed is falſe, and the contradictory one true. For if we ſuppoſe the aſſumed propoſition to be true, then, ſince all the other premiſſes that enter the demonſtration are alſo true, we ſhall have a ſeries of reaſoning, conſiſting wholly of true premiſſes; whence the laſt concluſion or contradictory of the aſſumed propoſition muſt be true likewiſe. So that by this means we ſhould have two contradictory propoſitions both true at the ſame time, which is manifeſtly impoſible. The aſſumed propoſition therefore, whence this abſurdity flows, muſt neceſſarily be falſe, and conſequently its contradictory, which is here the propoſition deduced from it, muſt be true. If then any propoſition is propoſed to be demonſtrated, and we *aſſume* the *contradictory* of that propoſition, and thence directly infer the propoſition to be demonſtrated, by this very means we know that the propoſition ſo inferred is true. For ſince from an aſſumed propoſition we have deduced its contradictory, we are thereby certain that the aſſumed propoſition is falſe; and if ſo, then its contradictory, or that deduced from it, which in this caſe is the ſame with the propoſition to be demonſtrated, muſt be true.

We have a curious inſtance of this in the twelfth propoſition of the ninth book of the elements. *Euclid* there propoſes to demonſtrate, *that in any ſeries of numbers, riſing from unity in geometrical progreſſion, all the prime numbers that meaſure the laſt term in the ſeries will alſo meaſure the next after unity.* In order to this he aſſumes the contradictory of the propoſition to be demonſtrated, namely; *that ſome prime number meaſuring the laſt term in the ſeries, does not meaſure the next after unity;* and thence, by a continued train of reaſoning, proves, that it actually does meaſure it. Hereupon he concludes the aſſumed propoſition to be falſe, and that which is deduced from it, or its contradictory, which is the very propoſition he propoſed to demonſtrate, to be true. Now that this is a juſt and concluſive way of reaſoning, is abundantly manifeſt from what we have ſo clearly eſtabliſhed above.

Having thus ſufficiently evinced the certainty of demonſtration in all its branches, and ſhewn the rules by which we ought to proceed, in order to arrive at a juſt concluſion, according to the various ways of arguing made uſe of; it is needleſs to enter upon a particular conſideration of thoſe ſeveral ſpecies of falſe reaſoning, which logicians diſtinguiſh by the name of *ſophiſms*. He that throughly underſtands the form and ſtructure of a good argument, will of himſelf readily diſcern every deviation from it. And although *ſophiſms* have been divided into many claſſes, which are all called by ſounding names, that therefore carry in them much appearance of learning; yet are the errors themſelves ſo very palpable and obvious, that it is loſt labour to write for a man capable of being miſled by them. Here therefore we chuſe to conclude this ſecond part of logic, and ſhall in the next part give ſome account of *method*, which, though inſeparable from reaſoning, is nevertheleſs always conſidered by logicians as a diſtinct operation of the mind; becauſe its influence is not confined to the mere exerciſe of the reaſoning faculty, but extends in ſome degree to all the tranſactions of the underſtanding.

PART III. *Of* METHOD.

Of method in general, and the diviſion of it into analytick and ſynthetick.

WE have now done with the two firſt operations of the mind, whoſe office it is to ſearch after truth, and enlarge the bounds of human knowledge. There is yet a third, which regards the diſpoſal and arrangement of our thoughts, when we endeavour ſo to put them together that their mutual connection and dependence may be clearly ſeen. This is what logicians call *method*, and place always the laſt in order in explaining the powers of the underſtanding; becauſe it neceſſarily ſuppoſes a previous exerciſe of our other faculties, and ſome progreſs made in knowledge, before we can exert it in any extenſive degree.

In this view it is plain, that we muſt be before-hand well acquainted with the truths we are to combine together; otherwiſe how could we diſcern their ſeveral connections and relations, or ſo diſpoſe of them as their mutual dependence may require? But it often happens, that the underſtanding is employed, not in the arrangement and compoſition of known truths, but in the ſearch and diſcovery of ſuch as are unknown. And here the manner of proceeding is very different. We aſſemble at once our whole ſtock of knowledge relating to any ſubject; and, after a general ſurvey of things, begin with examining them ſeparately and by parts. Hence it comes to paſs, that whereas, at our firſt ſetting out, we were acquainted only with ſome of the grand ſtrokes and outlines of truth, by thus purſuing her through her ſeveral windings and receſſes we gradually diſcover thoſe more inward and finer touches whence ſhe derives all her ſtrength, ſymmetry, and beauty. And here it is, that when, by a narrow ſcrutiny into things, we have unravelled any part of knowledge, and traced it to its firſt and original principles, inſomuch that the whole frame and contexture of it lies open to the view of the mind; here it is, that taking it the contrary way, and beginning with theſe principles, we can ſo adjuſt and put together the parts, as the order and method of ſcience requires.

But as theſe things are beſt underſtood when illuſtrated by examples; let us ſuppoſe any machine, for inſtance a watch, preſented to us, whoſe ſtructure and compoſition we are as yet unacquainted with, but want if poſſible to diſcover. The manner of proceeding in this caſe is, by taking the whole to pieces, and examining the parts ſeparately one after another. When by ſuch a ſcrutiny we have throughly informed ourſelves of the frame and contexture of each, we then compare them together, in order to judge of their mutual action and influence. By this means we gradually trace out the inward make and compoſition of the whole, and come at length to diſcern, how parts of ſuch a form, and ſo put together, as we found in unravelling and taking them aſunder, conſtitute that particular machine called a watch, and contribute to all the ſeveral motions and phænomena obſervable in it. This diſcovery being made, we can take things the contrary way, and, beginning with the parts, ſo diſpoſe and connect them, as their ſeveral uſes and ſtructures require, until at length we arrive at the whole itſelf, from the unravelling of which theſe parts reſulted.

And as it is in tracing and examining the works of art, ſo is it in a great meaſure in unfolding any part of human knowledge. For the relations and mutual habitudes of things do not always immediately appear upon comparing them one with another. Hence we have recourſe to intermediate ideas, and by means of them are furniſhed with thoſe previous propoſitions, that lead to the concluſion we are in queſt of. And if it ſo happen, that the previous propoſitions themſelves are not ſufficiently evident, we endeavour by new middle terms to aſcertain their truth, ſtill tracing things backward in a continued ſeries, until at length we arrive at ſome ſyllogiſm where the premiſſes are firſt and ſelf-evident principles. This done, we become perfectly ſatisfied as to the truth of all the concluſions we have paſſed through, in as much as they are now ſeen to ſtand upon the firm and immoveable foundation of our intuitive perceptions. And as we arrived at this certainty by tracing things backward to the original principles whence they flow, ſo may we at any time renew it by a direct contrary proceſs, if, beginning with theſe principles, we carry the train of our thoughts forward, until they lead us by a connected chain of proofs to the very laſt concluſion of the ſeries.

Hence it appears, that in diſpoſing and putting together our thoughts, either for our own uſe, that the diſcoveries we have made may at all times lie open to the review of the mind, or where we mean to communicate and unfold theſe diſcoveries to others, there are two ways of proceeding equally within our choice. For we may ſo propoſe the truths relating to any part of knowledge, as they preſented themſelves to the mind in the manner of inveſtigation, carrying on the ſeries of proofs in a reverſe order, until they at laſt terminate in firſt principles: or, beginning with theſe principles, we may take the contrary way, and from them deduce, by a direct train of reaſoning, all the ſeveral propoſitions we want to eſtabliſh. This diverſity in the manner of arranging our thoughts gives riſe to the twofold diviſion of method eſtabliſhed among logicians. For method, according to their uſe of the word, is nothing elſe but the order and diſpoſition of our thoughts relating to any ſubject. When truths are ſo propoſed and put together, as they were or might have been diſcovered, this is called the *analytick method*, or the *method of reſolution*; in as much as it traces things backward to their ſource, and *reſolves* knowledge into its firſt and original principles. When, on the other hand, they are deduced from theſe principles, and connected according to their mutual dependence, inſomuch that the truths firſt in order tend always to the demonſtration of thoſe that follow, this conſtitutes what we call the *ſynthetick method*, or *method of compoſition*; for here we proceed by gathering together the ſeveral ſcattered parts of knowledge, and *combining* them into one whole ſyſtem, in ſuch manner, that the underſtanding is enabled diſtinctly to follow truth through all her different ſtages and gradations.

There is this farther to be taken notice of, in relation to theſe two ſpecies of method; that the firſt has alſo obtained the name of the *method of invention*, becauſe it obſerves the order in which our thoughs ſucceed one another in the *invention* or diſcovery of truth. The other again is often denominated the *method of doctrine* or *inſtruction*; in as much as, in laying our thoughts before others, we generally chuſe to proceed in the *ſynthetick* manner, deducing them from their firſt principles. For we are to obſerve, that although there is great pleaſure in purſuing truth in the method of inveſtigation, becauſe it places us in the condition of the inventor, and ſhews the particular train and proceſs of thinking by which he arrived at his diſcoveries; yet is it not ſo well accommodated to the purpoſes of evidence and conviction. For at our firſt ſetting out, we are commonly unable to divine where the analyſis will lead us, inſomuch that our reſearches are for ſome time little better than a mere groping the dark. And even after light begins to beak in upon us, we are ſtill obliged to many reviews, and a frequent compariſon of the ſeveral ſteps of the inveſtigation among themſelves. Nay, when we have unravelled the whole, and reached the very foundation on which our diſcoveries ſtand, all our certainty in regard to their truth will be found in a great meaſure to ariſe from that connection we are now able to diſcern between them and firſt principles taken in the order of compoſition. But in the ſynthetick manner of diſpoſing our thoughts, the caſe is quite different. For as we here begin with intuitive truths, and advance by regular deductions from them, every ſtep of the procedure brings evidence and conviction along with it; ſo that in our progreſs from one part of knowledge to another, we have always a clear perception of the ground on which our aſſent reſts. In communicating therefore our diſcoveries to others, this method is apparently to be choſen, as it wonderfully improves and enlightens the underſtanding, and leads to an immediate perception of truth.

LOHOCH, or LOCH, in pharmacy, a compoſition of a middle conſiſtence between a ſoft electuary and a ſyrup, principally uſed in diſorders of the lungs.

There are ſeveral kinds of lohochs, denominated from the principal ingredient that enters into their compoſition. The common lohoch is made thus: take of freſh drawn oil of ſweet almonds, and of pectoral or balſamic ſyrup, one ounce; white-ſugar, two drams: mix, and make them into a lohoch.

LOINS, in anatomy, the two lateral parts of the umbilical region of the abdomen. See ANATOMY.

LOIRE, the largeſt river in France, riſes in the mountains of the Cevennes, and, after running a courſe of about five hundred miles, falls into the bay of Biſcay.

LOLIUM, DARNEL, in botany, a genus of the triandria digynia claſs. The involucrum conſiſts of one leaf; it has no calix; and the ſtipula conſiſts of many flowers. There are three ſpecies, two of them natives of Britain, *viz.* the perenne, or perennial darnel-graſs; and the temulentum, or annual darnel-graſs.

LOMBARDY, a kingdom which comprehended almoſt all Italy. It was erected by the Longobards, or Lombards, a German nation, about the year 598, and laſted till Charlemain put an end to it about the year 760.

LOMMOND, a lake in the county of Lenox, in Scotland, which runs almoſt the whole length of the county.

LONCHITIS, SPLEEN-WORT, in botany, a genus of the cryptogamia filicum claſs of plants, the fructifications of which are arranged into lunulated ſeries, and diſpoſed ſeparately under the ſinuſes of the leaves.

There are four ſpecies, none of them natives of Britain.

LONDON, the metropolis of Great Britain, where the firſt meridian is fixed on the Britiſh maps, lies in 51° 32′ N. lat. on the river Thames, and the greateſt part on the north-ſide of that river. The form of London, including Weſtminſter and Southwark, comes pretty near an oblong ſquare, five miles in length, if meaſured in a direct line from Hyde-Park to the end of Limehouſe, and ſix miles if we follow the windings of the ſtreets; the greateſt breadth is two miles and a half, and the circumference of the whole ſixteen or ſeventeen miles, but it is not eaſy to meaſure it exactly, on account of its irregular form. The principal ſtreets are generally level, exceeding well built, and extended to a very great length; theſe are inhabited by tradeſmen, whoſe houſes and ſhops make a much better figure than thoſe of any tradeſmen in Europe. People of diſtinction uſually reſide in elegant ſquares, of which there are great numbers at the weſt end of the town near the court. What moſtly contributes to the riches and glory of this city, is the port, whither ſeveral thouſand ſhips of burden annually reſort from all countries, and where the greateſt fleets never fail to meet with wealthy merchants ready to take off the richeſt cargoes. The number of perſons in the whole place are computed to be about eight hundred thouſand.

LONDONDERRY, a city of Ireland, in the province of Ulſter, and county of Londonderry, ſituated on the river Mourn, near its mouth, in W. long. 7° 40′, N. lat. 54° 52′.

LONG, an epithet given to whatever exceeds the uſual ſtandard of length; thus, we ſay a long-boat, long accent, *&c.*

LONGÆVITY, length of life.

Lord Bacon obſerves, that the ſucceſſion of ages, and of the generation of men, ſeems no way to ſhorten the length of human life, ſince the age of man, down from Moſes's time to the preſent, has ſtood at about eighty years, without gradually declining, as one might have expected. The greateſt inſtances of longævity in theſe our iſlands, are that of old Parr, who lived almoſt 153 years; of Jenkins, of Yorkſhire, who lived 169 years; or of the counteſs Deſmond, or Mr Eckleſton, both of Ireland, who each exceeded 140 years.

LONGFORD, a county of Ireland, in the province of Leinſter, bounded by the county of Letrim and Cavan on the north, by Meath on the eaſt and ſouth, and by Roſcommon on the weſt.

LONG-ISLAND, an iſland belonging to New York in North America, lying between 71° and 74° W. long. and in 41° 30′ N. lat.

LONGIMETRY, the art of meaſuring lengths, both acceſſible and inacceſſible. See GEOMETRY.

LONGINICO, a town of the Morea, in Europe, ſituated on the river Alpheus, fifty miles ſouth of Lepanto: being the ancient Olympia, where Hercules inſtituted the Olympic games.

LONGISSMUS DORSI, in anatomy. See ANATOMY, p. 218.

LONGITUDE *of a ſtar*, in aſtronomy, an arch of the ecliptic, intercepted between the beginning of aries, and the point of the ecliptic cut by the ſtar's circle of longitude.

LONGITUDE *of a place*. See GEOGRAPHY.

In the philoſophical tranſactions, n° 1, we have an account of a ſucceſsful experiment in finding the longitude at ſea, made with two pendulum-watches by major Holmes, in a voyage from the coaſt of Guinea homewards. This and ſome other ſucceſſes encouraged Monſieur Huygens ſo far, that, after he had improved the ſtructure of theſe watches, he publiſhed an account at large for the ſhewing how and in what manner theſe watches are to be uſed in finding the longitude at ſea, with directions for adjuſting of them and keeping a journal by them; which account the curious reader may ſee at large in the Philoſophical tranſactions, n° 47.

The chief objection againſt pendulum-clocks and watches, is the effects that heat and cold have upon the ſpring and pendulum, which make the ſpring in watches draw ſtronger at ſome times than at other times, and cauſes the pendulum to lengthen and ſhorten, according as the weather is hotter or colder; but theſe effects are ſo regular, that without doubt they may be accounted for.

But the moſt ingenious and ſucceſsful machines for this purpoſe have been invented by Mr. John Harriſon, who, at different times, contrived three different time-pieces for determining the longitude at ſea.

The firſt of Mr. Harriſon's machines was tried in May 1736, when it was put on board a man of war; and by its exact meaſure of time, in its return from Liſbon, corrected an error of almoſt a degree and an half in the computations of the reckoning of a ſhip. In 1739, Mr. Harriſon finiſhed his ſecond machine, which, from various experiments made upon it, was ſufficiently regular and exact for finding the longitude of a ſhip within the neareſt limits propoſed by parliament. Upon the ſucceſs of this, Mr. Harriſon, in 1741, undertook ſtill a more advantageous machine, which he finiſhed in 1758, when he applied to the commiſſioners of longitude for orders to make a trial of that inſtrument to ſome part in the Weſt Indies, as directed by the ſtatutes for the diſcovery of the longitude at ſea. In conſequenee of this application, Mr. Harriſon received orders for his ſon to proceed from Portſmouth to Jamaica, in one of his majeſty's ſhips of war, with his third inſtrument, in November 1761; and the commiſſioners having directed that every requiſite ſtep and precaution ſhould be taken, for making, with care, the proper experiments, and aſcertaining their accuracy, not only going to Jamaica, but in the return, it appears, from the calculations made from the experiments in going to Jamaica, that the difference between the longitude, as found by the time-piece, and calculated by the obſervations of the tranſit of mercury in 1743 at Jamaica and London, is five ſeconds of time, which at Jamaica is little more than a geographical mile.

During the voyage, Mr. Harriſon's time-piece corrected the ſhip's reckoning, which ſometimes erred about a degree and a half: and in going from Madeira to Jamaica, it alſo corrected the errors of the log, and ſhewed the longitude ſo exactly, that the ſhip made the iſland of Deſeada, and all the other iſlands, until they arrived at Jamaica, as foretold by the time-piece. At the arrival at Jamaica, the obſervations for finding the time were made by equal altitudes; and the longitude ſhewn by the time-piece, being within 5″ of time of the longitude ſhewn by the moſt accurate obſervations of mercury in its tranſit over the ſun in the year 1743, and with which all the obſervations at London and Paris agreeing within 23″, amounts to a demonſtration, that Mr. Harriſon has performed all that is required by the ſtatute of the 12th of queen Anne, to entitle him to the greateſt reward mentioned in that act. In returning from Jamaica, the weather was very tempeſtuous, ſo that the time piece was forced to be placed on the counter, to avoid being perpetually expoſed to the ſea water; there it ſuffered continual violent agitations, which, though they neceſſarily retarded its motion, yet did not occaſion any ſuch conſiderable error, as would have made Mr. Harriſon's right to the greateſt reward queſtionable, had it depended on this voyage only; for the time-keeper, in its going and return, loſt only 1′ 54″ and ½, which, in the latitude of Portſmouth, amounts to about eighteen geographical miles or minutes of a great circle, whereas the act required only that it ſhould come within the diſtance of thirty geographical miles or minutes of a great circle.

LONGITUDINAL, in general, denotes ſomething placed lengthwiſe; thus ſome of the fibres of the veſſels in the human body are placed longitudinally, others tranſverſely or acroſs.

LONGUEVILLE, a town of Normandy in France, twenty miles north of Rouen: E. long. 1° 10′, N. lat. 49° 50′

LONICERA, in botany, a genus of the pentandria monogynia claſs. The corolla conſiſts of one irregular petal; and the berry of two cells containing many ſeeds. There are 13 ſpecies, only one of which, *viz.* the periclymenum, or common honey-ſuckle, is a native of Britain.

LOOF, in the ſea language, is a term uſed in various ſenſes: thus, the loof of a ſhip is that part of her aloft, which lies juſt before the cheſt-tree; hence the guns which lie there are called loof-pieces: keep your loof, ſignifies, keep the ſhip near to the wind; to loof into a harbour, is to ſail into it cloſe by the wind; loof up, is to keep nearer the wind; to ſpring the loof, is when a ſhip that was going large before the wind, is brought cloſe by the wind.

LOOKING-GLASSES, are nothing but plain mirrours of glaſs; which being impervious to the light, reflect the images of things placed before them; for the theory whereof, ſee OPTICS.

LOOM, a frame compoſed of a variety of parts, uſed in all the branches of weaving. See WEAVING.

LOOSING of arreſtment, in Scots law. See LAW, Tit. xxv. 6.

LOPHIUS, in zoology, a genus of the branchioſtegious order of fiſhes, whoſe head is in ſize equal to all the reſt of the body: the head and body are both of a depreſſed form: there are a number of fleſhy pinnules or apendages ſurrounding the whole body of the fiſh. There are three ſpecies.

LORANTHUS, in botany, a genus of the hexandria monogynia claſs. The margin of the calix is entire; the corolla conſiſts of ſix ſegments folded backwards; and the berry contains one ſeed. There are five ſpecies, none of them natives of Britain.

LORD, a title of honour, given to thoſe who are noble, either by birth or creation; in this ſenſe it amounts to much the ſame as peer of the realm, or lord of Parliament. This title is, by courteſy, alſo given to all the ſons of dukes and marquiſes, and to the eldeſt ſons of earls; and it is alſo a title of honour beſtowed on thoſe who are honourable by their employments, as lord advocate, lord chamberlain, lord chancellor, *&c.*

LORETTO, a city of Italy, in the marquiſate of Ancona, in the pope's territories, 145 miles eaſt of Rome. This place is famous for the chamber of the bleſſed Virgin, which, according to the Roman catholic tradition, was brought by angels from Paleſtine to Dalmatia, and from thence tranſported over into Italy, and fixed at Loretto.

LORN, the north part of Argyleſhire in Scotland, bounded by Lochabar on the north, by Broadalbin on the eaſt, by the reſt of Argyleſhire on the ſouth, and by the ſea on the weſt.

LORRAIN, a duchy formerly belonging to the circle of the Upper Rhine in Germany, but now united to the crown of France. It is bounded by the duchy of Luxemburg on the north; by Alſatia, the duchy of Deux ponts, and the palatinate of the Rhine, on the eaſt; by the county of Burgundy, on the ſouth; and by Champaign, on the weſt.

LOTHIAN, a county of Scotland, bounded by the frith of Forth on the north; by the German ſea, on the eaſt; by Clydeſdale, Tweedale, and Merſe, on the ſouth; and by Stirling, on the weſt. The capital of this county is Edinburgh.

LOTION is, ſtrictly ſpeaking, ſuch waſhing as concerns beautifying the ſkin, by cleanſing it of thoſe deformities which a diſtempered blood ſometimes throws upon it, or rather are made by a preternatural ſecretion: for according to Quincy, generally thoſe diſtempers of the ſkin, commonly accounted ſigns of a foul blood, are, from thoſe ſalts which are natural in the beſt conſtitution, thrown off by the cutaneous glands, which ought to be waſhed away through the kidney; ſo that inſtead of thoſe inſignificant and ridiculous tribes of ſweeteners, which in this caſe are frequently uſed, promoting the urinary diſcharge, or rectifying that of the ſkin by proper waſhes, frictions, or ointments, or both together, is the only way to get rid of ſuch diſorders.

LOTTERY, a kind of public game at hazard, frequent in Britain, France, and Holland, in order to raiſe money for the ſervice of the ſtate; being appointed with us by the authority of parliament, and managed by commiſſioners appointed by the lords of the treaſury for that purpoſe. It conſiſts of ſeveral numbers of blanks and prizes, which are drawn out of wheels, one of which contains the numbers, and the other the correſponding blanks or prizes.

LOTUS, in botany, a genus of the diadelphia decandria claſs. The legumen is cylindrical; the wings are connivent above; and the calix is tubular. There are 17 ſpecies, only one of which, *viz.* the corniculata, or birds-foot trefoil, is a native of Britain.

LOVAGE, in botany. See LIGUSTICUM.

LOVE APPLE. See SOLANUM.

LOUIS, or *Knights of St.* LOUIS, the name of a military order in France, inſtituted by Louis XIV. in 1693. Their collars are of a flame colour, and paſs from left to right; the king is their grand maſter. There are in it eight great croſſes, and twenty four commanders; the number of knights is not limited. At the time of their inſtitution, the king charged his revenue with a fund of three hundred thouſand livres for the penſions of the commanders and knights.

LOUISIANA, or NEW FRANCE, a country of north America, bounded by the river and lake of Illenois on the north, North Carolina on the eaſt, and the gulph of Mexico on the ſouth.

LOUSE, in zoology. See PEDICULUS.

LOUTH, a county of Ireland, in the province of Leinſter, bounded by Monaghan and Armagh on the north, by the Iriſh Channel on the eaſt, by Eaſt Meath on the ſouth; and by Cavan on the weſt.

LOUVAIN, a city of the Auſtrian Netherlands, in the province of Brabant, ſituated on the river Dyle, fifteen miles north-eaſt of Bruſſels.

LOWERING, among diſtillers, a term uſed to expreſs the debaſing the ſtrength of any ſpiritous liquors, by mixing water with it.

LOXIA, in zoology, the name of a genus of birds of the order of the paſſeres; the diſtinguiſhing characters of which are, that the tongue is plain, equal and whole; the beak large, thick, and ſhort, and crooked and convex both ways. There are 48 ſpecies, principally diſtinguiſhed by their colour.

LOZENGE, in heraldry, a rhombus, or figure of equal ſides, but unequal angles, reſembling a quarry of glaſs in our old windows, placed erect, point ways. It is in this figure that all unmarried gentlewomen and widows bear their coats of arms, becauſe, as ſome ſay, it was the figure of the Amazonian ſhield; or, as others, becauſe it is the ancient figure of the ſpindle. Plate CIII. fig. 8. repreſents an ordinary of lozenges.

The lozenge differs from the fuſil, in that the latter is narrower in the middle, and not ſo ſharp at the ends.

LUBEC, a city and port-town of Germany, in the circle of Lower Saxony, and duchy of Holſtein, ſituated ten miles ſouth-weſt of the Baltic ſea: E. long. 10° 35′, N. lat. 54° 20′.

LUBEN, a town of Germany, in the circle of Upper Saxony, and marquiſate of Luſatia: E. long. 14° 25′, N. lat. 52°.

LUBLIN, a city of Poland, in the palatinate of the ſame name: E. long. 22° 15′, N lat. 51° 30′.

LUBOW, a town of Poland, in the palatinate of Cracow: E. long. 20° 30′, N. lat. 49° 30′.

LUC, a town of Provence, in France, twenty-three miles north-eaſt of Toulon.

LUCAR, or *St* LUCAR, a port-town of Spain, in the province of Andaluſia: W. long. 6° 38, N. lat. 36° 42′.

St LUCAR is alſo a town of Andaluſia, in Spain: W. long 8° 12. N. lat. 37° 20.

St LUCAR is alſo the name of another town of Spain, fifteen miles weſt of Seville.

LUCARNO, a town of the duchy of Milan, ſituated on the lake of Maggiore, but ſubject to Switzerland.

LUCCA, the capital of the republic of the ſame name in Italy, ſituated twelve miles eaſt of the Tuſcan ſea: E. long. 11° 20′, N. lat. 43° 45′.

LUCERN, the capital of the canton of the ſame name in Switzerland, ſituated on the lake Lucern, to which it gives its name: E. long. 8° 12′, N. lat. 47°.

LUCERNE, in botany. See MEDICAGO. For the culture of lucerne, ſee AGRICULTURE. p. 65.

LUCIA-ISLANDS, one of the Caribbee iſlands in America, ſituated ſeventy miles north-weſt of Barbadoes, being twenty-two miles long, and eleven broad.

St. LUCIA, one of the Cape Verd iſlands in Africa, lying in W. long. 25°, N. lat. 16° 30′.

LUCIOPERCA, in ichthyology. See PERCA.

LUCIUS, in ichthyology. See ESOX.

LUCONIA, or MANILLA, the chief of the Philippine iſlands, ſituated between 117° and 123° E. long. and between 12° and 19° of N. lat.

LUDLOW, a borough of Shropſhire, ſituated on the river Corve; eighteen miles ſouth of Shrewſbury. It ſends two members to parliament.

LUDWIGIA, in botany, a genus of the tetrandria monogynia claſs. The corolla conſiſts of four petals, and the calix of four ſegments; the capſule has four ſides and four cells, with many ſeeds. There are two ſpecies, none of them natives of Britain.

LUES, among phyſicians, is, in general, uſed for a diſeaſe of any kind; but, in a more particular ſenſe, is reſtrained to contagious and peſtilential diſeaſes: thus, the lues gallica, or venerea, ſignifies the venereal diſeaſe. See MEDICINE.

LUGGERSHAL, a borough-town, ten miles north of Saliſbury. It ſends two members to parliament.

LUGO, a city and biſhop's ſee of Spain, ſixty miles eaſt of Compoſtella: W. long. 7° 50′, and N. lat. 43° 5′.

LUKE, or *goſpel of St.* LUKE, a canonical book of the New Teſtament.

Some think it was properly St. Paul's goſpel, and that when that apoſtle ſpeaks of his goſpel, he means what is called St. Luke's. Irenæus ſays, that St. Luke digeſted into writing what St. Paul preached to the Gentiles; and Gregory Nazianzen tells us, that St. Luke wrote with the aſſiſtance of St. Paul.

St. LUKE *the evangeliſt's day*, a feſtival in the Chriſtian church, obſerved on the 18th of October.

LULA-LAPMARK, a province of Sweden, bounded on the north by that of Torne; on the eaſt, by the Bothnic gulph; on the ſouth, by Pithia-lapmark; and on the weſt, by Norway.

LUMBAGO, in medicine, denotes a pain about the loins, as that preceding fevers, agues, and the rheumatiſm.

LUMBARIS, a name given to the arteries and veins which ſpread over the loins. See ANATOMY.

LUMBRICAL, a name given to four muſcles of the fingers, and to as many of the toes. See ANATOMY, part II.

LUMBRICUS, the EARTH-WORM, in zoology, a genus of inſects belonging to the order of vermes inteſtina. The body is cylindrical, annulated, with an elevated belt near the middle. There is but one ſpecies of this animal. It lives under ground, and feeds upon the ſeeds and roots of plants. It comes above ground in the night, or during rain, for the purpoſe of copulation. For the effects of theſe animals in the human body, and the method of expelling them, ſee MEDICINE.

LUMME, in ornithology. See COLYMBUS.

LUMP-FISH. See CYCLOPTERUS.

LUNA, in aſtronomy, the moon. See ASTRONOMY.

LUNAR, ſomething belonging to the moon; thus we ſay, lunar month, lunar year, *&c.*

LUNARIA, HONESTY, in botany, a genus of the tetradynamia ſiliculoſa claſs. The ſilicula, or pod, is entire, elliptical, and compreſſed; with plain, equal, parallel valves. There are two ſpecies, none of them natives of Britain.

LUNATIC, a perſon affected with lunacy. See MEDICINE.

LUND, or LUNDEN, a city of Sweden, in the province of Gothland, the capital of the territory of Schonen, ſituated thirty miles eaſt of Copenhagen.

LUNDY, a little iſland in the mouth of the Briſtol-channel: W. long. 4° 50′, N. lat. 51° 25′.

LUNENBURG, the capital of the duchy of the ſame name, thirty miles ſouth-eaſt of Hamburg: E. long. 10° 20′, N. lat. 53° 35′.

LUNGS. See ANATOMY, p. 280.

LUNG-WORT, in botany. See PULMONARIA.

LUNISOLAR YEAR, in chronology, the ſpace of 532 common years; found by multiplying the cycle of the ſun by that of the moon.

LUNULA, in geometry, a plane figure like a creſcent or half moon.

LUPERCALIA, a feſtival of the ancient Romans in honour of the god Pan, obſerved on the 15th of February, and ſo called from luperci, the prieſts of that fabulous deity.

LUPINUS, in botany, a genus of the diadelphia decandria claſs. The calix conſiſts of two lips; five of the antheræ are oblong, and the other five round; and the pod is coreaceous. There are ſeven ſpecies, none of them natives of Britain.

LUPULUS, in botany, *&c.* See HUMULUS.

LUPUS, in zoology. See CANIS.

LUPUS MARINUS. See ANARRICHAS.

LUPUS, in aſtronomy. See ASTRONOMY, p. 487.

LURE, in falconry, a device of leather, in the form of a bird, with two wings ſtuck with feathers, and baited with a piece of fleſh; wherewith to reclaim or call back a hawk, when at a conſiderable diſtance.

LUSATIA, a marquiſate of Upper Saxony, bounded by Brandenburg, on the north; by Sileſia, on the eaſt; by Bohemia, on the ſouth; and by the duchy of Saxony, on the weſt: it is ſubject to the king of Poland.

LUSTRATION, in antiquity, ſacrifices or ceremonies by which the ancients purified their cities, fields, armies, or people, defiled by any crime or impurity.

Some of theſe luſtrations were public, others private. There were three ſpecies or manners of performing luſtration, *viz.* by fire and ſulphur, by water, and by air; which laſt was done by fanning and agitating the air round the thing to be purified. Some of theſe luſtrations were neceſſary, that is, could not be diſpenſed with, as luſtrations of houſes in time of a plague, or upon the death of any perſon; others again were done out of choice, and at pleaſure. The public luſtrations at Rome were celebrated every fifth year, in which they led a victim thrice round the place to be purified, and in the mean time burnt a great quantity of perfumes.

LUSTRE, the gloſs or brightneſs appearing on any thing, particularly on manufactures of ſilk, wool, or ſtuff. It is likewiſe uſed to denote the compoſition or manner of giving that gloſs.

The luſtre of ſilks is given them by waſhing in ſoap, then clear water, and dipping them in alum water cold. To give ſtuffs a beautiful luſtre, for every eight pounds of ſtuff allow a quarter of a pound of linſeed; boil it half an hour, and then ſtrain it through a cloth, and let it ſtand till it is turned almoſt to a jelly: afterwards put an ounce and a half of gum to diſſolve twenty-four hours; then mix the liquor, and put the cloth into this mixture; take it out, dry it in the ſhade, and preſs it. If once doing is not ſufficient, repeat the operation. Curriers give a luſtre to black leather firſt with juice of bar-berries, then with gum arabic, ale, vinegar, and flanders-glue, boiled together. For coloured leather, they uſe the white of an egg beaten in water. Moroccoes have their luſtre from juice of bar-berries and lemon or orange. For hats, the luſtre is frequently given with common water, ſometimes a little black dye is added: the ſame luſtre ſerves for furs, except that for very black furs they ſometimes prepare a luſtre of galls, copperas, Roman alum, ox's marrow, and other ingredients.

LUSTRUM, in Roman antiquity, a general muſter and review of all the citizens and their goods, which was performed by the cenſors every fifth year, who afterwards made a ſolemn luſtration. See LUSTRATION.

LUTE, or LUTING, among chemiſts. See CHEMISTRY, p. 116.

LUTE, is alſo a muſical inſtrument with ſtrings.

The lute conſiſts of four parts, *viz.* the table; the body or belly, which has nine or ten ſides; the neck, which has nine or ten ſtops or diviſions, marked with ſtrings; and the head, or croſs, where the ſcrew for raiſing and lowering the ſtrings to a proper pitch of tone are fixed. In the middle of the table there is a roſe or paſſage for the ſound; there is alſo a bridge that the ſtrings are faſtened to, and a piece of ivory between the head and the neck to which the other extremities of the ſtrings are fitted. In playing, the ſtrings are ſtruck with the right hand, and with the left the ſtops are preſſed. The lutes of Bologna are eſteemed the beſt, on account of the wood, which is ſaid to have an uncommon diſpoſition for producing a ſweet ſound.

LUTHERANS, the Chriſtians who follow the opinions of Martin Luther, one of the principal reformers of the church in the ſixteenth century.

This ſect took its riſe from the diſtaſte taken at the indulgences which were granted in 1517, by pope Leo X. to thoſe who contributed towards finiſhing St. Peter's church at Rome. John Stuptize, vicar general of the Auguſtines in Germany, was the firſt who took occaſion to declare againſt theſe abuſes, for which purpoſe he made uſe of Martin Luther, the moſt learned of all the Auguſtines. Luther was a native of Eiſleben, in the county of Mansfield in Saxony, and taught divinity at the univerſity of Wirtemberg; he mounted the pulpit, and declaimed vehemently againſt the abuſe of indulgences, and even fixed ninety-five propoſitions upon the church-doors of Wirtemberg, in order to their being conſidered and examined in a public conference: againſt theſe John Tetzel, a Dominican, publiſhed a hundred and ſix poſitions at Francfort upon the Oder; and by virtue of his office of inquiſitor, ordered thoſe of Luther to be burnt; when his adherents, to revenge the affront, publicly burnt at Wirtemberg thoſe of Tetzel. Thus war was declared between the Dominicans and Auguſtines, and ſoon after between the Roman catholic and the Lutheran party. In 1520, Luther ſent his book De Libertate Chriſtiana, to the pope; in which he grounds juſtification upon faith alone, without the aſſiſtance of good works; and aſſerts, that Chriſtian liberty reſcues us from the bondage of human traditions, and particularly the ſlavery of papal impoſitions; and afterwards, in a remonſtrance written in high Dutch, he proceeded to deny the authority of the church of Rome. He was the ſame year excommunicated by the pope; upon which Luther cauſing a large fire to be made without the walls of Wirtemberg, threw the pope's bull into it with his own hands, together with the decretals, extravagants, and clementines; and this example was followed by his diſciples in other towns. The next year the emperor Charles V. ordered his books to be burnt, and put him under the ban of the empire as a heretic and ſchiſmatic; and about this time king Henry VIII. of England wrote againſt him in defence of the ſeven ſacraments, to which Luther wrote a reply.

The elector of Saxony, who had for ſome time kept him concealed in his caſtle of Weſburg, now gave him leave to reform the churches of Wirtemberg as he thought fit; when this reformer propoſed, that the biſhops, abbots, and monks, ſhould be expelled; that all the lands and revenues of the biſhoprics, abbeys, and monaſteries, ſhould eſcheat to the reſpective princes; and that all the convents of mendicant friars ſhould be turned into public ſchools and hoſpitals: this year, Luther had the ſatisfaction to ſee a league contracted between Guſtavus king of Sweden, and Frederick king of Denmark, who both agreed to eſtabliſh Lutheraniſm in their dominions: and now Luther's perſuaſion, which from the Upper Saxony had ſpread into the northern provinces, began to be perfectly ſettled in the duchies of Lunenburgh, Brunſwick, Mecklenburgh, and Pomerania, and in the archbiſhoprics of Magdeburgh and Bremen; in the towns of Hamburgh, Wiſmar, Roſtock, and along the Baltic as far as Livonia and Pruſſia. Luther maintained the doctrine of conſubſtantiation; and at a general diet at Ratiſbon for reconciling both parties, the divines could agree to no more than five or ſix articles concerning juſtification, free-will, original ſin, baptiſm, good works, and epiſcopacy.

LUTHERN, in architecture, a kind of window over the corniche, in the roof of a building; ſtanding perpendicularly over the naked of a wall, and ſerving to illuminate the upper ſtory.

Lutherns are of various forms, as ſquare, ſemi-circular, round, called bulls-eyes, flat arches, *&c.*

LUTON, a market town, fourteen miles ſouth of Bedford.

LUTRA, in zoology. See MUSTELA.

LUXATION, in ſurgery, is when any bone is moved out of its place, or articulation, ſo as to impede or deſtroy its proper motion or office. See SURGERY.

LUXEMBURG, the capital of the duchy of the ſame name, ſituated an hundred miles ſouth-eaſt of Bruſſels, is a ſmall but ſtrong fortreſs: E. long. 6° 8′, N. lat. 49° 45′.

LYBIA, a name anciently given to all the coaſt of Barbary, eſpecially that part lying weſtward of Egypt.

LYCEUM, in Grecian antiquity, an academy ſituated upon the banks of the Iliſſus at Athens. It was compoſed of porticoes and walks, where Ariſtotle taught philoſophy; walking there conſtantly every day till the hour of anointing, whence he and his followers were called peripatetics.

LYCHNIS, in botany, a genus of the decandria pentagynia claſs. The calix conſiſts of one oblong ſmooth leaf, and the corolla of five unguiculated petals, with a bifid limbus; and the capſule has three cells. There are ſeven ſpecies, three of them natives of Britain, *viz.* the flos cuculi, meadow-pinks, or cuckow-flower; the viſcaria, or red German catchfly; and the dioica, or white campion.

LYCIUM, in botany, a genus of the petandria monogynia claſs. The corolla is tubular, the faux being ſhut up by the beard of the filaments; and the berry has two cells. There are three ſpecies, none of them natives of Britain.

LYCODONTES, in natural hiſtory, the petrified teeth of the lupus-piſcis, or wolf-fiſh, frequently found foſſile. They are of different ſhapes; but the moſt common kind riſe into a ſemiorbicular form, and are hollow within, ſomewhat reſembling an acorn-cup: this hollow is found ſometimes empty, and ſometimes filled with the ſtratum in which it is immerſed. Many of them have an outer circle, of a different colour from the reſt.

LYCOPERDON, in botany, a genus of the cryptogamia fungi claſs: It is roundiſh, and replete with farinaceous ſeeds. There are ten ſpecies, ſix of them natives of Britain, *viz.* the tuber, or ſolid puff-balls; the cervinum, or branny puff-ball; the boviſta, or common puff-ball; the ſtellatum, or ſtar puff-ball; the fornicatum, or turret puff-ball; and the pedunculatum, or ſtalked puff-ball.

LYCOPODIUM, in botany, a genus of the cryptogamia muſci claſs. The anthera is double-valved, and ſeſſile; the calyptra is wanting. There are 24 ſpecies, of which ſix are natives of Britain, *viz* the clavatum, or common club-moſs; the inundatum, or marſh club-moſs; the annotinum, or Welſh club-moſs; the alpinum, or mountain club-moſs; the ſelago, or firr club-moſs; and the ſelaginoides, or prickly club-moſs.

LYCOPSIS, in botany, a genus of the pentandria monogynia claſs. The tube of the corolla is incurvated. There are ſeven ſpecies, only one of which, *viz.* the arvenſis, or ſmall wild buglaſs, is a native of Britain.

LYCOPUS, in botany, a genus of the diandria monogynia claſs. The corolla conſiſts of four ſegments, one of them emarginated; the ſtamina are diſtant; and there are four ſeeds. There are two ſpecies; only one of them, *viz.* the europeus, or water-horehound, is a native of Britain.

LYDIA, an ancient province of leſſer Aſia, in which was the city of Philadelphia.

LYGEUM, in botany, a genus of the triandria monogynia claſs. The ſpatha conſiſts of one leaf; there are two corollæ above the ſame germen; and the nut has two cells. There is but one ſpecies, a native of Spain.

LYING-IN WOMEN. See MIDWIFERY.

LYME, a borough and port-town of Dorſetſhire, E. long. 3° 5′, and N. lat. 50° 44′.

It ſends two members to parliament.

LYMPH, a fine fluid, ſeparated in the body from the maſs of blood, and contained in peculiar veſſels.

Dr Keil ſays, that the lymph being chemically examined, will be found to contain a great deal of volatile, but no fixed ſalt, ſome phlegm, ſome ſulphur, and a little earth. The uſe of the lymph, he obſerves, may be gathered from the conſideration of the parts into which it diſcharges itſelf: that which comes from the head, neck and arms, is thrown into the jugular and ſubclavian veins; all the lymphatics which the parts in the cavity of the thorax ſend out, empty themſelves into the thoracic duct; and the lymph from all the reſt of the body, flows to the receptacle of the chyle; ſo that there can be no doubt but its chief uſe is to dilute and perfect the chyle before it mixes with the blood. See ANATOMY, Part III.

LYMPHATICS, in anatomy. See ANATOMY, p. 308.

LYNN-REGIS, a port-town of Norfolk, ſituated at the mouth of the river Ouſe, on a bay of the German ſea, thirty-two miles weſt of Norwich.

It ſends two members to parliament.

LYNX, in zoology. See FELIS.

LYONS, the capital of the Lyonois, a province of France, bounded by Orleanois and Burgundy on the north, by la Breſſe and Dauphine on the eaſt, by Languedoc and Guienne on the ſouth, and by another part of Guienne and Orleanois on the weſt. This city lies upon the confluence of the rivers Rhone and Soan, in E. lon. 4° 55′, and N. lat. 5° 50′. Next to Paris, it is eſteemed the place of greateſt trade in France.

LYRA, in ichthyology. See CALLYONIMUS.

LYRE, a muſical inſtrument of the ſtring-kind, much uſed by the ancients.

LYRE, in aſtronomy. See ASTRONOMY, p. 486.

LYRIC, in general, ſignifies ſomething ſung or played on the lyre: but it is more particularly applied to the ancient odes and ſtanzas, anſwering to our airs and ſongs, and may be played on inſtruments. This ſpecies of poetry was originally employed in celebrating the praiſes of gods and heroes, though it was afterwards introduced into feaſts and public diverſions.

LYSIMACHIA, in botany, a genus of the pentandria monogynia claſs. The calix is rotated; and the capſule is roundiſh, with a ſharp point, and contains ten valves. There are eleven ſpecies, five of them natives of Britain, *viz.* the vulgaris, or yellow willow-herb; the thirſiflora, or tufted looſe-ſtrife; the nemorum, or yellow pimpernell of the woods; the nummularia, or money wort; and the tenella, or purple money-wort.

LYTHRUM, in botany, a genus of the dodecandria monogynia claſs. The calix conſiſts of twelve ſegments, and the corolla of ſix petals inſerted into the calix; and the capſule has two cells, and many ſeeds. There are ten ſpecies, two of them natives of Britain, *viz.* the ſalicaria, or purple ſpiked looſe-ſtrife; and the hyſſopifolia, or ſmall hedge-hyſſop.

END OF THE SECOND VOLUME.

ERRATA.

End of the article CATASTROPHE. For *See* EPIC *and* DRAMATIC *compoſitions*, read, *See* COMPOSITION.

CHEVRON. Read *Plate LXV.*

CIRCUMDUCTION. For *addigeamus*, read *alledgeances*;—and for *Pobation*, read *Probation*.

DECLINATURE *of judges*. For *legal obligation*, read *legal objection*.

Page 424. column 2. line 39. For *fig.* 31. read *fig.* 3.

P. 425. col. 1. In paragr. 4. there ſhould have been a reference to *fig.* 6.—N. B. In any Treatiſe, or long article, illuſtrated by plates, when a figure is referred to without repeating the N° of the plate, let it be underſtood that the plate laſt mentioned is meant.

P. 426. col. 1. l. 35. For *fig.* 9. read *fig.* 3.—N. B. Fol. 425 & 426 are, by overſight, twice repeated.

P. 429. col. 1. l. 41. For *Fig.* 5. read *Fig.* 3.

P. 437. col. 2. l. 12. For *gait*, read *gate*.

DIODON. Omitted the reference to the figure, *viz.* Plate LXVIII. fig. 4.

DIPONDIUS. For *two ſparrows*, read *five ſparrows*.

DRACO. Omitted to refer to Plate LXVIII. fig. 5.

ECHENEIS. Omitted to refer to Plate LXXIV. fig. 4.

P. 477. col. 1. l. 43. For *Plate LXXV.* read *Plate LXXIV.*

P. 616. col. 1. l. *ult.* Read *Plate LXXX. fig.* 3.

P. 684. col. 1. By miſtake Florida is placed under the Spaniſh empire, and Canada under that of France; whereas they were both ceded to Britain by the late treaty of peace.

GIRONNE. For *fig.* 5. read *fig.* 4.

GORE. For *fig.* 4. read *fig.* 5.

P. 729. col. 2. l. 28. For *as to language*, read *as eſſential to language*.

P. 731. col. 2. l. penult. For *remain changed*, read *remain unchanged*.

P. 735. col. 1. l. 43. For *to write*, read *to unite*.

P. 742. col. 1. l. 26. For *was it not*, read *it was not*.

GRYLLUS. For *fig.* 3, 4, 5. read *fig.* 4, 5, 6.

GULES. For *Plate CI. fig.* 6. read *Plate XCVII. fig.* 7.

P. 805. col. 2. l. 29. For *fig.* 4. read *fig.* 5.

INTERLOCUTOR. For *extacted*, read *extracted*.

P. 863. col. 1. l. 40. For "*increaſe. However, the voice*," &c. read "*increaſe; and the voice*," &c.

P. 864. col. 1. Inſtead of l. 17, 18, 19. read thus: "But although it may be conſidered as a general rule, that the language of any nation is a very exact index of the ſtate of their mind, yet it admits of ſome particular exceptions; for as man," *&c.*

Ibid. l. 9. *Dele* the words *in time*.

Ibid. col. 2. Inſtead of l. 11, 12. read thus:—"little advantage from it, as the antiquity of a language does not neceſſarily imply any degree of excellence, ſeeing we all know that ſome nations," *&c.*

P. 865. col. 2. l. 34. For *word*, read *words*.

P. 866. col. 1. l. 6. For *one*, read *on*;—and in l. 24. *dele* the word *all*.

Ibid. col. 2. l. 22. For "and the *pluperfect* in ISSEM and ERO," read "the *pluperfect* in ISSEM, and the *future* in ERO."

Ibid. col. 1. and 2. Delete *Loqueo, Odio, Loque-bam, Odie-bam*, with the Engliſh words accompanying them;—and for *Faceo, Pona-bam, Obie-bam, Gaudie-bam*, and *Abſtinie-bam*, read *Facio, Pone-bam, Obi-bam, Gaude-bam*, and *Abſtine-bam*.

P. 868. For "TU, *Tytere, lentis in umbra*," &c. read "TU, *Tityre, lentus in umbra*," &c.

Ibid. col. 1. l. 28. For *contract*, read *contraſt*;—l. 37. for *paſion*, read *paſſion*;—and delete the ſyllable *con* at the beginning of l. 45.

P. 869. col. 2. l. 7. from the bottom. For *as they ought to have*, read *as they might have*.

P. 870. col. 2. lines 22, 23, 24, 25, and 26. read thus: "For all their nouns in UM of the ſecond declenſion, in E of the third, and in U of the fourth, have each their nominative and accuſative ſingular alike. Nor in the plural number is there any diſtinction between theſe two caſes," *&c.*

Ibid. col. 2. l. 19. from the bottom. For *language*, read *languages*.

P. 872. col. 1. l. 13. For *by accumulated*, read *by the accumulated*;—and l. 25. for *any grammatical errors*, read *any conſiderable grammatical errors*.

P. 873. col. 1. l. 10. from the bottom: for *commutation*, read *communication*;—col. 2. l. 5. for *more naturally adapted to the genius of the language*, read *more agreeable to the genius of the language in which he wrote*;—and col. 2. l. 38. for *that*, read *their*.

P. 874. col. 2. l. 23. For *languages far leſs capable*, read *languages, far leſs capable*.—Ibid. l. penult. for *quite*, read *too*.

P. 875. col. 2. l. 24. For *into*, read *in*.

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ERRATA.

P. 875. col. 2. l. 31. For *new-moulded ſhould at this juncture partake*, read *new-moulded at this juncture ſhould partake.*

P. 876. col. 1. l. 15. For *ſtanzas*, read *ſcenes*;—col. 2. l. 3. for *is it poſſible*, read, *is it, as we imagine, poſſible*;—and l. 16. for *is it*, read *it is*.

P. 877. col. 1. l. 10. Read *Madam Deſhouliers*.

P. 883. col. 2. l. 7. from the bottom, read thus: "Hence, as one ſtatute may be explained or repealed "by another," *&c.*—and in l. 6. delete the words *or repealed*.

P. 885. col. 1. l. 13. from the bottom. For *enexed*, read *annexed*.

P. 887. col. 1. l. 11. from the bottom. For 1972, read 1672.

P. 889. col. 1. l. 16. For *give*, read *given*.

P. 890. col. 1. l. 43. For *confirmed*, read *conferred*.

P. 895. col. 1. l. 31. For "*of the tocher and the wife*," &c. read, "*of the tocher ; and the wife*," &c.

P. 904 col. 2. l. 8, 9. For "*ward-holding was* in dubio," read "*ward-holding was* in dubio *preſumed*."

P. 905. col. 2. l. 32. For *commiſſion*, read *commiſſioners*.

P. 908. col. 1. l. 5. For *eſtabliſh as the full right*, read *eſtabliſhes the full right*.

P. 909. col. 2. l. 8. For *again*, read *againſt*;—l. 9, 10. for *hypothec payment*, read *hypothec for payment*;—and in l. 41. for 1755, read 1756.

P. 914. col. 1. l. 2. For *brought*, read *bought*;—l. 10. for *of general terms*, read *in general terms*;—and l. 11. for *in the ſervitude*, read *of the ſervitude*.

P. 916. col. 2. l. 13. For *p*. 159, read *p*. 259.

P. 920. col. 1. l. 18. Delete the word *be*;—and in col. 2. l. 6. from the botom, for *of diviſion*, read *or diviſion*.

P. 921. col. 2. l. 26. For *ſtatem*, read *ſtatim*;—and in l. 31. for *may exiſt*, read *may never exiſt*.

P. 931. col. 2. l. 18. For *ſeiſin has actually followed*, read *ſeiſin has not actually followed*.

P. 947. col. 2. l. 11. from the bottom. For *action*, read *actions*.

P. 951. col. 2. l. 13. For *or law*, read *of law*.

P. 953. col. 2. For *Tit*. 26. read *Tit*. 33.;—and in l. 5. from the bottom, for *hin*, read *kin*.

P. 958. col. 2. l. 12. from the bottom. For *forms of law*, read *forms of trial*.

The page following 958 is numbered 949 inſtead of 959. In col. 2. l. 25. of ſaid page, for *It is neceſſary*, read *It is not neceſſary*.

LOGIC. Read lines 3d, 4th, and 5th, of the firſt paragraph thus: "Inaſmuch as it traces the progreſs "of our knowledge from our firſt and moſt ſimple con"ceptions through all their different combinations, "and all thoſe numerous deductions," *&c.*

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